TICCIH Congress 2012

The International Conservation for the Industrial Heritage Series 2

Selected Papers of the XVth International Congress of the International Committee for the Conservation of the Industrial Heritage

CONTENTS

FOREWORDS

FOREWORD / MARTIN, Patrick

I am very pleased to open this collection of papers and presentations from the Fifteenth Congress of The International Committee for the Conservation of the Industrial Heritage, convened in Taipei, Taiwan, Republic of China in November 2012. Though there had been previous and memorable meetings in the region, this meeting was the first full General Assembly of TICCIH to be held in Asia and is significant for that reason, as well as others. The sessions and discussions were lively, the mix of participants was broad and well representative of the range of nations included in TICCIH's membership.

Because printing of all presentations was simply not feasible, the organizers and individual session chairs selected the papers we have reproduced here as among the best offered at the meeting. In addition, they represent the range of topics and themes presented.

Among the important outcomes of the Congress was the generation of a Declaration recognizing the shared interest in the distinctive elements of the Asian experience of industrialization and a shared dedication to a cooperative effort to support preservation and interpretation of that heritage. The details of the Taipei Declaration and cooperative plans are offered herein.

Patrick Martin

TICCIH President
Professor of Anthropology and Archaeology, Michigan Technological University, USA

FOREWORD / LIN, Hsiao-Wei

TICCIH Congress 2012 in Taiwan, starting from November 4th through 11th, 2012, was the first TICCIH Congress held in Asia since 1978. There were more than two hundred delegates from twenty-six countries, an extremely high standard of papers and discussions, and the arrangements of the exhibition, workshops and tours were handled impeccably with enormous support from various governmental officials, organizations and enthusiastic staff. The Congress committee is very much grateful to the supporters and participants who contributed and facilitated such excellent outcomes.

This Selected Papers are screened by the editor committee from 96 presented papers during the congress and are compiled in very limited time. Thus, the editor committee would like to apologize if there are any oversights or mistakes. The fact that this Congress ended with the establishment of an Asia Industrial Heritage Network for TICCIH and the publications of Taipei Declaration and Selected Papers justified all the hard work and efforts which were put in by numerous individuals and organizations. It is a milestone for TICCIH's influence in Asia.

The text of the Taipei Declaration and the list of the selected papers are also available in details on the website of TICCIH Congress 2012 for wider publicity.
http://www.arch.cycu.edu.tw/TICCIH%20Congress%202012/index.html

We hope our efforts can lead a step forward to the development of conservation for industrial heritage in Asia as well as the international world. We also hope to see you again soon for the Asia Industrial Heritage Network in the near future.

Hsiao-Wei Lin

Chairman of TICCIH Congress 2012
Assistant Professor of Department of Architecture, Chung Yuan Christian University, Taiwan

FOREWORD／LIN, Hui-Cheng

The TICCIH Congress 2012 was held from the fourth day to ninth day of November in the Taipei City of Taiwan, the capital city of Taiwan. This congress includes three days' conference, and the latter was composed of keynote lectures, theses presentation, posters presentation, forum, and workshops.

In the conference, we have received around 140 abstracts from difference countries all over the world, and after deeply discussions by the members of academic committee, we decided to accept eighty-three papers for oral presentation and twenty-eight papers as poster presentation. All oral presentation papers were divided into four subjects, as follows: (a) Theory and Methodology, (b) Planning and Design, (c) Interpretation and Application, and (d) Social and Economic Impacts.

From the fact that scholars of twenty and more countries try to contribute their knowledge to this conference, this implies that the industrial heritage have gradually paid attention by the world societies. Secondly, the topic of papers including history and theory, territorial conservations planning, and the study of a certain object etc. are various, this shows that the interesting of industrial heritage from intellectuals are thorough. Finally, from the fact that the majority of papers own comprehensive discourse framework, sufficient row materials, reasonable methodology, and well format, all these indicate that the papers of this conference own high quality.

As the chairperson of academic committee of this conference, I am very impressive on the variety, rigor, and abundance of papers of this conference. Also, I believe that all the discussions of this conference will benefit to the international industrial heritage conservation in the future time.

Hui-Cheng Lin

Chairman of Academic Committee of TICCIH Congress 2012
Professor and Dean of Taipei National University of the Arts Graduate Institute of Architecture and Cultural Heritage, Taiwan

INTRODUCTION

CONGRESS PROGRAM
CONGRESS THEME & SECTIONS

Congress Program

【Table-1】TICCIH Congress 2012 Conference Program and Date

Time	Day 1 4th Nov. Sun	Day 2 5th Nov. Mon	Day 3 6th Nov. Tue	Day 4 7th Nov. Wed	Day 5 8th Nov. Thu	Day 6 9th Nov. Fri	Day 7 10th Nov. Sat	Day 8 11th Nov. Sun
AM	TICCIH Board Meeting	Opening Ceremony Keynote Lecture 1-2	Congress Tour Taichung Broadcast Bureau Taichung Creative and Cultural Park	Keynote Lecture 3-4 TICCIH Special Section	Asian Industrial Heritage Cooperation Forum	Post-Congress Tours – 3 days 1. Industrial Heritage Tour to Southern Taiwan 2. Industrial Heritage Tour to Northern Taiwan		
PM	Registration Pre-congress Tour Taipei Industrial Heritage Tour	Sessions/ Workshop A National Representative Meeting	Changhua Railway Workshop/ Xihu Sugar Factory	Sessions/ Workshop B	TICCIH General Assembly/ Poster Sessions			
EVE	Welcome Reception at Huashan1914 Creative Park	Social Program (optional)	Lugang Settlement (Back to Taipei)	Free night	Farewell Party at National Taiwan Museum			

Congress Theme & Sections

We use the term ‘post-colonial’, to cover all the culture affected by the imperial process from the period of colonization to the present day. Since the beginning of industrialization the development of more and more new industries has changed the urban and rural landscapes all over the world. The process of birth, growth and decline of such industries is even more dramatic and fast-coursed by the colonization of the world. It is still visible in the remaining industrial monuments; it is also alive in the structure of a landscape which was formed over centuries by industrial activities and the development of technical infrastructure. Thus, as the first TICCIH congress held in Asia, we would like to explore the industrial heritage in relation to post-colonialism - to see the industrial heritage of others from various points of view and to seek the solution to the massive industrial impact on the landscape in the present day.

In the west, ‘regeneration through heritage’ has a long development since the 1960s. In Asia, it is a relatively new concept for urban and regional development. Different attitudes towards post-colonialism have also affected the life of industrial heritage and social development of society. In addition, there are some countries which just started their industrialization. Therefore, it is the time to review the industrial heritage development and to look for a dynamic and sustainable development of the industrial world in the future.

The congress theme ‘Post-colonialism & Reinterpretation of Industrial Heritage’ aims at these close connections between historical, political, racial, environmental, economic, technical, and social questions of industrial heritage in our modern world. It was be a forum for presentations and discussions on these issues and for realized, actual and planned projects as well as concepts for possible solutions of these problems. Therefore, the congress and its planned sessions was be open for participants from all scientific and administrative fields and institutions which are dealing with historical, political, ecological, economic and heritage problems of industrial monuments and industrial landscapes. The key-sessions and sub-sessions will be defined later.

The conference will begin with four keynote speakers from Europe, USA and Asia. They will give introductions and overviews on general topics about the main theme of the congress. Furthermore, the conference will be open for four sections and poster sessions for presentations on the results of new research and development projects in this field. The four sections for oral presentations are as below:

Section I: Theory and methodology
Section II Planning and design
Section III Interpretation and application
Section IV Social and economic impacts

A poster sections as well as a special exhibition: An Inch to World Heritage-TICCIH Congress 2012, Spark to Taiwan's Industrial Heritage, was be held during congress.

In addition to the conference, a pre-congress tour, a congress tour and 2 post-congress tours are provided. The pre-congress tour visited Taiwan Railways Administration Workshop, Huashan 1914 Creative Park and Cultural and Creative Park. The congress tour taken participants to Taichung Cultural & Creative Industries Park and to visit Bureau of Cultural Heritage, Xihu Sugar Refinery and Changhua Fan-shaped Railway Workshop. The optional post-congress tours brought participants either to the industrial heritage of southern Taiwan such as Cigu Salt Field, Wushantou Reservoir and Jianan Irrigation Waterways, Kaohsiung Port, or to the industrial heritage of northern Taiwan for Gold Ecological Park, Taiwan Coal Mine Museum, Chu-huang-keng Oil Mining Landscape, Taipei Water Park and railway workshop. Asian industrial heritage cooperation forum and some social events are also arranged during the congress.

【Table-2】TICCIH Congress 2012 Theme & Sections

Theme: Post-Colonialism and Reinterpretation of Industrial Heritage							
Section I:		Section II:		Section III:		Section IV:	
Theory and methodology		Planning and design		Interpretation and application		Social and economic impacts	
S1-1	Industrial archaeology	S2-1	Brownfield treatment	S3-1	Post-colonialism & heritage policy	S4-1	Industrial tourism
S1-2	Conservation science and technology	S2-2	Regeneration of ecological environment	S3-2	Interpretation of exhibitions and museums	S4-2	Operation and management
S1-3	History of technology	S2-3	Landscape planning and management	S3-3	Colonial industrial heritage	S4-3	Laborer culture & community issues
S1-4	Industrial cultural landscape	S2-4	Reuse of industrial space	S3-4	Industrial Heritage in the Japanese World Heritage tentative list	S4-4	Community empowerment
S1-5	Industrial Archives and documentation	S2-5	Urban regeneration	S3-5	Workshop A : Nomination of Industrial Heritage for Inscription on the World Heritage List: Process and Practice	S4-5	Intangible industrial heritage
				S3-6	Workshop B : Digitising Industrial Heritage		

CHAPTER ONE :

KEYNOTE PAPERS

Industrial Heritage: Treasure or Trash?

COSSONS, Neil
Pro-Provost and Chairman of Council of the Royal College of Art, UK
Knighted in 1994 for his work in museums and heritage.

Abstract
As the industrial world expands and its epicentre moves inexorably east so the industrial heritage – the material evidence of past industrial cultures - expands exponentially. And, each nation or community views its own industrial heritage through distinctively different eyes: an asset of intrinsic worth, a mark of identity, as part of a collective inheritance, a resource for regeneration, an incongruous nuisance to be swept away. Often it can be all of these concurrently, raising complex questions about differentiation, advocacy and determining inherent value. In this, international comparative analysis can be of critical importance. Neil Cossons reflects on the opportunities afforded in a post-colonial, globalised world for the industrial heritage to reinforce individuality in the face of homogenisation, and to take its place as an expression of a shared past – not only in what is preserved but also how and by whom.

This is the first time that TICCIH has held its triennial Congress in Asia. It is taking place at what is one of the most seminal moments in history. All who understand the significance of industrialisation in the making of the modern world recognise that we are living through a period not just of immense change but witnessing one of those exceptional inflections in the long arc of history that will touch the lives of us all. We are all of us a part of this critical global re-adjustment, in which the epicentre of the world's economy is shifting irrevocably.

It is an inflection driven by a new Industrial Revolution and, just as those earlier industrial revolutions from the eighteenth century onwards changed the world and ultimately made it immensely more populous and prosperous, so too the industrial revolutions taking place around us today are presaging the same transformative consequences. Nothing that has gone before will be the same again.

The forces of demographic change have been reshaping the world for over three centuries. The drivers have been industrialisation and urbanisation. Five years ago researchers at North Carolina State University and the University of Georgia, working with United Nations data, estimated – rather endearingly – that the planet officially became more urban than rural on 23 May 2007. It was a Wednesday. The specificity of the date was of course largely symbolic, but the thesis was clear: more people are living in towns and cities than ever before. Indeed, the United Nations has estimated that as many as 60 per cent of the planet's population will be urban dwellers by 2030, compared with 14 per cent a century ago.[1] The rate of change is clear, exponential and inevitable.

So, it is an especially important time for us to reflect on industrialisation and its wider consequences,

what it means, how we treat its history, what we can learn from it and – most significantly for TICCIH – how we handle its material evidence. Is the industrial heritage something to treasure and take forward as a valued part of the past or should it be consigned to oblivion, as trash? Or, again, are there alternatives, of allowing it to quietly mature – like laying down a good wine - until public attitudes and political opinion catch up? There are many examples of industrial heritage places that have been redeemed after years of neglect as succeeding generations came to recognise their value. It is most appropriate too that we should contemplate these events and their implications here in Taiwan, at an international congress in an Asian setting.

In this new and challenging environment contemporary historians and commentators are striving to understand what is happening, in a world on the one hand traumatised by financial calamity, on the other experiencing the most astonishing economic transformation; in Asia, and especially in China and India, but also, for example, in Turkey - and in parts of Latin America, most notably Brazil and Mexico. For some, this ascent of Asia is seen as entirely novel, an unprecedented revolution driven by industrialisation and reflected in urbanisation and the rise of new, prosperous, educated urban elites, progressively improved standards of living, and astonishing changes in the physical environment, although at the same time raising tough questions about energy consumption, carbon and global warming. Others take a longer and more nuanced perspective. They see the rise of industrial Asia as symbolising a return to an historic status quo. In their view, the dominance of Europe and North America on the world stage was a brief five-hundred-year interlude in the long continuum of history; Asia is now simply returning to the position it held for over four millennia, as the centre of civilisation, of power and of influence.

This questioning of what is taking place is not new. Nor are challenges to the proposition of manufacturing industry. Industrial revolutions have always raised dilemmas, shaped attitudes and left complex and ambivalent legacies. Stand in Monticello in Virginia, home of Thomas Jefferson (1743-1826), principal author of the American Declaration of Independence and third President of the United States. Today Monticello is a World Heritage Site. High on the wall in one corner of the dining room hangs the 1782 Michael Angelo Rooker engraving of the Iron Bridge, cast at Coalbrookdale, England in 1779. This first iron bridge stands to this day. It was then, as now, the most visible and emblematic symbol of Britain's emergence as the world's first industrial nation.[2]

Jefferson bought the picture at a time when he was perplexed by the role that manufacturing might play in the new United States. Initially, he was intensely hostile.[3] In 1785 and again in 1788 he spoke passionately against manufacturing and the urbanisation that he saw as an inevitable and unwelcome consequence. He regarded industry as a British evil rather than an American opportunity. It would be rural values that guided the new republic; for him, virtuous, representative government had to rest on the shoulders of independent yeoman farmers.

Although he was not alone in his views, Jefferson's voice was at variance with an influential majority who recognised that, once free of colonial restrictions, the United States would flower as an industrial nation. Benjamin Franklin (1706-1790) was an enthusiastic supporter of manufacturing, as might be expected, as was George Washington (1732-1799), who sought to encourage technology as a means of American improvement. In the words of Tench Coxe (1755-1824), who drafted much of Alexander Hamilton's (1755 [1757?]-1804) influential Report on Manufactures of 1791, 'As long as we remained in our colonial situation our progress was very slow …"[4]. In the new nation, he predicted 'Machines ingeniously constructed, will give us immense assistance'.[5]

Twenty years later Jefferson reluctantly changed his views, recognising not only that the unique events then taking place in Britain were already having global consequences but that if the United States failed to embrace them the nation would be sidelined. In this respect, the United States may be regarded, in a very real sense, as the world's first post-colonial industrial nation. And, of course, the United States was to go on to become the world's leading industrial power by the first half of the twentieth century.[6]

A century earlier, in the 1840s, in a Britain approaching the height of her industrial pre-eminence, there was also another and very different picture – of appalling housing, child labour and dangerous working conditions - that raised questions about the social consequences of industrialisation and urbanisation. While on the one hand Manchester – the first industrial city – drew people from all over the world to admire its spectacular progress, it was the darker side of the city's industrial culture that inspired commentators like Friedrich Engels (1820-1895) and Karl Marx (1818-1883) to canvas a new political creed in which industrial capitalism would be subjugated to what they saw as higher and more altruistic ideals.

Although it was in part the social issues prompted by industrialisation that provided some of the impetus, it was primarily the threat to the rural landscape of England that led to the first moves to preserve historic places, initially archaeological monuments, later historic buildings and landscapes. It was what many saw as the destruction of a rural, pre-industrial England that energised the first moves towards historic conservation, led to the founding in 1877 of the Society for the Protection of Ancient Buildings and, twenty years later, the National Trust – now with over four million members – and created a climate in which heritage protection became a legitimate concern of government.

It is not surprising therefore that it was not until the mid-1950s that industrial archaeology was to emerge, driven by a belated recognition that tangible remains of the world's first Industrial Revolution still survived but were under threat, from urban renewal and industrial modernisation in a new post-war and post-colonial world. Across much of Europe, the industrial heritage now takes its place as an acknowledged and valued part of the wider historic landscape, in many cases enjoying legislative protection and enthusiastic public support. From the 1960s industrial sites and monuments began to enjoy widespread statutory protection; in England, of the 19,748 Scheduled monuments, 887 are industrial, while of the 374.230 Listed buildings, 16,407 come into this category; 4.49 per cent and 4.38 per cent respectively.[7]

Today, in a more mature world, industrial heritage is being seen as a symbol of national identity. In Scotland, contemplating a referendum in 2014 on whether it should become independent from the United Kingdom, industrial heritage is increasingly being presented as a mark of distinctiveness and nationhood. The concept of an inventive, industrial Scotland has something to offer the Scots of today and tomorrow, linking the pedigree of the Scottish enlightenment, and the scientific lineage that was a part of it, with a new and distinguishing future. It at once confers value on the material evidence, identifying it as a part of the nation's essential DNA, and offers an inspirational message to those young Scots seeking their way in the world.

In Wales too the industrial heritage is increasingly at the heart of what differentiates the Welsh from the rest of the world and perhaps from the rest of Britain. Wales now proudly proclaims herself 'The First Industrial Nation'[8] as a persuasive amplification of how it sees the future. In the

autonomous state of Catalonia too, where Barcelona once styled herself the 'Manchester of the South', it has been an investment in industrial heritage that has helped differentiate it from the rest of Spain, trading on qualities of distinctiveness and pride in a past for which the heritage offers both a vivid reminder and pointers to a Catalan future in which making things again matters.

If we look at industrial heritage in the Asian arena, it is of course Japan that offers the foremost example of an industrially-driven transformation, made the more astonishing because it was self-generated, and achieved in an extraordinarily short space of time. From a unique position of global isolation – and in part because of it – Japan became a full-fledged industrial nation in just half a century, a phenomenon equally outstanding in the Asian context. It was in this respect that Japan became the paradigm for other countries seeking to find their own place in the world.

Turkey, Egypt and Persia (today's Iran) all saw in Japan's emergence as a new industrial nation something to be admired and learnt from. The reforming Young Turks especially, soon to assume power and build a nation state out of the ruins of the Ottoman Empire, viewed Japan as a beacon.[9] In Turkey, Japan's reputation had continued to rise throughout the 1890s and especially after 1902 when she achieved what the Ottomans had for decades tried unsuccessfully to do – forge a treaty with Great Britain. As early as 1889 a leading Turkish newspaper stated:

The [Japanese] government, adorned with great intelligence and ideological firmness in progress, has implemented and promoted European [methods] of commerce and industry in its own country, and has turned the whole of Japan into a factory of progress, thanks to many [educational institutions]; it has attempted to secure and develop Japan's capacity for advancement by using means to serve the needs of the society such as benevolent institutions, railways, and in short, innumerable modes of civilization.[10]

This then is the context in which we contemplate the future of the industrial heritage here in Taiwan, in a global context and a post-colonial environment.

But we must not forget that globalisation brings its own imperialism, at least as controlling and as subjugating as the territorial ambitions of the colonial powers in the eighteenth, nineteenth and twentieth centuries. Industrial imperialism ensures its position and protects its future not by the conquest of distant lands as by the securing of its sources of raw materials, and to an extent by imposing export embargoes. The modern world is as much under the control of the major industrial powers as it ever was during the colonial era. Many of the sources of rare metals so crucial to automobile, IT and solid-state electronic manufacture have been identified and procured for years ahead, enabling the corporations that have bought them and the nation states that stand behind them, to guarantee their own future prosperity.[11]

Iron ore sales from Western Australia represent 47 per cent of the State's income, 64 per cent of output going to China and 21 per cent to Japan. From the twenty-one open-pit mines in the Pilbara some 80 per cent of output goes overseas, a classic example of a quasi-colonial economy. In July 2009, Japan's Ministry of Economy, Trade & Industry (METI) identified thirty-one metal ores as being crucial to the nation's future and launched a four-point strategy to underpin the industrial base.[12] Prime among these was securing future access to international supplies. At the same time, at a non-governmental level, German companies have formed an alliance to secure their own stocks of rare metals.[13] All this suggests that although the mechanisms may have changed

the motives and the effects, of creating dependency cultures, especially in developing countries, are little different from the colonial era. This has huge implications for historic mining areas, especially where re-working of previously uneconomic deposits are concerned.

In contemplating the industrial heritage of post-colonial societies and in the context of globalisation, these are the sorts of factors that need to be taken into account. Extractive industries in particular often reflect these dependency characteristics. They have limited duration, contingent on the life of the lode or seam. They often involve external capital and frequently the import of foreign skills and technologies. A case in point - and a classic example - is the worldwide spread of Cornish hard rock mining technology from the early nineteenth century onwards. Highly developed skills, established over generations in Cornwall's tin and copper mines, were attracted overseas by opportunity on the one hand and at times unemployment in Cornwall, the result of fluctuations in tin and copper prices, not least resulting from the exploitation of cheaper alternative sources abroad. Today, the Cornwall and West Devon Mining Landscape World Heritage Site[14] is the focal point of efforts to expand its reach to other Cornish mining settlements where tangible evidence still survives in the hands of communities proud of their Cornish heritage. As a result, sites in, for example, Spain, South Africa, Australia, and New Zealand may become reconnected with Cornwall in what would be the first example of an intercontinental world heritage serial network.

While Cornish pumping engine houses have an immediately distinctive signature, and as ruins present conservation challenges that are relatively easy to handle, the remnants of other often more transient and rapacious forms of mineral extraction are much more difficult, standing outside the stereotypical image of aesthetically pleasing and monumental heritage. Regenerating the mining town of Broken Hill – 'the Hill that changed the Australian Nation'[15] - is a case in point. Here cultural tourism, based on the strong will of a community's pride and determination, is building a new and alternative economic model as traditional mining employment evaporates. It is an example of a worldwide trend in which heritage-led regeneration is increasingly being used as part of government policy to combat the regional decline associated with de-industrialisation, and reflected in economic breakdown, unemployment and social fragmentation.[16]

These global trends offer us an agenda for how TICCIH might address the conservation of the industrial heritage, at a strategic level as well as by presenting examples of best practice regionally, nationally and internationally. Globalisation has been a gathering force for over three hundred years, affecting communities throughout the world. It is a cultural phenomenon in its own right with its own history and heritage. Mass migrations of people, the mercantile and industrial revolutions, as well as imperial ambitions, have led on the one hand to the progressive erosion of indigenous character and distinctiveness and on the other to the creation of a new world order typified by the growth of transcontinental industries and markets and the startling new urban landscapes that derive from them.

This has profound implications for cultures and communities and the future of their heritage. At a local level we see small communities in decline in the face of the pull of the city, and older industrial settlements overtaken and marginalised by new industrial enterprise elsewhere. The rustbelt landscapes in parts of the United States are a case in point, the result of international competition or flight to the sunbelt.[17] So too are port cities like Liverpool. The heritage of these relict landscapes is frequently rich but the economic capacity to secure their futures often fragile. Elsewhere, thriving industrial societies have yet to recognize the value of their primal industrial

heritage and are willing to see it swept away in the face of modernization or the perceived need to maintain the flexibilities essential to encourage industrial growth unencumbered by the past.

By contrast, proposals for a serial World Heritage nomination in Kyushu/Yamaguchi, charting the origins of industrial Japan, represent a groundbreaking approach on the part of prefectural and national governments, as well as industrial corporations, working together in partnership.[18] The inclusion of operational ports, shipyards and steelworks reflects an innovative approach to World Heritage inscription - almost without precedent - that challenges ICOMOS and UNESCO to recognise that new heritage needs new approaches, and the flexibility to interpret rules designed for a more traditional heritage to be adapted to the new needs of a new day.

Let me conclude with what I see as some key fundamentals that might guide our future debate. First, and most important, there is the need for advocacy; to articulate clearly and persuasively the values that underscore the industrial heritage and why it should be preserved. This needs to be in plain language; comprehensible to the general public, soundly argued, simple, clear and convincing. The present danger – and this applies to the heritage sector in general – is that the core principles and justifications are obscure to any but insiders. National heritage agencies, ICOMOS and UNESCO, are all guilty of this. Their policies and the declarations that lie behind them are by no means self-evident to an outsider asking straightforward questions about why this stuff should be kept for the future. That presupposes of course that we know the answers to these questions ourselves. If we wish to see it as treasure rather than trash then a stronger case needs to be made.

In this respect TICCIH has taken a first step with the publication of Industrial Heritage Retooled[19], supported by the generosity of the J M Kaplan Fund. Most capably edited by James Douet, this is the first time TICCIH has sought to influence the public directly. My hope is that it will not be the last.

Second, we need to demonstrate that there are sites and monuments that have intrinsic value as part of the cultural heritage and that this is the essential justification for their retention. As primary evidence or as places central to the life and memories of communities we must not be shy of stating that there are parts of the wider cultural heritage that are worthy of preservation, in their own right. This is preservation for history's sake. Some may merit World Heritage inscription because of their Outstanding Universal Value, as defined by UNESCO. Many more will not. Their value may be to local communities as a part of their own identity and sense of place. But, here again, the nature of those values is not always apparent – even to local communities themselves - and is easily misunderstood by many people outside the heritage sector. What is valued by a local community may have little resonance in the face of development pressures or an overwhelming need to create jobs. Often, the two need not be mutually exclusive. Good, creative place-making allows a reconciliation of the voices of the past and society's aspirations for the future. Properly argued we can have our past and make it a vibrant part of tomorrow.

Third, there is an easily-held assumption that adaptive reuse represents the only future for redundant industrial buildings; worse, that unless a new commercial use can be found then the building is not worth saving. Adaptive reuse is of course frequently the answer, and often the only answer, but it needs to be handled with care, understanding and skill. The processes of adaptive reuse of industrial buildings deserve to be arbitrated in a manner that respects inherent historical

significance. But, it is only through precise statements of value, clearly articulated in conservation plans, that these buildings can be protected from inappropriate treatment. In the regeneration of historic buildings there is rarely if ever any justification for destruction of historic fabric or loss of essential character. Understanding is the key. From understanding grows caring, from caring grows sound conservation, from sound conservation comes inspiration and enjoyment. Architectural narcissism can be seriously damaging to an historic building's meaning. Informed conservation enables historical integrity and ambitious, economically viable, re-use to co-exist. But, in every case we should ask the question, 'where is industry?'

A fourth way, is to afford some degree of legislative protection well in advance of proposals for regeneration. This is to accommodate the interlude between informed recognition on the one hand and finding an effective future on the other. It is especially challenging for those who promote the future of the industrial heritage and comes back to the need for powerful advocacy and persuasion; to demonstrate that these places are not liabilities but assets-in-waiting. It was forty years between the 1967 designation of St Pancras Station in London as a Grade 1 Listed building, at the low point in its fortunes, and the reopening in 2007 – in a reprise of its former self – as the terminus for Eurostar trains to Paris and Brussels.[20]

We should understand too that ruins have a value. They stand marooned in time. Perhaps we should leave them there. In decay theirs is a quality of innocent authenticity unspoilt by tourism, unsanitized by conservators, untainted by voyeurism. Abandonment is a natural and inevitable consequence of the end of industry but it leaves detritus that can speak to future generations. Offshore of Nagasaki is an abandoned coalmining island, Gunkanjima. Beyond all possibility of conservation in the conventional sense, corrosion and decomposition are its most overwhelming characteristics. Here a future as a ruin in unmanaged and continuous decay is both practical and perhaps the most ethically pure way forward. Intervention would destroy the majesty of disintegration. This is the antithesis of adaptive reuse

Jerry Herron, in his essay 'Living with Detroit', notes that 'Because so much of the city was abandoned in so short a time - a period of only twenty years or so – and because there was so little reason to maintain, let alone demolish, what got left behind …. Detroit has become the richest site in America when it comes to ruins.[21] There are more ruins here, inside the city limits, than at any other place in this country….' Note the use of the word 'richest'. In these strongly textured environments of decay lie the raw materials for tomorrow's historians, to examine and understand a world that has passed.

And, perhaps buried deep in them, can still be found the memories of those former industrial communities. Theirs is a heritage often overlooked in our concern for the physical fabric and our veneration of the written word. As Gaynor Kavanagh has pointed out, '… the elevation of the written over the spoken has overridden memory, rendered it suspect, literally the stuff of hearsay. With it has come the ignoring of those who seek to remember, and therefore loss of alternative views of ourselves and the human condition.'[22] In Japan the recent and successful nomination for inscription on the Memory of the World Register of the Sakubei Yamamoto Collection[23] of illustrations of mining underground in the Tagawa City Coal Mining Historical Museum is especially encouraging and exemplifies the meanings hidden in these former mining communities. These are the nameless people.[24] Our job is to pierce their anonymity so that future generations may understand their extraordinary achievements.

The future of these working places is in our hands; to preserve for posterity, to recycle for tomorrow, or to leave alone so that future generations can make choices for themselves based on our prudence and their values and judgments. We have a choice over whether it is treasure or trash.

Fig.1
The first Iron Bridge, cast at Coalbrookdale, England in 1779 and seen then, as now, as one of the emblems of the new industrial world.
Photo © Neil Cossons

Fig.2
Industrialisation was widely seen as a desecration of the traditional rural landscape. In this view of the proposed Birmingham and Liverpool Railway of 1825 the railway is seen as an adornment to be accommodated into the countryside.
Photo © Neil Cossons (author's collection)

Fig.3
In Catalonia, in Scotland, and here in Wales, the industrial heritage is increasingly seen as a symbol of national identity. The slate industry of North Wales is currently the subject of a world heritage nomination.
Photo © Neil Cossons

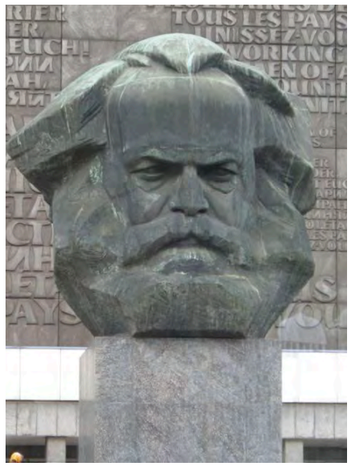

Fig.4
Industrialisation provoked many reactions; admiration of the progress and wealth generated in the new industrial cities and horror at the proletarianisation of workers. Capitalism as we know it emerge from industrialisation, so too did socialism and communism. Here the enormous head of Karl Marx dominates the centre of Chemnitz in Germany, a city in the East that was called Karl-Marx-Stadt from 1953 to 1990.
Photo © Neil Cossons

Fig.5
Japan's rise in the second half of the nineteenth century as the first Asian industrial nation was inspiration for many other countries. These reverberatory furnaces at Niryama form part of a world heritage nomination on the roots of Japanese industrialisation.
Photo © Neil Cossons

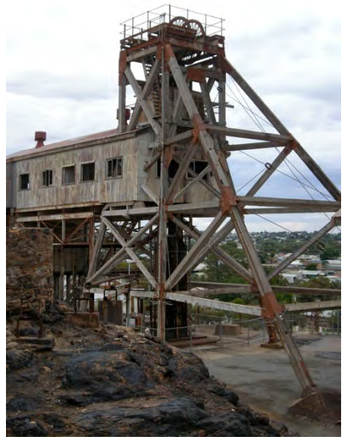

Fig.6
In Broken Hill, Australia, heritage tourism forms part of the community's vigorous response to the challenge of a decline in mining and the consequent loss of jobs.
Photo © Neil Cossons

Fig.7
Adaptive reuse is a crucially important means of finding new uses for redundant industrial buildings. St Pancras Station, London was Listed Grade 1 in 1967, when its future was in doubt but its importance becoming recognised. Here, 160,000 new 'best Welsh slates' form part of the regeneration of the building as the terminus for Eurostar trains from Paris and Brussels. Maintaining the authentic qualities of the original was critical to achieving an outstanding result.
Photo © Neil Cossons

Fig.8
The new interest in ruins and their future is becoming a worldwide fetish. Here is Gunkanjima - Battleship Island - offshore of Nagasaki. Impossible to conserve by any conventional means its future may be in unmanaged and continuous decay. Ruins like this can speak powerfully to future generations.
Photo © Neil Cossons

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Enlightening the Spirit of Industrial Heritage in Taiwan

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Abstract
On November 28, 2011, the 17th general assembly of ICOMOS adopted the Joint ICOMOS-TICCIH Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes, readdressing and reconfirming the importance of industrial heritage to human society. The new declaration is the second international document devoted to industrial heritage followed by the Nizhny Tagil Charter for the Industrial Heritage in 2003. Recognizing the significance of industry to the history of Taiwan, the government of Taiwan has started to pay attention to industrial heritage and an effort to preserve important sites has been implemented since the late 1990s. However, most of industrial heritage sites are conserved and preserved in a conventional manner, similar to heritage of other heritage building types. The core values of industrial heritage are always neglected, either consciously or unconsciously. The policy of industrial heritage conservation was executed without considering the uniqueness of every site. This paper will discuss the essential elements of the spirit of industrial heritage in Taiwan, in particular, how it is embodied, and it will review the preservation and conservation of industrial heritage sites in a historical context. The paper will also argue that the spirit of industrial heritage in Taiwan should be enlightened so that it can play an important role in the cities.

Keywords: industrial heritage, Taiwan

Introduction

Taiwan's preindustrial manufacturing activities can be traced back to the seventeenth century. Between 1895 and 1945, Taiwan was colonized by the Japanese for fifty years. The colonial government soon turned its attention to industry and initiated many types of industry. Taiwan became modernized and industrialized during the Japanese period. Taiwan's industry witnessed the transformation of Taiwan's economy. At the same time, it changed the society of Taiwan in many aspects. Every industrial heritage site provides historical evidence of Taiwan's history. Strictly speaking, the term industrial heritage refers to those heritage sites built after the Industrial Revolution in the eighteenth century. However, the definition of the industrial heritage in Taiwan should be expanded to include heritage sites related to both preindustrial and postindustrial activities.

Based on that definition, the first part of this paper is devoted to the review of the most crucial industries in Taiwan. The focus will be placed on how these industries emerged, developed and declined. The second part of the paper is a brief discussion on the preservation and conservation of industrial heritage in Taiwan. Emphasis will be placed on how industrial heritage was rescued

by scholars and people from cultural circles. The third part of the paper is the discourse on the core values of the industrial heritage. The concept of the spirit of the place is adopted to interpret the discourse. The spirit of the place always refers to the unique, distinctive, and cherished aspects of a place. The concept was reemphasized in the Quebec Declaration adopted in the 16th International Council of Monuments and Sites (ICOMOS) Assembly. In the final part of the paper, strategy and policy are discussed in order to propose an appropriate solution toward a sustainable conservation of industrial heritage in Taiwan.

From Factory to Heritage: The Rise and Fall of Taiwan's Crucial Industries

Through the development of modern Taiwan, various types of industry have played a crucial role. Industries such as sugar, wine, mining, tea, salt, textile, forestry, wood, shoes-making, and ship-building are cases in point. All of them were supported by transportation, power, and water-supply facilities. Historically speaking, Taiwan's industrial development began in 1895 when the Japanese gained control of Taiwan after the Sino-Japanese War. After several years of suppressing both anti-Japan resistance and local banditry, the Japanese began to modernize the island's economy. Transportation facilities, such as modern railways, roads, bridges, and harbors, were constructed, which facilitated the development of various types of modern industry. Progress in sugar, salt, wine, and forestry industries were significant. After 1935, the Japanese colonial government in Taiwan began encouraging investment in nonagricultural industry on the island. Although most of the industries were monopolized by the Japanese, the society did change gradually from one dominated by the agricultural economy toward one with industrial production. Sugar, together with rice, tea, and camphor, were the four main products during the Japanese period.

After the end of WWII, the Chinese Nationalist government took control of Taiwan in 1945. The late 1940s was a period of violence and hyperinflation in Taiwan. In the 1950s, Taiwan was dependent on American aid. The government implemented a land reform program that increased equality among the farm population and strengthened government control of the countryside. High-speed economical growth accompanied by quick industrialization began in the late 1950s. Taiwan became known for its cheap manufactured exports produced by small enterprises. Textile, shoes-making, bicycle making, and ship-building became crucial industries in Taiwan. However, the success of these industries depended on cheap labors, and the use of the land and resources was not sustainable. Beginning in the 1980s, rapid changes in urban expansion, land exploitation, population growth, industrial structure, technology innovation, and methods of production happened. Consequently, the vacating and demolition of several types of industry in urban and suburban areas became a common phenomenon. The need to preserve industrial heritage became an important issue. Among various industries that used to play crucial roles in Taiwan, sugar, wine, forestry, and textile industries are of great importance and deserved more discussion.

Sugar Industry

Taiwan's long history of producing and exported cane sugar could be dated back to the seventeenth century. The cultivation of sugar cane followed closely the settlements of the Chinese in southern Taiwan. The Dutch, on their arrival in 1624, found that sugar could be one of the principal products for export. The Koxinga family, who followed the Dutch as the rulers of Taiwan, continued to give a great impetus to sugar making, as well as salt-producing. During the Japanese period between 1895 and 1945, the colonial government soon turned its attention to this industry and initiated many factory establishments. Beginning in 1900, modern sugar factories were established widely

on the island, by the Japanese colonists. During the high development period, there were more than forty sugar factories in Taiwan. The Taiwan Sugar Corporation (TSC), reorganized from four major Japanese-managed sugar companies after the WWII, and was inaugurated on May 1, 1946, became a state-owned enterprise. Between 1952 and 1964, sugar was Taiwan's leading export commodity.

The TSC's sugar industry has contributed considerably to the prosperity of Taiwan's economy and has stimulated the development of all the other industries on the island. The TSC has offered many job opportunities to Taiwanese people, and the sugar industry is an inseparable part of many Taiwanese people's life. However, since the 1980s, the industry has waned as a result of Taiwan's changing economic structure. When the TSC became privatized, most sugar factories were forced to close or to reduce their products. The development has led to the emergence of abandoned factories. In recent years, some of these deserted factories have been reused as arts centers, cafés, exhibition halls and museums.

CHAPTER ONE

The factory of the Great Japan Sugar Manufacturing Company (The Dai Nippon Seito Kabushiki Kaisha, founded in 1900, now the Taiwan Sugar Industry Museum in Ciaotou) is the most important sugar industry heritage site in Taiwan. The factory was initiated and supported by the Governor-General's Office and the governor. The first sugar mill was set up in 1911. The factory was completed and commenced operations on December 11, 1911. The factory building is double storied in part and covers over 25,000 square feet. The plant of the defunct Yayeyama factory was bought outright for 75,000 yen, and an English five-roller crushing mill, a French triple-effect apparatus and vacuum pan, and some other apparatus, which were found in good condition and much of which had never been used, were removed for use in this new factory. A new five-roller mill, two vacuum pans, four centrifugal separators, an engine, and other machinery were purchased from England; six eliminators, six filters, boilers, and other equipment were purchased from Japan, and an engine and electrical machinery were purchased from the United States. The total expenditure during that time on the completion of the factory amounted to 850,000 yen. The establishment marked Taiwan's start in the decades-long history of sugar making. Since then, more than forty factories have been established. The tall chimneys of the plants, together with sugar cane farms, transportation wagons, and dormitories for the employees formed the most impressive landscapes in many areas in Taiwan. (Fig.1-Fig.4)

Fig.1
The appearance of the No. 1 Mill of the Great Japan Sugar Manufacturing Company in Ciaotou
(Source: Photo Album of the Great Japan Sugar Manufacturing Company)

Fig.2
The machinery of Cane Roller Mill at theNo.1 Mill of the Great Japan Sugar Manufacturing Company in Ciaotou
(Source: Photo Album of the Great Japan Sugar Manufacturing Company)

Fig.3
The appearance of the No.2 Mill of the Great Japan Sugar Manufacturing Company in Ciaotou
(Source: Photo Album of the Great Japan Sugar Manufacturing Company)

Fig.4
The Lime Slaking Machine and Sulphur Furnace of the No.2 Mill of the Great Japan Sugar Manufacturing Company in Ciaotou
(Source: Photo Album of the Great Japan Sugar Manufacturing Company)

Wine Industry

Wine making had been a folk tradition since the Qing dynasty in Taiwan. Both Chinese people and aboriginal people produced wine for domestic use. In order to control the economic development, the Japanese colonial government imposed an alcohol tax during the early colonization in order to have more tax income. Small and private wine factories were either closed or merged to form a larger winery. In a short time, different wines were produced in Taiwan by advanced, modern breweries and distilleries controlled by the colonial government. The modern wine factories started to dominate the wine-producing market. Among various wine factories, the Taipei Wine Factory, the Taichung Wine Factory and the Taipei Brewery are most impressive in terms of their scale and facilities as well as their wine productions.

The Houjou Wine Company (now known as Huashan 1914), which is famous for its sake wine, was one of the earliest modern wine factories in Taiwan. The factory was established in 1914. The company was bought by the Japanese colonial government in 1922 following the ―Taiwan Liquor and Tobacco Monopoly Law‖ of 1922, and was renamed the Taipei Wine Factory. In 1949, the factory became part of the Taiwan Provincial Tobacco and Wine Monopoly Bureau. The production reached its climax in the 1950s and 1960s, with a reputation of producing high-quality rice wine and fruit wine. What followed was rising land prices and water contamination from the alcohol-brewing process, and the Taipei Wine Factory was relocated to the Linkou Industrial Zone in Taipei County in 1987, and its time as the center of the wine industry in Taiwan came to an end.

The Taisho Wine Company (now the Taichung Cultural & Creative Park) started its operation in 1916. In 1922 the company was renamed the Taichung Brewery following the ―Taiwan Liquor Monopoly Law,‖ and it started to produce various wines. The factory also became part of the Taiwan Provincial Tobacco and Wine Monopoly and was renamed as the Taichung Wine Factory. After a new distillery was built in a new site in 1998, the wine making operation of the Taichung Wine Factory was terminated. Within the boundary of the factory, there are nearly 30 buildings of different functions.

The Takasago Brewery (now the Taipei Brewery) was founded in 1919. It is in this brewery that Taiwan Beer originated. The complex, built in 1920, was the first beer brewery constructed in Taiwan, and the company enjoyed a reputation that rivaled the Japanese breweries. After the liquor

and tobacco monopoly system was enforced in 1922, the brewery continued to be operated by the Takasago Company. After the end of WWII, this brewery was also placed under the authority of the Taiwan Provincial Tobacco and Liquor Monopoly Board. Its name was subsequently changed to the Taipei Beer Company and, later, to the Taipei Second Brewery. In 1975, it was officially named the Chienkuo Brewery. It is the best example of Taiwan‘s industrial development, culture and beer-making technology.

Textile Industry

Similar to the sugar and the wine industries, the cotton textile industry in Taiwan started in the Japanese Period. Because Taiwan did not produce good-quality cotton, most cotton products were imported from Japan in the beginning of the colonial period. During the war time, textile factories started to appear in response to the military demands. After WWII, all textile factories were merged to form the textile section of the Taiwan Industry and Mining Company. Beginning from 1951, with the support of U.S. aid, a new policy was adopted in the textile industry. Raw materials, machinery, as well as the technology, were supplied by the U.S. government, and a prosperous boom in the textile industry soon started. The cotton textile industry became one of the earliest industries set up in postwar Taiwan.

Between 1948 and 1953, the number of new factories increased from 200 to 1,228, and amounted 10% of the all factories in Taiwan. Most of them were privately owned. The production value of the textile industry reached to more than 20% of the value of all industries in Taiwan in 1953. By 1957, Taiwan produced a surplus of cotton fabric that could be exported. By the end of 1980, the production value of cotton textile reached NT$61.7 billion (US$1.7billion), 18% of the total production value of the textile industry in Taiwan. Because the supply of cotton and other raw materials was restricted, only those supported by the government could take advantage of this crucial moment to develop their textile factory. Three most famous companies, that is, the Far East, the Shinkong, and the Tainan groups were founded during this period.

The Far Eastern Textile Company (now the Far Eastern New Century Corporation) was founded by Yu-Ziang Hsu in Shanghai in 1942, under the name ―Far Eastern Knitting Factory Company‖ to produce ―skyscraper‖-brand underwear. The company moved to Panchiao, Taiwan, because of the civil war of China. The company continued producing and marketing knitted products. In 1953, the name of the company was changed to the Far Eastern Knitting Co., Ltd. At that time, the Taiwan Far Eastern Textile Co., Ltd. was founded for the purpose of establishing a weaving mill. The Far Eastern Knitting and Taiwan Far Eastern Textile Companies were merged to form Far Eastern Textile Ltd., which was located in Taipei. The textile division of the company produces spun yarns, woven greige fabrics, knitting fabrics, industrial fabrics, and apparel. In 1963, cotton and chemical fiber facilities were installed in response to the needs of society and the synthetic fiber industry.

The Shinkong Cotton Textile Company (now the Shinkong Synthetic Fibers Corporation), which was initially founded by Ho-Su Wu in 1967, was the first modern cotton mill in Taiwan. The Tainan Textile Company (now the Tainan Spinning Co.,Ltd.) was established by San-lien Wu in 1955. It is a Taiwanese company engaged in the production, processing, and sale of a range of textiles. Its founding can be traced back to 1954, when the first stockholder‘s meeting was held in October, then San-lien Wu was elected to be the chairman of the board, and Hsiu-chi Wu was appointed to be the president. Production started with all 10,000 spindles in December. More facilities and

plants were constructed in the 1960s and 1970s, and the company developed into one of the largest corporations in southern Taiwan.

In the 1950s and 1960s, the government promoted regulations favorable for overseas Chinese to invest in Taiwan. With the help of cheap labor, ready-made clothes had become Taiwan‘s major textile export, replacing yarn and gauze since 1967. The clothing industry became the largest sector in Taiwan‘s textile industry. By the end of 1990, the clothing industry produced NT$145.5billion (US$4billion) worth of goods, 34% of the textile industry‘s total production value.

As was the case for many other traditional industries, the rise in labor costs and environmental awareness beginning at the end of the 1980s caused a wave of overseas relocations in the textile industry. Consequently, exports and productive values have decreased remarkably from the 1990s. When restrictions on overseas and mainland investments were relaxed in 1993, large manufacturers began investing on the Southeast Asia and Chinese mainland. More and more textile factories became vacant or were demolished for estate development. For example, when the productive lines moved to Viet-Nam in 1996, the factory of the Tainan Spinning Co.,Ltd. was shut down and the whole area became a commercial zone.

Forestry Industry

Taiwan is crossed through from north to south by a range of mountains soaring between 1,000 meters to nearly 4,000 meters above the sea level. There are diverse forests containing tropical, subtropical, temperate, arctic, and other types of trees. The woodlands occupy about 70% of the entire area of the island. After Japan started to colonize in 1895, the Taiwan Governor-General‘s Office promptly began the opening and development of the forestry industry with an aim to exploit Taiwan‘s rich forest resources. In August 1895, the Governor-General‘s Office established the Civilian Affairs Bureau Colonial Assets Part Forestry Division.

A forest nursery was established in January 1986 in order to begin the modern management and surveying of forests. In November the same year, the Internal Forest Survey Regulations were drawn up. At the same time, Japanese forestry experts were invited to come to Taiwan and undertake surveys of Taiwan‘s wild forest. In 1915, the Governor-General‘s Office instituted the Forestry Administration Bureau, and, from this, the Colonial Assets Bureau, Monopoly Bureau, and Forest Administration Bureau became the three main structures for the modern exploitation, testing, and surveying of Taiwanese forests. In 1919, the Governor-General‘s Office promulgated the Taiwanese Forest Directive, which officially brought Taiwanese forests under colonial law, comprehensively controlled Taiwan‘s forestry resources, and undertook the planning of the exploitation process.

Statistics show that Taiwanese forestry revenues increased annually between 1922 and 1942. The administration and exploitation of forests by the Governor-General‘s Office saw considerable economic benefit. Taiwanese forests became an important resource for the Japanese Empire. The forestry products from various mountains were under the direct management of the colonial government. They consisted of cypress, pine, cryptomeria, and a kind of hemlock spruce. Most of the products were in the shape of logs, while a part was made into lumber. The products were used for the construction of buildings, wagons, and ships. Some were reserved for shrines and temples of lofty height, because gigantic trees were scarce in Japan. The Alishan, Taiping, and Lintian Mountain range forests were the most important for the forestry industry in Taiwan.

Ali Mountain (Alishan) is a range on Taiwan‘s spine, averaging 2,500 meters in height with the highest peak, Datashan, reaching 2,663 meters. Ali Mountain is well known to the whole world for its forests, oriental cherry blossoms, sea of clouds, spellbinding sunrises, and mountain railway. Beginning from their colonization, the Japanese expeditions to the area found large quantities of cypress (hinoki in Japanese). This led to the development of the forestry industry in the area and the export of local cypress and other Taiwanese wood. A series of narrow-gauge railways were built in the area during this time to facilitate the transportation of lumber from the mountains to the plains below, part of which continues to operate nowadays. The railway, 72 kilometers in total, starts from the space 30 meters above sea level and rises up to 2,450 meters above sea level; the gradient of which is so big that it is rare in the world. New settlements started to emerge along the railway lines. It was also during this time that the first tourists began to visit the area and a New Shintaka (New Highest) Alisan National Park was also planned. Several factories and related facilities were built in the area near Chiayi, owing to the prosperous growth in the forestry industry. However, by the 1970s, the forest resources were exhausted, the forestry industry soon stopped. The new Alisan highway constructed in the 1980s displaced the railway as the primary mode of transportation up the mountain. In 2001, the Alishan National Scenic Area was established to integrate forest conservation and tourism. (Fig.5-Fig.8)

Fig.5
Original wooden bridge of Ali Mountain Forestry Railway
(Source:Japan Geography Series: Taiwan)

Fig.6
Chao-Ping Station of Ali Mountain Forestry Railway
(Source: Japan Geography Series: Taiwan)

Fig.7
Log transportation facility of Chiayi Lumber Plant
(Source: Japan Geography Series: Taiwan)

Fig.8
Log pond of Chiayi Lumber Plant
(Source: Japan Geography Series: Taiwan)

Taiping Mountain (Taipingshan), located in northern Taiwan covering an area of 12,631 hectares and with an elevation close to 2,000 meters, is one of Taiwan‘s three major forest areas. The Taiping Mountain environment is rich in ecological resources. The mountain range was called —Miannaoǁ, which means —green and luxuriant, or thriving and flourishing with dense forestǁ in the Atayal Aborigine language. Lotong was an important town for the Taiping Mountain forestry industry. The specially constructed Lotong Forest Railway is a part of the Taiping Mountain Forest Railway. It opened in 1924. Ten stations were established for the convenience of the local people. Facilities for forestry industry were built along the railway. For example, the storage pond of the nowadays Lotong Forestry Administration is the former storage pond of the Lotong Forestry Railway. Logging of the Taiping forest stopped in 1982; the pond was reduced to an area of 5.6 hectares, and many other facilities ceased to function or were demolished. At the same time, Taipingshan National Forest Recreation Area was set up to promote forest tourism. (Fig.9-Fig.10)

Fig.9
Transportation Railway of Taiping Mountain Forestry Industry
(Source: Japan Geography Series: Taiwan)

Fig.10
Log pond of Taiping Mountain Forestry Industry in Lotong
(Source: Japan Geography Series: Taiwan)

Lintian Mountain is also abundant in forests which attracted the arrival of the Japanese. The exploitation of the forests began in 1918. Beginning in 1925, the logging of the forests of Lintian Mountain was intensified when the Governor-General‘s Office started the island-wide forestry survey. The drop of the wood prices in 1934 led to the withdrawal of the Hualien Harbor Wood Company, which was responsible for the operation of the logging business, and, thus, the forest in Lintian Mountain had a resting period. Beginning in 1938, the Japanese started to construct the railway, rope car, and community on a large scale. This development was managed by the Taiwan Hsin-yeh Company. The Japanese also established a Lintian Mountain Logging Office and proposed a long-term plan for forestry industry. After WWII, skillful logging workers from other forests came to Lintain Mountain and brought with them their experiences with other plants. The 1972 fire of the mountain changed many things, including the community reconstruction and the conservation of the forest. In 1992, under the cooperation between public and private sectors, preserving Lintian Mountain forestry became an aim of many people.

Industrial Heritage Rescue and Rediscovery

When Taiwan‘s economy changed from one dependent on heavy manufacturing industry to one based on technology and service, most owners of the mentioned industries, especially those of private and semiprivate companies, generally consider the profit value rather than the heritage value of their factories and machinery.

Conflicts between the economic development and cultural heritage have occurred very often since the 1990s. Further, economic and social structures changed drastically since the 1980s. Many types of industry had lost their competitiveness, both by the rise of the overall labor salaries and by the competitive prices of products worldwide. The shutdown or demolition of the industrial factories in Taiwan became a common fact, and many related facilities were forced to decrease their multifunctional operations. For example, in the 1990s, free trade and open markets became priorities as Taiwan prepared for admission to the World Trade Organization (WTO) in 2002. Laws went into force that year that opened Taiwan‘s market to competing products. On July 1, 2002, the Monopoly Bureau passed into history. When the Taiwan Tobacco & Liquor Corporation became privatized, many breweries and factories became deserted spaces.

Consequently, the conservation and preservation of industrial heritage became an urgent task from the late 1990s and early twenty-first century. A project for a nation-wide survey of industrial heritage started with financial aid from the government, and a number of industrial heritage sites of different types were listed as monuments or historical buildings by various local governments and the central government. Among them are heritage related to mining, sugar, fishery, forestry, tea, ship-building, oil, and wine industries. Some of the traffic construction, especially the railways and bridges, have also been recognized. A few hydraulic facilities, such as water works, water reservoirs, and irrigation waterways have been listed. In addition, traditional salt fields and stone tidal weirs are also being treated as industrial heritage. It is important to recognizing that industrial heritage is not merely spaces and built structures per se; industrial heritage sites contain historical, cultural, artistic, and scientific values, which is the main reason for their preservation. People and the government in Taiwan are now prepared to take the responsibility for preserving more industrial heritage on the island. Different strategies are proposed for different types of industrial heritage by both the public and private sectors.

The Spirit of Industrial Heritage as the Core Value

In comparison to the conventional concept of and strategy for conserving monuments and historical buildings, there is a changing attitude toward the conservation of industrial heritage, from a single building to an industrial complex, and from the built environment to the cultural landscape. The core value of industrial cultural landscapes is embodied in “the spirit of the place.” The spirit of the place is a traditional Roman concept. It is called genius loci in Roman terms, and this term is still in use. In classical Roman concept, a genius loci was the protective spirit of a place. Currently, the concept’s chief proponent is Norwegian architect Christian Norberg-Schulz, and his theory became mature in the book Genius Loci: Towards a Phenomenology of Architecture.

For centuries, genius loci has been an idea inseparable from man’s living reality. Since the genius loci is more than the summation of a place’s components, it is also the complex interplay among them. But how should we respond to the genius loci? On this point, Norberg-Schulz offers a suggestion: “The genius loci becomes manifest as location, spatial configuration, and characterizing articulation. All these aspects to some extent have to be preserved; as they are the objects of man’s orientation and identification, what has to be respected are obviously their primary structural properties, such as the type of settlement and the way of building as well as characteristic motifs.” “To respect the genius loci does not mean to copy old models. It means to determine the identity of the place and to interpret it in ever new ways. Only then we may talk about a living tradition which makes change meaningful by relating it in a set of locally founded parameters.”

In the 16th General Assembly of the ICOMOS held in Quebec, Canada, the issue of the spirit of the place was reevaluated, and the Quebec Declaration was adopted with the theme of the spirit of place. The Quebec Declaration stressed that “the spirit of place offers a more comprehensive understanding of the living and, at the same time, permanent character of monuments, sites, and cultural landscapes. It provides a richer, more dynamic and inclusive vision of cultural heritage. Spirit of place exists, in one form or another, in practically all the cultures of the world, and is constructed by human beings in response to their social needs. The communities that inhabit place, especially when they are traditional societies, should be intimately associated in the safeguarding of its memory, vitality, continuity and spirituality.” Based on the Quebec Declaration, the core value of the industrial heritage can be interpreted from the four dimensions of the spirit of the place. (Fig11)

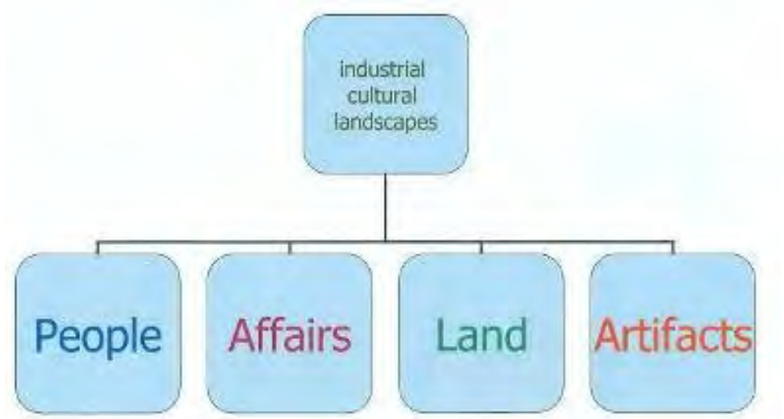

Fig.11
Four dimensions of the spirit of the industrial heritage site

The Spirit of the People

Without contributions of many different people, the success of certain types of industry would be impossible. The owner, officers, staff, technicians, workers, family members of personnel, and local communities are all involved in any kind of industry. Moreover, the thousands of people who have worked for various factories in Taiwan played a crucial role in the industrial development and economic growth, also had a great impact on the daily life and activities of the society where factories are located. For example, the life of workers, especially bathing, at the Songshan Tobacco Factory and Taipei Railway Works during the Japanese colonial period had been recorded. And many previous workers valuated this experience as “unforgettable!”

Another example that illustrates the relationship between industrial heritage and people is the historic railroad of the sugar company in central and southern Taiwan. Because of the poor road transportation system back in 1960 to 1970, the communication of workers and students of some counties solely depended on this company railroad wagon. Most of the lines of the Sugar Railways system were also linked with stations shared among the main railway lines so that passengers could transfer to long-distance trains. Trains carrying sugarcanes and passengers ran along the Sugar Railways at relatively slow speeds of roughly 10 km/h. Locomotives were initially steam powered, but by the late 1970s most of them had converted to small diesel locomotives. Since the speed of the wagon was so slow, it was easy for children to take one sugar cane, for a snack,

out of wagon, in those poor-economic times. Although the sugarcane is hard for the children to bite, it is a nostalgic memory of many of those countryside children and remains as a collective memory of the last generation.

The Spirit of the Affairs

Industrial heritage sites are not merely spaces and built structures per se. Most industrial heritage involves the construction of the buildings and the installation of the instruments. Skillful craftsmanship is always an important part of industrial heritage. Within every industry in Taiwan exists a systematic knowledge that can explain the evolution and development of the operations, technologies and processes. Not only are the built structures of the industry important, but also too are the know-how and management behind them. Without preserving the necessary knowledge of every industry, the built structure will become merely a collection of buildings and machinery. As for the beer, there are several steps in the brewing process, which include malting, milling, mashing, lautering, boiling, fermenting, conditioning, filtering, and packaging. It is crucial for heritage visitors that the beer breweries preserve all facilities and machinery of every step and deliver proper explanation and interpretation of their processes.

Similarly, there are several steps in the process of sugar making. As industrial heritage, a sugar factory should be able to provide visitors with the knowledge of how sugar is made. From sugarcane planting to collecting the harvest, agricultural knowledge is needed. A combination of manual and mechanical methods is applied to the final gathering of mature canes. Then canes are transported by a so-called half-standard gauge wagon to a sugar factory. Following the process of cleansing and grinding, juicing, clarifying, evaporation, crystallization, refinery, separation, and packing, different kinds of sugar are produced. The establishment of every industry heritage from the past to the present, reflects the attempt of many people to achieve better quality products. These aspects should not be ignored as far as the preservation and conservation of industrial heritage is concerned.

The Spirit of the Land

The World Heritage Committee acknowledged that cultural landscapes represent the —combined works of nature and of manǁ designated in Article 1 of the World Heritage Convention. They are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal. In Taiwan, many industrial heritage sites are listed as cultural landscape and most of them witnessed the economic as well as socio-cultural changes of the society at local and national levels. They also had a great impact on the land-use pattern in Taiwan when private lands were appropriated for industrial uses. As a result, an industrial cultural landscape was formed. When a conservation plan is proposed for a specific type of industrial heritage, its landscape should also be safeguarded.

For example, the cultivation of sugar canes and the factories with tall chimneys and the railroads for the train to transport the sugar cane became the most commonly seen landscapes in areas where the sugar industry dominated. Such landscapes were an integrated part of life for a great number of people in the past and should be preserved together with the built environment of the sugar factory. In other words, the integrity of the landscape, environment, settings, vegetation, and ecology is part of the story of the industrial heritage and its surrounding land.

The Spirit of the Artifacts

Since every industrial heritage site is cultural complex, machinery, associated facilities, documents, relics, vehicles, buildings, and related settlements are objects for preservation and conservation because they reflect the history, memory, and story of man-made and tangible objects. Industrial heritage in Taiwan is a symbol of modernity. In addition to the construction element, artistic considerations are always important in achieving the aesthetic and visual qualities of the facilities. In the modern factories full of machinery, so-called machine aesthetic popular in the late nineteenth and early twentieth centuries, are undoubtedly the most striking quality when compared with other types of heritage. Industrial heritage that includes machine aesthetics suggested that objects are machine-made, and representative of the arrival of industrialization, mass-production, and engineering.

Conclusion: Toward Sustainable Conservation of Industrial Heritage in Taiwan

Influenced by the movement to preserve of the industrial heritage that emerged at the end of the last century and in the beginning of the current century, Taiwan‘s industry heritage has become the target for preservation, although such efforts, initially, were strongly opposed by the associated companies and corporations in the first place. The reason for their opposition is that the factories, machinery and installations possess no monetary value and are not delicate heritage when compared with cultural heritage. Facing this challenge, several strategies could be applied in order to secure a more sustainable future for Taiwan‘s industrial heritage.

The first strategy is to transform the industrial heritage of various functions into educational settings, especially the museums. This strategy is meaningful in many dimensions. First of all, it would provide people with a setting to learn the processes and production methods of different kinds of industry and their relation with Taiwan‘s economic development. The aspects and meanings of industrial heritage offer a variety of resources for learning. Second, the adaptation of industrial heritage into museums will provide an opportunity to properly preserve the machinery and objects related to various industries in Taiwan. The explorations of the historic atmosphere, the testimony of the authenticity of the historic story, or to be in a historic event venue are among the most popular factory experiences for visitors. In Taiwan, both the Ciaotou Sugar Factory and the Jinguashih Gold Mine were adapted and reused as industrial museums, and the numbers of visitors are increasing. The aim of transforming industrial facilities into museums is to create settings that will help people to understand the history of Taiwan‘s industry and its close relationship with Taiwan‘s economic development.

The second strategy is to reuse industrial heritage, especially wine factories, as so-called creative and cultural parks, such as the former breweries in Taipei, Taichung, Chiayi, Tainan, and Hualien. The plan started in the late 1990s, and the Taiwan Tobacco & Liquor Corporation became privatized in the last decade of the twentieth century. At that time, many historical breweries and related facilities became deserted spaces and were at risk of being demolished. At that time, the Council for Cultural Affairs of the Taiwanese Government intervened, and the concept of the Creative and Cultural Parks emerged. The Huasan 1914, where the Taipei Brewery is located, became the first one of these parks to operate. The Huashan 1914 Complex covers 7.21 hectares, including green spaces, exhibition spaces, offices, commercial spaces, restaurants and multipurpose spaces for design workshops and other activities. This once-abandoned brewery complex has now been transformed into a place for the brewing of creativity.

The third strategy is to promote the industrial heritage sites as tourist factories, as attractions for

cultural tourism. Experiences have told us that activities held in cultural heritage sites will receive more attentions, than the same activities held in ordinary places. Since the adaptive reuse of several old sugar factories, the factory‘s charm has drawn large numbers of visitors. More tourists are expected to be attracted by the establishment of the revitalized factories and to create a boom for local leisure industries. Further, there is a Tourism Factory project, which was initiated in 2003 by the Industrial Development Bureau, Ministry of Economic Affairs, and the Central Region Office of the Ministry of Economic Affairs. Under this policy, the Taiwan government has actively promoted the amalgamation of local industrial culture and tourism, in order to bring benefit of tourism to the manufacturing industries. In spite of that, the motivation of tourism factory is economically oriented, and the movement does in some degree help to preserve some factories. Through innovative concepts and value-added services, some factories are preserved and have become heritage, offering visitors the experience and knowledge of certain industries.

While the preservation of industrial heritage in Taiwan is now a firm policy of the government, plans with more human power and financial support will be needed in the future. In order to achieve the successful conservation and preservation of valuable industrial heritage in Taiwan, priorities should be given to those sites with a suitable management plan and sustainable potential. It is the hope of many people in Taiwan that industrial heritage will become assets rather than a burden to stakeholders and the society, and will be revitalized in the future in sustainable ways.

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Remembering Marie Nisser: TICCIH's Past & Future

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The untimely passing of Professor Marie Nisser has left a substantial void in the community of scholars who study and preserve elements of the industrial heritage. At the same time, her rich personal and professional life has helped to define the history of our field and to establish the trajectory for the field into the future. We take this opportunity to pay homage to Marie, to explore her contributions, to commemorate her accomplishments, to recognize her leadership role in defining the future of industrial heritage conservation, and to remember her as a dear friend and colleague. We will review the landmarks of her career and examine the impacts she made on a national and global scale, especially in research, advocacy, education and the establishment of our organization, The International Committee for the Conservation of the Industrial Heritage.

Many of the Congress attendees are new to TICCIH and may not have met Professor Nisser, nor have a clear idea who she was, or what roles she played in this organization. For those who did not have the opportunity to know her, this presentation is intended to inform about her life and career. It will also remind those who DID know her about her important service to the conservation of industrial heritage and about her critical involvement in TICCIH's founding and growth over the years. This is by no means a comprehensive retrospective of her life; in fact it is very limited. But it is my belief that Marie Nisser's role in these matters has been instrumental in the success of industrial heritage conservation on the international scene, central in shaping what TICCIH has become, and her example will serve as a guide for the future of our field and our community of scholars.

FIGURE ONE ABOUT HERE: Caption "Marie Nisser on TICCIH Tour"

Born in 1937 in Stockholm, Marie enjoyed a broad education that included study in other parts of the European Continent. This breadth of education and experience was regularly evident as she seamlessly shifted between the several languages that she spoke with fluency, and demonstrated her extensive knowledge of history, technology and culture. Her family background and education prepared her well for a career based in international scholarship.

Marie earned her Licentiate degree in the History of Arts at the University of Uppsala, with a thesis about fortification engineering in Sweden during the 17th-19th centuries. In addition, she studied a year at the Stockholm Royal University College of Fine Arts/Architecture in a project called —Nordic wooden towns,‖ some of which were under the threat of being pulled down. At this time in the late 1960s-1970s, there was an increasing interest in the history of working people and industry in Sweden. In this context, her focus on the history of architecture and engineering awakened an appreciation for the built environments of work and industry. During her research

at Uppsala University, she established contacts with others in Sweden and internationally, who shared those interests. Marie was among an early group of scholars studying industrial heritage in Europe, paying particular attention to the key industries of Sweden‘s industrial heydays: iron, steel, timber and paper.

She began her concentrated work in the field of industrial heritage from a position as research assistant at the Department of the History of Arts at Uppsala University. In 1968, together with Kenneth Hudson – one of the most prominent actors within British industrial archaeology in the period – she took a leading role in the first initiative in Sweden to document industrial heritage. In the early 1970´s, she worked for the Association of Pulp and Paper Engineers, leading one of the first large scale efforts to document industrial heritage in Sweden – a complete documentation of paper and pulp mills in the forested region of Värmland and Dalsland. For many years, with her position in Uppsala as a platform, she undertook a great number of projects documenting industrial sites in Sweden - industries in operation as well as historic remains of older industries, such as paper and pulp, iron and steel, hydropower, textiles , and canals. The projects were sometimes financed by industrial corporations and trade organizations, as well as by county governments, national, regional and local museums. In many cases, it was Marie who initiated the projects. She also stimulated the formation of historical committees in the trade associations for the iron and steel industry, paper and pulp industry and hydropower, where she became an engaged member.

She was a regular and enthusiastic participant in the early industrial heritage conferences at Bath in the 1960s, gatherings that ultimately led to the International Conference on Industrial Monuments (TICCIM) at Ironbridge in 1973, followed by a second event in Bochum, Germany in 1975. Professor Nisser arranged the Third TICCIM Conference, held in Sweden in 1978.

This conference was attended by 140 delegates from 19 countries, and produced a massive set of Proceedings, as well as drafting the structural change of TICCIM to a more permanent and broader based organization known as The International Committee for the Conservation of the Industrial Heritage (TICCIH) and setting the stage for articulation with UNESCO. Marie subsequently played a central role in the organization, hosted many meetings, servi on the Board, and was elected President at the TICCIH Congress held in Lowell and Boston in 1984.

In 1992, the Swedish research foundation for humanities (HSFR) recognized the growing importance of the field of Industrial Heritage and Marie‘s work by awarding her a chair in Industrial Heritage Research. Marie chose to establish that seat at The Royal Institute of Technology (Kungliga Tekniska Högskolan, or KTH). From this position she created a pioneering PhD program, mentored a number of successful students, and conducted numerous ground-breaking studies.

Among her many accomplishments, one she recalled with particular fondness was the international training program called the Nordic/Baltic Industrial Heritage Platform. This was a project that linked representatives from the Nordic nations with a number of their Baltic neighbors in a multi-year program of training and research designed to have mutual benefits across borders that had been profound barriers during the Soviet period in the Baltic region. This program provided a venue for interaction that had lasting effects, especially on young professionals establishing themselves in the context of this young discipline of study and practice.

It was during her time at KTH that she also saw sites such as Engelsberg Bruk inscribed onto the World Heritage List (1993), along with the Great Copper Mountain in Falun (2001), and numerous other sites recognized by national and regional governments. Marie worked tirelessly to see that these sites were properly valued, using her considerable skill and influence with government and corporate bodies alike.

I personally got to know Marie when she joined a symposium run by the Society for Industrial Archeology in Lowell, Massachusetts, the famous textile mill town in 1998. Entitled —Whither Industrial Archaeology?‖ the symposium was an examination of the development of Industrial Archaeology with a view to both its past and its future. Professor Nisser was a key speaker, providing a powerful international context to a group that was predominantly provincial in perspective. This initial contact led to subsequent reciprocal visits between us, me participating in her Nordic/Baltic course and she lecturing at Michigan Tech. In fact, it was one of those visits that left Marie stranded in the United States for several days following September 11, 2001.

FIGURE TWO ABOUT HERE: Caption “Marie Nisser at Ahmeek Stamp Mill, Lake Linden, Michigan.”

My memories are vivid of Marie‘s shock and alarm as the events unfolded, and of her profound sorrow and pity for the helpless victims of that awful attack. But as shocking as the global events were, the visits led to a series of fruitful research collaborations. Marie‘s student Dag Avango was researching a Swedish coalmining operation on Svalbard, the archipelago formerly known as Spitsbergen. Discussions about this project led to a realization that one of the pioneers of mining in that far northern land was a mining man from Michigan, John M. Longyear. Longyear had been a very successful mineral speculator in the iron ranges of the Upper Great Lakes and was on the Board of Control for the Michigan School of Mines, now known as Michigan Technological University, where I work. Furthermore, Longyear‘s company is still active, and the founder left a substantial body of historical documentation in the Michigan Tech Archives. While Marie visited Houghton, we learned that there was extensive data, photos, maps and company records about the Arctic Coal Company, not only from Longyear but also from two of his mine managers.

This realization led to research visits by Avango, a series of meetings and research proposals including colleagues from Sweden, Norway, Russia, the Netherlands, the US and the UK. Thus was born a multi-year project of teaching and research that has engaged upwards of 25 researchers and will produce several graduate theses and dissertations.

FIGURE THREE ABOUT HERE: Caption “Marie with research team at Longyearbyen, Svalbard.”

Marie was a regular participant at TICCIH Congresses throughout her career, presenting papers and joining intensely in discussions about scientific matters and organizational details alike. Though Marie shifted formally to Emerita status at the University in recent years, she remained intensely active, providing guidance to students and colleagues around the world. For instance, she arranged financing and logistics for a seminar held in Norberg, Sweden in 2008 devoted to the notion of training and education in Industrial Heritage. This effort was characteristic of Marie‘s broad international scope, with participants from Sweden, Hungary, Germany, Greece, Romania, China, Argentina, France, India, Lithuania, the USA, Norway, the UK, Finland, Poland and Spain, 16 countries represented among 25 participants! It was an occasion of passionate discussion and intense focus, remembered fondly by all that attended. It also revealed something of Marie‘s

personal hospitality, as she welcomed members of the group into her home in Stockholm during a TICCIH Board meeting.

She was very much present and active at the last TICCIH Congress in Freiberg during 2009, where she enjoyed the papers, the tours, and the camaraderie with old friends. Though she fought disease gallantly for several years, she never let it define her. Marie stayed busy with work until the end of her life. In fact, her last publication went to press literally on the eve of her death. This portion of the National Atlas of Sweden, devoted to Swedish Mining and Metalworking, Past and Present, was edited with Jan af Geijerstam and Leif Wastenson.

FIGURE FOUR ABOUT HERE: Caption "Marie Nisser, 1937 - 2011
Marie Nisser's voice will remain influential for years to come for many reasons, especially among those associated with TICCIH. Several key principles characterize her distinctive contributions. First, she insisted on excellence and integrity, in research, in interpretation and in collaboration. Many of you have shared with me the experience of her withering gaze when she felt disappointed in our performance or our position. Many others have met the critique of her editorial and/or professorial pen, and recognized that she was right to be demanding of others, as she was of herself.

Second, though she was a consummate academic, she saw the value in full inclusion of the communities where she studied. It was charming to travel with her through some of the sites where she had previously worked, around the Bergslagen region, for instance, and witness the comfortable ease with which community members addressed her. This was no aloof scholar, but rather an engaged and passionate professional. These strong relationships characterized her connections with captains of industry and government leaders, as well. Marie was a master at navigating the corridors of influence in the service of scholarship and heritage preservation. The record of preserved sites and published research bears clear testimony to her skills.

Third, Marie insisted that industrial heritage needed to grow as an academic discipline, and that this required attention to research problems that are relevant in our time, matters such as globalization and deindustrialization. This demands a connection with mainline theoretical discussions in the social sciences, in addition to the practical struggles with preservation and management of historical resources. The fundamental tension and dichotomy between the theoretical and applied dimensions of industrial heritage is a core problem that can only be ignored at great risk to the discipline. Furthermore in this vein, Marie focused her attention not only on the World Heritage sites and prominent structures, but also on the abandoned towns, not only on the on the technical monuments but also on the homes of the workers, not only on core elements, but also on the whole industrial heritage at a community and landscape scale.

Fourth and perhaps most important, Marie always attended to the rising generation. Not seeking simply to bask in the light of scholarly glory, she was devoted to the prospects of a new crop of professionals who would follow her. The development of the Industrial Heritage Studies program at KTH was a massive undertaking, reflective of her drive and vision, and has left a significant mark on the field. It is also important to note that she was not simply content to support the development of her fellow countrymen and women, but also reached out purposefully to promising students from many other countries.

Marie was a groundbreaker, an innovator and a leader by virtue of her careful and dogged attention to the fundamentals of industrial heritage. She recognized that this subject is compelling because the intellectual and cultural history is bound up inextricably with the material culture and landscape. She saw that places and things are as important as the ideas and people of history, and that the locus of work and production is as critical in understanding human history as the palace and the cathedral. Recognizing these base observations, and combining them with the instincts of a fine scholar made her approach to industrial heritage study powerful and influential.

As important as she has been to the past of TICCIH and the field of Industrial Heritage, her lasting contributions will carry on in the work of her friends and students who remember her unique combination of intellect, critical thinking, energy and care for those around her. Let these examples serve as models for the future of TICCIH.

Fig.1
Marie Nisser Figure One

Fig.2
Marie at Stampmill Figure Two

Fig.3
Marie at Svalbard Figure Three

Fig.4
Marie Nisser Figure Four

The Conservation Movement of Historic Heritage in Japan
- Past, Present and Future? (1960-2012+α) -

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Abstract
I would like to explore some of the issues and problems associated with industrial heritage while epitomizing the past 50-year history of historic heritage in Japan.

First of all, I will sort out the revisions made to Japan's Act on Protection of Cultural Properties. While the origin of Japan's law for the protection of cultural properties dates back to the Meiji period, the current Act on Protection of Cultural Properties was enacted in 1950 after the war and has since undergone some revisions.

Secondly, I will examine the reasons why it was revised in light of residents' or citizens' movement. In Japan, the industrial heritage conservation movement has evolved from the historic cityscape conservation movement.

Since the cultural background and historical development vary from country to country, how people view historic and industrial heritage and what shape these legacies take also vary with the country. I will limit my talk to the Japanese case.

The big development of the industrial heritage conservation movement is affected greatly by residents' or citizens' movements and by researchers and the media that support the movements and that these movements have given rise to the revision of laws related to cultural properties down to this day.

Thirdly, I will talk about the biased industrial heritage conservation in Japan and the foresight of the Japan Industrial Archaeology Society (JIAS) "recommended industrial heritage" system while introducing the system.

Since 1985, JIAS has selected and announced the JIAS recommended industrial heritage on an annual basis. The criteria and purpose of recommendation are as follows: "JIAS selects and recommends important industrial legacies, which need to be preserved, but have not been designated as cultural properties by the central or local government, to promote their preservation by appealing to public opinion and related institutions." JIAS was the first to establish the industrial heritage commendation system in Japan.

Fourthly, as one of key points for the Congress, I will introduce the issues facing Japan through "intangible technical heritage."

There is a wooden arch bridge, Kintai-kyo, in Iwakuni City located in the western region of Japan,

which has maintained its arch form for 340 years. It is a 193.3-meter-long five-span bridge and the central three wooden spans are arched. It was built in 1673 and the length of one span is 35.1m, the longest span among wooden-framework rib arch bridges in the world. It is, however, not designated as a national important cultural property due to the reason that it lacks material authenticity as it has been rebuilt nearly every 20 years. On the other hand, Iwakuni City that manages the bridge and the committee of the city think that the bridge is eligible for being designated as a World Heritage.

Taking this opportunity, I would like you to consider how the construction technology and the maintenance and management technology have developed in this climate or how they should be, and so on.

Research and studies on industrial archaeology in Japan have been influenced by research activities overseas. Against such a backdrop, the Japan Industrial Archaeology Society (JIAS) was established as the need for such an organization was realized through participation in the International Conference on the Conservation of Industrial Monuments (ICCIM). However, it required local residents' or citizens' movements for the further development of the industrial heritage conservation movement.

Today, I would like to explore some of the issues and problems associated with industrial heritage while epitomizing the past 50-year history of historic heritage in Japan.

First of all, I will sort out the revisions made to Japan's Act on Protection of Cultural Properties. Secondly, I will examine the reasons why it was revised in light of residents' or citizens' movement. In Japan, the industrial heritage conservation movement has evolved from the historic cityscape conservation movement.

Thirdly, I will talk about the biased industrial heritage conservation in Japan and the foresight of JIAS "recommended industrial heritage" system while introducing the system.

Fourthly, as one of key points for the Congress, I will introduce the issues facing Japan through "intangible technical heritage."

1. Japan's Act on Protection of Cultural Properties and revisions

Figure 1 is "Schematic Diagram of Japan's Cultural Properties". While the origin of Japan's law for the protection of cultural properties dates back to the Meiji period, the current Act on Protection of Cultural Properties was enacted in 1950 after the war and has since undergone some revisions. Below are the major revisions that have some relation to the industrial heritage:

1) "Historical Resources" were added to the category of "Works of Fine Arts & Applied Crafts" in tangible cultural properties. Consequently printers and rail cars became eligible to be designated as tangible properties (although some of those designated as such are questionable) ….. 1975

2) The category of "Groups of Traditional Buildings" was newly established, leading to expanding the target items from conventional single cultural properties to linear, planar, and collective

cultural properties…… 1975

3) Heritage in the fields of transportation, industry, and civil engineering was added to the category of important cultural properties in tangible cultural properties…..1996

4) In terms of the system, the cultural property registration system was established in addition to the conventional cultural property designation system, leading to a two-tiered system. Consequently, “Registered Tangible Cultural Properties”, “Registered Tangible Folk Cultural Properties”, and “Registered Monuments” were added to each category of “Tangible Cultural Properties”, “Folk Cultural Properties”, and “Monuments”….. 1996

5) A new category of “Cultural Landscapes” was added to “Cultural Properties” (enacted in 2004 and enforced in 2005).

The above five revisions correspond to the numbers shown in the country column on the extreme right of Table 1: Chronological Table for the Movements and the Cultural Property and Other Systems related to Industrial Heritage.

2. Development of activities to conserve historic heritage in Japan: From historic cityscape to industrial heritage

Since the cultural background and historical development vary from country to country, how people view historic and industrial heritage and what shape these legacies take also vary with the country. These differences affect the conceptual definition, planning, system design, citizen participation, finance, and legal system of industrial heritage. Today, I will limit my talk to the Japanese case.

Table 1 (first) shows that the big development of the industrial heritage conservation movement is affected greatly by residents’ or citizens’ movements and by researchers and the media that support the movements and that these movements have given rise to the revision of laws related to cultural properties down to this day.
Dividing Table 1 into the four categories of historic heritage (ancient capitals, historic cityscape, civil engineering heritage, industrial heritage) and analyzing them will show the following characteristics:

1)The “Preservation of Ancient Capitals” was the first to be categorized among historic heritage and the period from the emergence of problems to the implementation of solutions was short.

The Preservation of Ancient Capitals was the first issue to be addressed among historic heritage and it took only two years to enact the Ancient Capitals Preservation Law, one of solutions to the issue. When the issue emerged, people did not recognize it as the issue of ancient capitals, but viewed it from a wider concept of historical environment as local cities, such as Matsue, were facing similar problems. It was a big policy action that limited the concept to ancient capitals: It was thought that since no one would disregard ancient capitals, the use of “Ancient Capitals” would make it easier for the public to recognize and promote the preservation of such historic heritage.

2) It took seven years from the emergence of the issue of historic cityscape to its solution while

it took about 20 years, the longest period, for civil engineering heritage. Why did they take so long?

It was Kanazawa in Ishikawa Prefecture and Kurashiki in Okayama Prefecture that were troubled by the construction of modern concrete buildings amid their historical cityscapes. Kanazawa and Kurashiki tried to protect their cityscapes by enacting own voluntary ordinance for the preservation of cityscapes as these municipalities could not wait for the central government to take action. In the meantime, Tsumago in Kiso (Nagano) implemented the Tsumago-juku Preservation Project by focusing not on the value of each building, but on the value of a group of buildings, which served as a model for the preservation of Groups of Traditional Buildings. Resident groups that aim to preserve Groups of Traditional Buildings were also formed (Narai-juku Preservation Society in Nagano Prefecture).

It was the Agency for Cultural Affairs that quickly responded to the emergence of local residents’ movements and voluntary ordinances of municipalities for the preservation of Groups of Traditional Buildings. The Agency incorporated the traditional buildings preservation district system into the Act on Protection of Cultural Properties and showed the direction of the government’s protective policy.

3) It was civil engineering heritage that took the longest time to establish policies for the preservation of “objects.”

For local residents’ movements, the Society for the Groups of Yomigaeru Omihachiman (Shiga) was established in 1969. However, it took 21 years since then for legal measures to be taken (1990) and another six years for the protection of civil engineering heritage to be stipulated in a law (revision to the Act on Protection of Cultural Properties in 1996).

What should be noted here is the reason why the preservation of civil engineering heritage was delayed. While the administrative bodies (the central government and municipalities) were planning to rebuild old infrastructures, such as bridges and reclamation of the canal, public preservation movements opposed these plans. Consequently, these movements were not able to get support from municipalities, but the central government responded to them (refer to 5)).

4) As I stated at the beginning, the Japan Industrial Archaeology Society (JIAS) was established in 1977 with the aim of preserving industrial heritage as the need for the establishment of such an organization was realized through the participation in the International Conference on the Conservation of Industrial Monuments (ICCIM). While an academic society generally aims to promote academic and technological progress and development, JIAS is unique in that the provision of support to preservation movements is also stipulated in its prospectus.

TICCIH (the International Committee for the Conservation of the Industrial Heritage) was established in 1978, the following year of the establishment of JIAS.

5) When the Agency for Cultural Affaires revised the Act on Protection of Cultural Properties and added the category of “Groups of Traditional Buildings” to cultural properties, other ministries and agencies of the central government responded quickly. Their quick response demonstrated that the bureaucrats not only had a good foresight, but also were quick to realize the policy and

budgetary impact on their own facilities.

3. The recommended industrial heritage system of the Japan Industrial Archaeology Society (JIAS)

Since 1985, JIAS has selected and announced the JIAS recommended industrial heritage (hereinafter referred to as the "recommended industrial heritage") on an annual basis. The criteria and purpose of recommendation are as follows: "JIAS selects and recommends important industrial legacies, which need to be preserved, but have not been designated as cultural properties by the central or local government, to promote their preservation by appealing to public opinion and related institutions."

While other societies and government offices have a similar commendation system in place, JIAS was the first to establish the industrial heritage commendation system in Japan.

There have been 87 items accredited as industrial heritage before 2012. While 14 items were recommended in the first year of 1985 and nine items the following year, there was none recommended in 1987 and 1988. In 1989, five items were recommended followed by three items in 1990 and two items in 1991. In the following ten years, items up to five (one to five) were recommended every year. In the last ten years, items up to three have been recommended each year.

Selected items vary in size: large ones include remains of mines and coal mines, docks, bridges, buildings, and airplanes while small ones are machines and literatures. Table 2 shows the trial categorization of recommended industrial heritage by category and by structure. There are five categories, including Mine/Coal Mine, Civil Engineering, Architecture, Traffic, and Machine. Table 3 shows the result of the final classification. The Architecture and Traffic category have 23 items. Railway category of Traffic has 19 items (Figure 2). The Machine category has 15 items, followed by 14 items in the Civil Engineering category and 12 items in the Mine category.

What should be noted here is the "Designated type." As I mentioned previously, one of the selection criteria for the recommended industrial heritage is that "the item has not been designated as a cultural property by the central or local government." Among the 87 items listed in Table 3, 37 items (43%) are currently designated, registered, or certified as a cultural property. The value of these items was not recognized at the time of the selection by JIAS, but later designated as national or prefectural cultural properties. This fact clearly demonstrates the foresight of JIAS activities.

The recommended industrial heritage includes those legacies that have not yet been registered as World Heritage Sites, but are included in the tentative list of World Heritage Sites, such as the Sado complex of heritage mines, primarily gold mines, and Miike coal mines and related facilities (The Modern Industrial Heritage Sites in Kyushu and Yamaguchi). Moreover, the long-wave high-frequency generator of the former Yosami Radio Transmitting Station was awarded the IEEE (Institute of Electrical and Electronics Engineers, another commendation system in the world) Milestone Award.

This is the 27th year since 1985 when the recommended industrial heritage system was launched. As aforementioned, during those years, a total of 87 industrial heritage items were recommended.

The annual average number of recommended items is three. In recent years, public interest in industrial heritage has been increasing and many of these legacies have been designated as cultural properties. Although it has become more difficult to find valuable industrial heritage in Japan, we believe that there must be many more industrial legacies in Japan and intend to continue our activity to recommend them in the future.

Personally, I would like to point out the following: Interest in industrial heritage has increased among the central and local governments and related institutions, leading to the establishment of systems similar to the recommended industrial heritage system in these organizations. Therefore, for industrial heritage, the time to focus on the dissemination, education, and discovery of industrial heritage has ended and the next challenge is how to build maintenance and management techniques and mechanisms to conserve the discovered or recommended industrial heritage as long as possible and pass them on to the next generation. At the same time, we at JIAS need to create and add a commendation program that focuses on the management, maintenance, and use of the industrial heritage to the existing commendation system that includes the recommended industrial heritage system.
When we address the maintenance, management, and use of the industrial heritage, we need to give due consideration to people involved, including the participation of local residents and citizens. Although I do not go into details here, JIAS has long focused on people and have commended people since 1983, two years before the establishment of the recommended industrial heritage system. This is the only commendation program in Japan for people involved in preservation activities.
The following three are the selection criteria for people to be commended:

1) Persons who have made outstanding contribution to the investigation and preservation of industrial heritage.

2) Persons who have made outstanding contribution to the development of industrial archaeology.

3) Persons who have contributed to the development of JIAS.

Up to the present, 81 persons have been commended. Many of them engaged or continue to engage in the preservation of industrial heritage.

4. Issue for Japan: Intangible technological heritage – Kintai-kyo and Technology in the Local Climate

Lastly, I would like to raise an issue while introducing an industrial heritage case that has been much talked about in Japan recently.

There is a wooden arch bridge, Kintai-kyo (Figure 3), in Yamaguchi Prefecture located in the western region of Japan, which has maintained its arch form for 340 years. It is a 193.3-meter-long five-span bridge and the central three wooden spans are arched. It was built in 1673 and the length of one span is 35.1m, the longest span among wooden-framework rib arch bridges in the world. It is, however, not designated as a national important cultural property due to the reason that it lacks material authenticity as it has been rebuilt nearly every 20 years (however, it is designated as a place of scenic beauty).

On the other hand, Iwakuni City that manages the bridge and the committee of the city (I am one of the committee members) think that the bridge is eligible for being designated as a World Heritage due to the following reasons:

1) The bridge has high integrity as a wooden arch structure. The structure itself is quite unique.

2) The span length of 35.1m is the longest span among wooden-framework rib arch bridges in the world.

3) The basic structure has been maintained and handed down to the present without any change for 340 years. A case like this cannot be found in the world, the past, or the present.

4) Six wooden materials (Japanese cypress, zelkova, Japanese red pine, Thujopsis dolabrata, Japanese chestnut, oak) are used by leveraging features of each material (hard, soft, hard to decay, soft to the feel). The bridge also demonstrates the ability to select and use a material best fit for each part of the bridge.

5) Handing down the tradition of the above techniques and the development of people involved have enabled to maintain the bridge for 340 years.

While techniques are basically international, it is also true that there are techniques unique to a country or region (vernacular), such as those used to build Kintai-kyo. In particular, techniques to use wooden materials have continuity, that is, they can be passed on to the next generation although the wooden material lacks perpetuity. Moreover, wooden materials are reclaimed materials in full conformity with the laws of nature. If forests are maintained and managed appropriately in conformity with the natural laws, the continuity of materials can also be secured.

As you know, the XVth International TICCIH Congress 2012 in Taiwan is the first international TICCIH meeting in Asia. Taiwan belongs to the Asian monsoonal climate zone, where there are lots of typhoons and rainfall and the humidity is high. Compared to Europe, such environmental conditions are not favorable for iron, concrete and wooden materials. Taking this opportunity, I would like you to consider how the construction technology and the maintenance and management technology have developed in this climate or how they should be, and how the Western technology has been introduced and incorporated into the local technology. One of the key points of this Congress is the technology in the local climate as opposed to the Western technology.

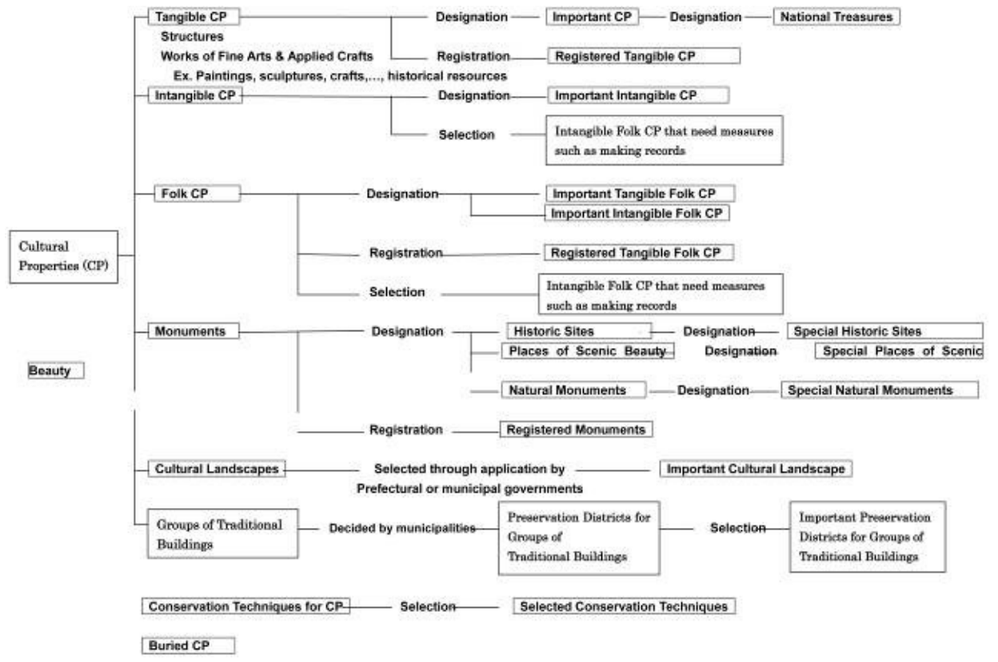

Fig.1
Schematic Diagram of Japan's Cultural Properties

Fig.2
No.219, Type2100 Steam Locomotive (JIAS Recommended Industrial Heritage in 1992)

Fig.3
Kintai-kyo founded in 1673
Not an important cultural property due to the reason of the lack of authenticity as it has been rebuilt nearly every 20 years for the past 340 years.

【Table 1】Chronological Table for the Movements and the Cultural Property and Other Systems related to Industrial Heritage

Year	Main Event	Residents/Citizens		Function /Society	Mass Media	Administration	
		Residents	Citizens			Local Government	Central Government
1950							Enactment of the Act on Protection of Cultural Properties
				Issue of Kyoto Tower			
1964	Tokyo Olympics	Kamakura Oyatsu Trouble		Nara Prefectural Government Bldg. Dispute			
		Issue of housing land development raised by Jomyoji Temple in Kamakura	Route 24 Bypass Plan related to the Heijo-kyu Relics(Nara)			Issue of spoiling the beauty of Marunouchi district(Tokyo)	Ancient Capitals Preservation Law (MC)
1966							
1967				Issue of Imperial Hotel			
						Tsumago-juku Preservation Project	
	Mexico Olympics	Tsumago Protection Group (Nagano)					
1968						Voluntary Ordinance : The Preservation of a traditional environment in Kanazawa City & Kurashiki City	Inauguration of ACA
		Narai-juku Preservation Society (Nagano)					
1969	Man's first landing on the moon	Group of Yomigaeru Omihachiman (Shiga)				Voluntary Ordinance : The landscaping along roads(Miyazaki)	
		* Later, many Protection/ Conservation Groups were founded..					
1970	Japan World Exposition	National Federation for the Preservation of Historical Natural Features			List of Meiji Western-style Bldg. (Architectural Institute of Japan)		Issue of Scenery of Yamate District, Yokohama
							Voluntary Ordinance : The preservation of natural environment in Morioka City
1971	Dollar Shock	Residents' Charter for the Preservation of Tsumago-juku	Nakanoshima Protection Movement(Osaka)				* Ten voluntary ordinances over the next 3 years
1972	Stockholm Conference	Setagaya Karasuyama Teramachi Residents' Movement	Group for the Protection of Nakanoshima				Historical Landscape Cities Liaison Council
	1st ICCIM International Conference	Society for the Protection of Nakashima River (Nagasaki)					
1973			Kobe Landscape Questionnaire				
	Oil Crisis	Otaru Canal Preservation Society (Hokkaido)					
							Voluntary Ordinance : The preservation of a traditional environment in Imajo-cho
1974		Machinami Conservation & Regeneration	Karasuyama Teramachi Study Group				* Issued almost every year. Currently there are 98 districts.
1977					JIAS established		Survey on traditional cultural city environment preservation districts (MC & ACA)
1978	TICCIH International Conference	National Seminar on Machinami launched					
1979		Isekawasaki History and Culture Development Group (Mie)					

1980			Group for the Conservation of Stone Bridges in Japan	Japanese Modern Architecture by Architectural Institute of Japan)			Amenities Symposium launched (Environment Agency)
							Survey on Historical Port Facilities (MT)
1981				Workshop on Historical Studies in Civil Eng. launched			
1982	Nagasaki Flood * Washout of Megane-bashi		Study Group on Bridges in Tokyo				Historical District Environment Improvement: Streets (MC)
1983		Issue of landfill and bridging works in Tomonoura, Hiroshima		JIAS Commendation System launched			
1985				JIAS Recommended Industrial Heritage System launched	Civil eng. heritage serialized in Kensetsu Gyokai		Lighthouse Research Committee (Japan Coast Guard)
1987		Issue of Furo-bashi in Wakanoura					
1989			Kachidoki-bashi o Ageru Kai		Kokudo Sanka by Japan Civil Eng. Contractors Association		Historical Port Environment Creation Project (MT)
1990							Comprehensive survey on modernization heritage
							Historical Dam Conservation Project (MC)
1991				National Survey on Modern Civil Eng. Heritage (JSCE)			
1993	Kagoshima Flood * Ishibashi outflowed	Issue of Yoshino River 10th Weir in Tokushima	National Liaison Conference for Ishibashi in Kagoshima		NHK Mini Program “Modernization Heritage”		Designation of modernization heritage as important cultural property

1996	Atlanta Olympics						(3) Transportation, industry, and civil engineering added to the cultural property category
1997							(4) Registered cultural propoerties→2004
1998					Civil eng. heritage serialized in FRONT		Non-profitable activities promotion law
2004	Sumatra Earthquake Athens Olympics						(5) Landscape Law (Ministry of Land, Infrastructure, Transport and Tourism, Agency for Cultural Affairs, Ministry of Agriculture, Forestry and Fisheries of Japan)

Note 1: Revisions made to the Act on Protection of Cultural Properties are written in italics at the right column.
Note 2: Abbreviation of the right column. MT: Ministry of Transport, MC: Ministry of Construction, ACA: Agency for Cultural Affairs

【Table 2】Classification of Industrial Heritage JIAS Recommended 1985-2012

No	Name	Category	Structure/ Machine Site	Specified Structure	Designated/ Registered	Location	Recommended	
					Government/Local	Pref.	City/Town	Year
1	Sado Gold Mine	Gold Mine	Structures & Machines		Tentative WH	Niigata	Sado City	1985
2	Industrial Heritage of Miike Coal Mine	Coal Mine	Structures & Machines		Tentative WH	Fukuoka	Omuta, Arao City	1994
3	Concrete Shaft Tower of Shime Coal Mine	Coal Mine	Structure	Shaft	National	Fukuoka	Shime Town	2006
4	Shaft Facility of Sumitomo Akabira Coalmine Company with Relating Archives	Coal Mine	Structure	Shaft, Literatures		Hokkaido	Akabira City	1999
5	Giant Chimney Stacks of Hitachi Mine for Pollution Prevention	Copper Mine	Structure	Chimney		Ibaragi	Hitachi City	1985
6	Hokkei Shaft Site at Takashima Coal Mine	Coal Mine	Site	Shaft	City	Nagasaki	Nagasaki City	1986
7	Kanna-nagashi or a Facility to Concentrate Iron Sand Using Torrent Stream Flow	Iron Mine	Site	Facility	National Registered	Shimane	Oku-Izumo Town	1985
8	Ruin of Kuriki Iron Mill	Iron Mine	Site		Local	Iwate	Sumida Town	1989

No	Name	Category	Structure/ Machine Site	Specified Structure	Designated/ Registered	Location	Recommended	
					Government/Local	Pref.	City/Town	Year
9	Charcoal Furnace Works to Manufacture Pig Iron at Torigami	Iron Mine	Site	Furnace Works		Shimane	Oku-Izumo Town	1996
10	Site of Matsuo Sulfur Mine	Sulfur Mine	Site	Materials		Iwate	Hachimantai City	2006
11	Remains of Mutsuo Reverberating Furnace	Iron Works	Remains	Furnace	Town	Tottori	Hokuei Town	1989
12	Remains of Ajimu Reverberating Furnace	Iron Works	Remains	Furnace	City	Oita	Usa City	1989
13	Ishii Lock Gate	Civil Eng., Canal	Structure	Lock Gate	National	Miyagi	Ishinomaki City	1985
14	Iwabuchi Water Gate of Sumida River	Civil Eng., River	Structure	Water Gate	Local	Tokyo	Kita Ward	1995
15	Pocket Harbor for Herring Fishery at Tanaka	Civil Eng., Fishing Port	Structure	Pocket Harbor		Hokkaido	Tomari Village	2004
16	Jetty & Revetment of Todairyo Factory	Civil Eng., Harbor	Structure	Jetty & Revetment	City Admitted	Kanagawa	Yokohama City	1986
17	Dry Docks at Yokosuka Dockyard	Civil Eng., Harbor	Structure	Dock		Kanagawa	Yokosuka City	1985
18	No.1 & No.2 Shafts of No.1 Tunnel of Lake Biwa Canal	Civil Eng., Water Supply	Structure	Shafts	National	Shiga	Otsu City	1985
19	Site of Tenno Reservoir	Civil Eng., Water Supply	Structure	Reservoir	National Registered	Osaka	Sakai City	1985
20	Goroku Sluiceway	Civil Eng., Agriculture	Structure	Sluiceway		Gifu	Mizuho City	1992
21	Yanagihara Sluiceway	Civil Eng., Agriculture	Structure	Sluiceway	METI	Chiba	Matsudo City	1995
22	Megane-Bashi or Brick Arch Bridge over Kotone River	Civil Eng., Agriculture	Structure	Bridges	METI	Saitama	Kasukabe City	1998
23	Jinzaemon Sluiceway over Ayase River	Civil Eng., Agriculture	Structure	Sluiceway	Local	Saitama	Soka City	1998
24	Head Works of Meiji Agricultural Water	Civil Eng., Agriculture	Remains	Head Works		Aichi	Toyoda City	1985
25	Lighthouse Base Stone Masonry at Shiogama Shrine	Civil Eng., Harbor	Remains	Base Stone		Miyagi	Shiogama City	1992
26	Ishiide Agricultural Water	Civil Eng., Agriculture	Site	Waterway		Kagoshima	Kagoshima City	1985
27	Red Brick Walls of the Nation-owned Senju Woolen Fabric Mill	Architecture	Wool Mill	Wall		Tokyo	Arakawa Ward	1986

No	Name	Category	Structure/ Machine Site	Specified Structure	Designated/ Registered	Location	Recommended	
					Government/Local	Pref.	City/Town	Year
28	Brick Brewery of National Institute of Brewing	Architecture	Brewing Laboratory	Bldg.		Tokyo	Kita Ward	1991
71	Aircrafts & Engines exhibited at Tokyo Metropolitan College of Industrial Technology	Traffic, Aircraft	Aircraft, Engine			Tokyo	Arakawa Ward	2000
72	Grade Type Monoplane(Replica) at Kakamigahara Museum	Traffic, Aircraft	Aircraft	Literatures		Gifu	Kakamigahara City	2003
73	Yosami Radio Transmitting Sta.	Machines	Radio Transmit		IEEE, METI	Aichi	Kariya City	1996
74	A Group of Machines Producing Peppermint Crude Oil	Machines	Peppermint Oil		METI	Hokkaido	Kitami City	2008
75	Grind Mill of Itabashi Gunpowder Factory	Machine	Grind Mill		Ward Listed	Tokyo	Itabashi Ward	1985
76	Casale Ammonia Synthesis Machines Commemoration Plaza	Machines	Ammonia Synthesis		City	Miyazaki	Nobeoka City	1994
77	Complete Set of Waste Silk Spinning Machinery at Shinshu Univ.	Machines	Silk Spinning			Nagano	Ueda City	2009
78	Machines & Equipments of Natural Camphor of Uchino	Machines	Camphor Machines			Fukuoka	Miyama City	2011
79	Voith Hydroelectric Turbine & Siemens Generator of Miyashiro 1st Power Sta.	Machines	Turbine, Generator		METI	Nagano	Azumino City	1991
80	Wood Lumber Mill driven by a Band Saw	Machines	Wood Lumber Mill			Okayama	Mimasaka City	2005
81	Inokuty's Volute Pump	Machine	Pump			Tokyo	Ota Ward	1994
82	Stationary Oil Engine of Mitsu-uroko Co.	Machine	Engine			Okayama	Ihara City	2008
83	Stationary Engine & Materials of Charcoal Gas	Machine	Engine			Kagawa	Ayagawa Town	2012
84	0.5ton & 3,0ton Steam Hammers Placed at Yokosuka Dockyard	Machines	Hammer		National	Kanagawa	Yokosuka City	1985
85	Water Cooled Oil-immersed Transformer	Machine	Transformer			Kanagawa	Yokohama City	1995
86	Roller & Clearer Carding Engine Manufactured by Platt Brothers & Co. Ltd.	Machine	Cotton Spinning Mill	Engine		Miyagi	Sendai	2004

87	Screw Mill to Beat Rice Straw	Machine	Rice Straw	Screw Mill		Toyama	Nanto City	1989

Note 1: In terms of the abbreviation of the column “Designated/Listed, Government/Local”, see Table 4.

【Table 3】Classification of IH JIAS by Structure/ Machine etc.

Category		Structure etc.	Number	Subtotal
Mine		Structures & Machines	2	12
		Structure	3	
		Site	7	
Civil Eng.		Structure	11	14
		Site	3	
Architecture		Mill	7	23
		Warehouse	3	
		Univ., Residence	2	
		Museum	4	
		Site	3	
		Materials & Literature	1	
		Destroyed	3	
Traffic	Railway	Structures & Machines	3	23
		Structure	6	
		Train Car	8	
		Machine	1	
		Destroyed	1	
	Bus	Bus	2	
	Aircraft	Aircraft	2	
Machine		Machine	15	15
Total			87	87

【Table 4】Designated/Listed, Government/ Local

	Designated etc.	Number
International	Tentative WH, IEEE	3
Designated	National(ACA)	6
	Local	3
	City	4
	Town	1
Regisuered	National(ACA)	7
	City	1
	Ward	1
Others	METI	8
	Local	2
	City	1
Total		37(43%)

Note :

Tentative WH: Tenatatibe World Heritage

IEEE: Institute of Electrical, Electronics & Eng.

ACA: Agency for Cultural Affairs

METE: Ministry of Economy, Trade & Industry

CHAPTER TWO : SELECTED PAPERS

SECTION I: THEORY AND METHODOLOGY

SECTION II: PLANNING AND DESIGN

SECTION III: INTERPRETATION AND APPLICATION

SECTION IV: SOCIAL AND ECONOMIC IMPACTS

SECTION I: THEORY AND METHODOLOGY

Evidence of Modernized Technology Transfer Found on the Size, Structure, and Materials of Historic Dry Docks in Europe and Japan

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Abstract

In 15 century England, dry docks were devised to repair sailing vessels.[1,2] Those dry docks had dramatically improved by the mid-19th century, and became a vital part of the shipping industry for not only Europe but as far east as Japan. This study will examine several of these historic shipyards and focus on important aspects of dry docks such as the size, structure, materials, history, and overall design. In addition, substantial improvements including the secular change of ratio, the width to the depth, as well the soil bricks used primary in the Netherlands and transferred to Germany and Japan, are examined. As a result, its influence and transfer of technology can be seen in the major shipyards of Japan even though several of these Japanese dry docks include marked difference compared to their European counterparts. Based on these results, we point out the significant role of the history of transferred technology and how its influence can be seen as a testament to the harmonization of technology with everyday life in the so-called transferred countries. To prove this point, we focus on issues such as the simultaneous conservation projects of historic dry docks in Europe, the United States, Japan, etc. For this purpose, we propose effective procedure that is the announcement of typical examples about the technology transfer containing historic shipyards by The International Committee for the Conservation of the Industrial Heritage (TICCIH).

Keywords: dry dock; technology transfer; Europe; Japan; shipyard

1. Introduction

Today's technology has primarily developed in Europe and North America. It has been transferred dramatically to many countries in Asia, Africa and South America to produce mainly manufactured goods with low cost. Those technology and the goods strongly influence to their cultures, traditional life style and customs. Therefore a more efficient and smooth transfer is necessary for the overall harmonization of today's technology with traditional customs, especially for less developed countries.

To realize this, we must begin by first examining the history of technology transfer in 19 century since such transfer actually influenced the harmonization of everyday life for the so-called ‗transferred countries'. In regard to modern ship-building, many aspects were transferred from Europe to Japan. For example, since dry docks were vital and successful ‗tools' in the European shipyards, a large dry dock was built and used in Yokosuka in 1871 under the leadership of French engineers, F.L.Verny and R.F.Frolan.[3] After that, approximately 20 dry docks were built over a period of 30 years under the supervision or leadership of European engineers.[4] By simply

comparing these Japanese dry docks with their historic counterparts in Europe, one can quickly see the obvious influence of the transfer itself and its subsequent improvements.

For this purpose, Wakamura recently has researched historical dry docks (HDDs) in Europe, and compared those with their counterparts in Japan.[5] In regard to the secular change of the ratio, RD (= width of dock/ depth of dock), he found characteristic variations for Japanese and European dry docks. For example, several of the Japanese dry docks include a large number of stairs on the outer wall. Modifications such as these show a smooth transfer of technology with adequate allowances for improvements in structure design.

For the purpose of a more throughout investigation, we employ more number of data about the size, material, and arrangement of the stairs in European HDDs. In regard to the secular changes of RD and number of stairs on the outer wall, we confirm characteristic changes. These changes imply variety of transferred technology. It can be connected to new idea of technology in 21 century. Based on these results, we focus on the necessity of simultaneous conservations of HDDs in general (especially in relation to technology transfer in the world), and propose effective method for their long-term preservation.

2. Transfer and classification of dry docks

Historical dry docks have two overall styles depending on whether they originate from England or France.[5] Aptly named the ‗English' or ‗French' style, their apparent differences are shown based on the schematic design in Fig.1. The older English-style dry docks include many levels on the outer wall with few stairways set perpendicular to them as seen in Fig.2. Conversely the French-style consists of only a few levels on the outer wall with its stairways set parallel to them as shown in Fig.3. These design characteristics were subsequently transferred to additional European shipyards in the Netherlands (Fig.4a), Belgium (Fig.2b), and Germany.

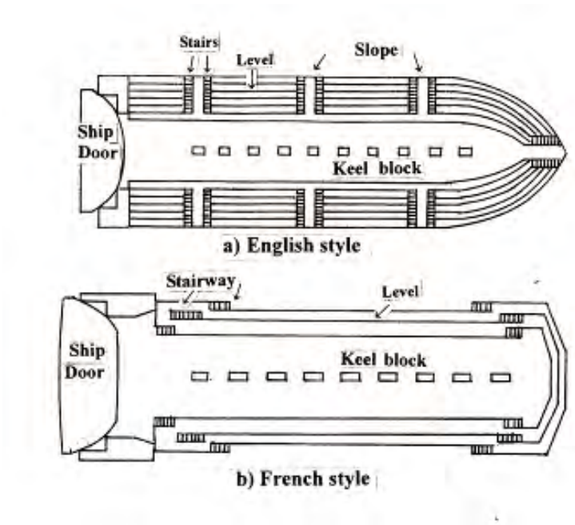

Fig.1
Schematic design of typical wall styles of dry docks

Fig.2
English-styles (a):P1, (b):A1

In Japan, before about 1900, dry docks were designed and built under the leadership of either French, English, Dutch or German engineers.[4] A school of engineering was established in Yokosuka, based on the suggestion of F.L.Verny in 1867.[3] Because of the creation of this program, many subsequent Japanese engineers acquired their knowledge of shipbuilding and dry dock technology based on this European influence and produced many Japanese HDDs based on the French-style. Two examples are shown in Figs.3b and 9a.

3. Comparison of historic dry docks in Europe and Japan

3.1 Transfer of structure

In Europe, the so-called ‗English-style' has been conserved at Portsmouth (as shown in Fig.2a) and Chatham, England. It has been moved in Antwerp (Fig.2b) and also in USA.[1] At the Hellevoetsluis shipyard in the Netherlands, an English-style dry dock was built in 1806 (the front of Fig.4a). Later, engineer Jan Blanken built a French-style dry dock (the back of Fig.4a) and connected it with the English- style portion in 1825.[6]

Fig.3
French-styles (a):R1 in Table I, (b): Y1

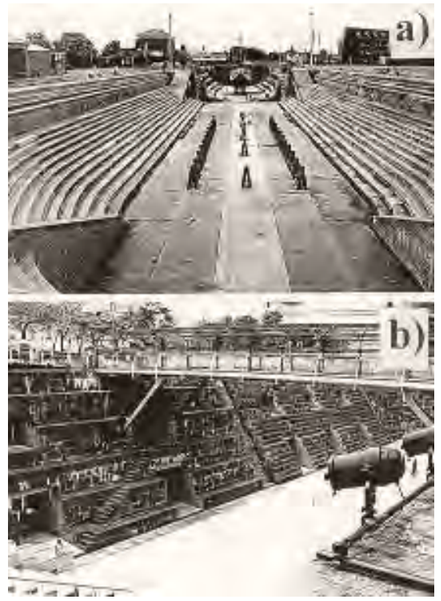

Fig.4
Combination of the styles, (a):HE, (b):YHI

In Yokohama Japan, the first dry dock was planned by, H.S.Parma an English engineer. Unfortunately he died before his plan had come to fruition. Subsequently, a Japanese engineer named Tunekawa, who had acquired his knowledge of French style technology at the Yokosuka engineering school,[3,7] planned and completed the dry dock by combining both the French- and English-styles in 1896, as shown in Fig.4(b).

3.2 Transfer of materials for dry docks

As seen in Figs. 2 and 3, English- and French -style dry docks have been primarily built with stones. However soil bricks were mainly used in the Netherlands (seen in Fig.4a) since stones were not generally found there. Although the idea of soil bricks as a structural material of dry dock was transferred to Germany (see Figs.5a) and Japan (see Figs.5b), the use was not widespread.

Today there are only five of those dry docks left in the world. Those are indicated with " * " in Table I.

Fig.5
Soil brick dry docks, (a): BR, (b): U

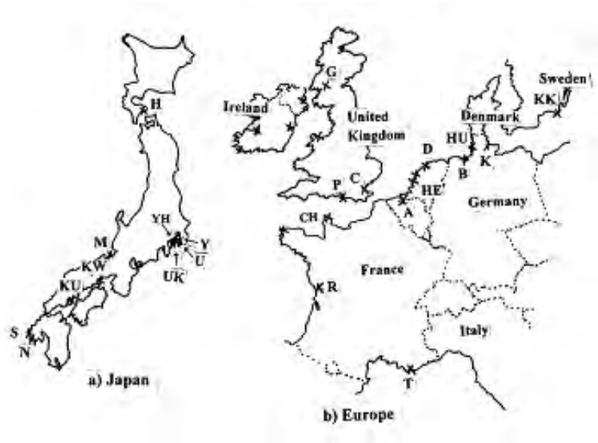

Fig.6
Maps of HDDs in Europe and Japan

Table I Data of Historical Dry Docks. Symbols are as follows, England, G:Glasgow, C:Chatam, P:Portmous, France, R:Roschfort, CH:Cherbourg, T:Turon, Belgium, A:Antwerp, Germany, HU: Husum, K:Kiel, B:Bremerhaven, Dutch, D:Denhelder, HE:Hellevoetsluis, Sweden, KK: Karlskrona, Japan, Y:Yokosuka, U:Uraga, UK:Kawama, YH:Yokohama, H:Hakodate, KU: Kure, M:Maizuru, KW:Kobe, S:Sasebo, N:Nagasaki. Materials of wall, brick, concrete, and stone are indicated with symbols *, + and no sign, respectively. Data are mainly taken from refs.4, 5, and 6.
L, D, and W are given with unit, "meter".

Name	L	W	D	year	Name	L	W	D	year	Name	L	W	D	year	Name	L	W	D	year
C2	110	22	8	1856	A1	160	24	6	1863	B1	87	28	5	1860	Y1	122	25	8.4	1871
C3	120	24	6	1820	A2	72	12	4	1865	B2	145	18	6.4	1871	Y2	156	29	10	1885
C4	105	23	5	1840	A3	50	10	3	1865	B3	237	33	11	1899	Y3	94	14	7	1874
P1	80	18	6	1801	A4	134	15	5	1881	B4	268	40	11	1913	Y4	220	26	10	1906
P2	73	20	7	1802	A5	134	15	5	1881	B5	113	17	4.5	1904	U*	148	20	8.4	1899
R1	95	14	8	1861	A6	134	15	5	1881	B6	180	37	5.4	1910	UK*	137	16	9.7	1898
R2	105	15	8	1725	HE*	157	31	7	1806,25	K1	179	32	7	1902	YH1	168	28	9	1898
R3	65	10	6	1671	D1*	90	22	6.5	1822	K2	201	30	28	1903	YH2	128	18	8	1896
G1	165	22	6.3	1875	D2*	120	25	8	1866	HU	78	33	8	1877	H+	162	25	9	1903
G2	172	20	7	1886	NM	222	30	10	1905	S1	141	30	12	1895	KW	129	20	8.5	1902
G3	268	25	8	1898	K3	230	34	11	1912	S2	177	29	16	1905	M	207	26	12	1904
T	74	24	8	1846	CH	78	18	6.5	1813	KK	74	16.3	4.8	1724	KK	65.4	15	6.0	1792
KK	86	15.4	6	1792	KK	66.8	15.4	6	1802	KK	66.7	15.4	15.4	1843	KK	67.7	15.4	6	1846
KK	200	20	5.5	1903															

4. Results and discussions

Many HDDs located in England, Western Europe, and Japan are shown with the crosses in Fig.6. Characters in the figure are correspondent to those in Table I. For many of those HDDs in Europe, we obtained the length (L), width (W), and depth (D) from the measurements and other reports.[5,8,9] Further, in regard to the Japanese dry docks, we employed data from the report by Nishizawa.[4] These are listed in Table I. The ratio RD is calculated and shown in Fig.7 as a function of y.

4.1 Shapes of dry docks common in Europe and Japan

As seen in Fig. 7, curve A or B can be drawn through the points with dashed or solid line, though those curves take slight shifts from those in Ref.5 because of added data. The dry docks marked on the A-curve were primarily built for sail vessels. After 1810, the RD roughly decreases with y until about 1850, which may suggest an increase in the depth of the dry docks. Conversely, dry docks on the B curve were built for ships powered by steam engines. In this case, the RD decreases until about 1900 but rapidly increases after 1900 with y. The variations before and after 1900 suggest that there were an increase in depth and width, respectively. As shown in Fig.7, these variations appeared in Japan at the same time as Europe. This fact presents that the HDDs in Japan are in fact evidence of harmonized technology.

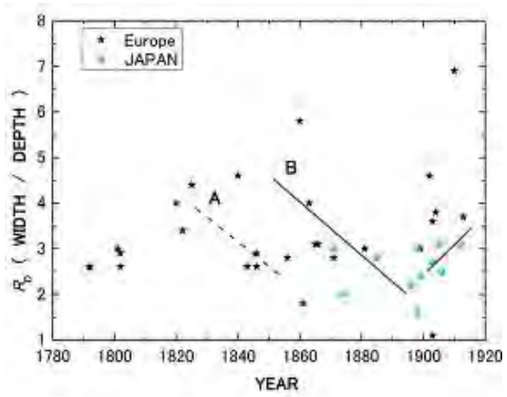

Fig.7
RD vs. y.

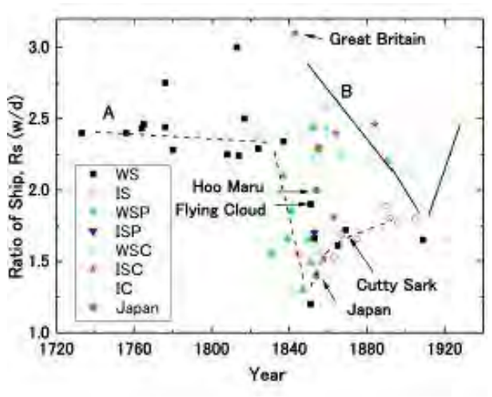

Fig.8
RS vs. y for historical ships,
W: wood, I: iron, S: sail, P: paddle, C: screw

To understand the variations of RD in Fig.7, we must first take note of the shape of the ships since the dry docks were specifically built to accommodate and repair them. Then we examine the data of historical ships,[10] and show the ratio of RS (= width/ depth), as seen in Fig.8. Again, the ships on the A curve are primarily sailing vessels, while those on the B curve are steam-powered ships, which include higher RS-values than their wind-powered counterparts. Curves A and B show the decreases with increasing y before 1850 and 1910, respectively.

Based on these data, we can interpret the decrease in RS with respect to the increase in the overall speed of ships with y. With increasing speed, the square footage of the sails might be also increased. As a result, this also increased the possibility of heeling in strong winds. Therefore, the depth of hull was enlarged. This progression is represented by the decreasing value of RS with y, as seen in Curve A in Fig.8. Therefore, we predict a y-dependence of RD after 1820 similar to RS.

After 1850, the decrease in RS changed to an increase which can be attributed to the change of hull materials from wood to steel. This also changes the structural design since steel hulls create less friction against the sea, and the overall speed of the vessel is increased. Therefore, ships were redesigned to include smaller sails and shallow hulls. This was primarily because of the advancements from the industrial revolution in the 19th century.[11]

As seen in Curve B in Fig.8, there was another period of decrease just before 1910. This decrease was again associated with speed since sails were still being used on steam-powered vessels. Therefore, the same reason with that of the sailing ship is applied to Curve B as well as the decrease of RS with y. In regard to RD, it is the same as that of Curve A in the period before 1910.

After 1910, the RS of Curve B increases because of the overall increase in speed for the steam-powered, screw-driven vessels. This major improvement provided faster speeds with wider hulls, which as a result, allowed the ships to increase their capacities. Then the widths of the dry docks were built to accommodate these wider vessels. This width increase is represented by the increase with y. In Fig.7, the secular changes after 1890 are similar in Europe and Japan within scatter.

In regard to dry docks built with soil bricks in Japan, we find considerably small RD values compared with those of the Netherlands as seen in Table I. For this difference, we notice that Japanese dry docks were built during the age of steam-powered ships while the latter was originally designed to accommodate wooden sailing vessels.

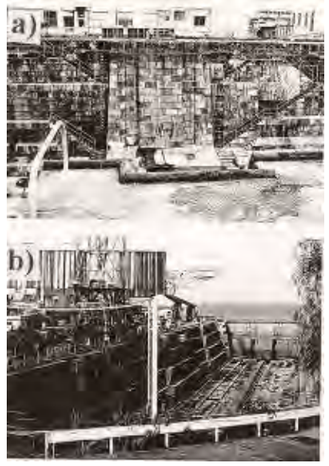

Fig.9
Many stairways at a level, (a):Y2, (b):UK.

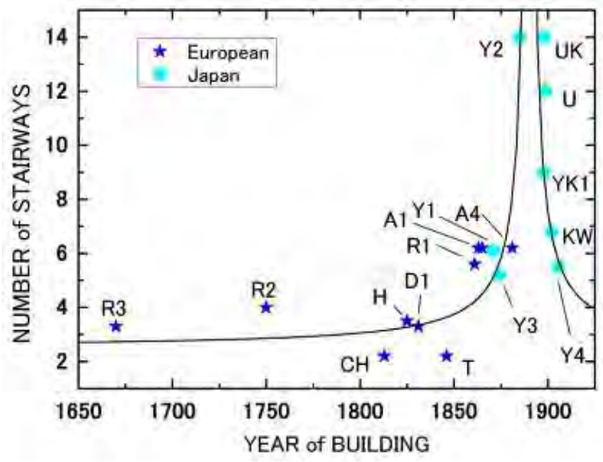

Fig.10
Number of stairways vs. y. Characters are same with those in Table I.

4.2 Dry dock stair patterns in Europe and Japan

Next, we examine the number of stairs per level on the outer walls of the dry dock having French-style. In regard to the Y2 dry dock, we take half the number of stairs per a level since it is a double-style dock that originated in France. Indeed, as seen in Fig.9a, the dock includes a flute for setting doors in its center. These numbers are shown as a function of y in Fig.10. As we examined more dry docks, we discovered that Japanese dry docks included a greater number of stairways

compared to their European counterparts. The maximum number of stairs appears few before 1900. The examples are shown in both images of Figs.9a and 9b as well as the dry dock in Fig.5b.

We believe that the increased number of stairs was devised to shorten the time for workers to travel from the upper rim of the outer wall to the base of the dry dock. Based on the data in Fig.10, we conclude that this structural was one example of the modification of transferred technology by Japanese engineers. In addition, the structure might have originated from the Y2 dry dock, and transferred to dry docks of the U (Fig.5b) and the UK (Fig.9b) since several engineers who worked in the Yokosuka shipyard were also employed on those dry dock projects, though the building of the U was originally planned by De Leke, a Dutch engineer, and started by the supervision of L. N. Bogel, a German engineer.[5]

We also find further characteristic differences in the positions of the stairs. For example, in the U, Y1 and the UK dry docks, the stairs are arranged in the form of a 'V', which can be seen in Fig.5b and Fig.9. A similar arrangement can be found on the Keiser No.2 dry dock at the Lloyd Werft shipyard in Bremerhaven (B4 in Table 1).[9] Although this modification is another example of transferred technology, the correlation between Japan and Germany remains unclear. These however are evidence for the variety of dry dock designs after the transferring of the technology. In general, from the results in Figs.7, 8, and 10, we can conclude that HDDs over transferred countries are valuable heritages for understanding the history of dry docks. In addition, these and the modification of the structure of transferred dry docks are examples of transferred technology that harmonize with the culture of the transferred countries. Those are also the evidence of friendships, for example, as seen in that of Japan with France, England, the Netherlands, etc. Yokohama, Yokosuka, and Uraga are typical memorial places for the technology transfer since we find French, English, and Dutch styles of dry docks, respectively, in there.

5. Conclusions

By observing and measuring the size of the historical dry docks in Europe and Japan, we obtained the secular changes of the ratio RD with similar relationships to that of RS. After 20 years from the first building of dry dock, Japanese engineers graduated from the engineering school built about 20 dry docks over a period of 30 years. For those dry docks, we discovered that Japanese engineers devised a greater number of stairs compared to their European counterparts.

In addition, only two Japanese dry docks were built with soil bricks based on the technology transferred from the Netherlands. These had been used for more than a century. The RD values of these are considerably small compared with those in the Netherlands. For the cause, we concluded that any modifications were simply a reflection of the age.

From these results, we concluded that dry dock technology was one example of the harmonized technology transferring to countries of different culture, and clarified the importance of the technology education and the device of transferred technology in transferred countries for the harmonization of overall traditional custom, life style and culture.

To know well the history of technology transfer, we suggest the importance of the conservation of historical dry docks. This further provided us the variety of transferred technology in dry dock designs and the evidence for the devised technology by transferred nations. Those may give new idea for developing the technology in 21 century.

In order to realize the conservation with understandable form, we propose simultaneous conservation projects of dry docks built under the technology transfer, which as a result, formed long-term international friendships.

Acknowledgements
We are grateful to the Fukutake Science Association for supporting this research. We would also like to thank the U.S.Naval Base at Yokosuka, the Karlskrona Naval base in Sweden, and also the Lloyed Werft shipyard in Bremerhaven, Germany, for taking photos and providing data of these historic dry docks. We further thank Dr. D.J.Peters, German Maritime Museum and Mr. Manne Dunge, senior curator of Statens Maritima Museer for obtaining the data about dry docks in Germany and Karlskrona, respectively.

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The Copper Forge-house in Banská Bystrica- the Urbanity and Architectonic Document of the Evolvement of Historical Industrial Area

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Abstract
The emplacement of producing buildings was always connected with local geomorphologic, hydrological and climatic conditions. Not far from Banská Bystrica[1] (middle of Slovakia today), there are known as early as from 14th century the smelting-houses for copper ore processing. From the year 1496 there also the comprehensive forge-house was built.

Beginning of Hungarian Copper Company[2] is connected with bank's family of Fugger from Augsburg (Germany) and with the family of Jan Thurzo Cracow burgess living-in Levotcha in north Slovakia. The company had the ore mining only in rentals for the prime 10 years. After 1505, it took all the controls from the mining to final processing over.

The intensive deep-mine excavation was the headstone of enterprise. The newly build mining workings were connected by shafts and adits and they reached the top-level of that time world (besides the deep-mine excavation, also powerful winding machines, detailed mining maps, etc.). The excavated ore was processed in the smelting-houses and forge-houses that were different according to processing technology. The Copper Forge-house was the unique centralized manufacture for to produce the finished pieces from the ore excavated in large surrounding. Among the particular working places, there were build up the roads and well organized continual cargo transport worked there. The enterprise had all the signs of the today's modern industrial enterprise, already in that time and it gone the massive profits.

The area of Copper Forge-house was several times rebuilt. The substantial expansion in 1496, another milestone was the year the 1761st. It is then stretched around the village consisting of independent residential and administrative buildings - employee colony. Another modification was associated with the introduction of electrolysis in the late 19th century, in the first half of the 20th century with new technologies and new administrators.

Keywords: industry settlement; forge-house; copper; Banska Bystrica

Introduction

In the year 1996, 500 years elapsed since the Banska Bystrica´s Copper Company for the mining and processing of the copper was founded. The workshop producing the final goods – so called Copper Forge-house[3] – belonged to the main pillar of the company from its beginning. In the occasion of this anniversary a scientific conference was held in Banská Bystrica. Their participants

analysed the reasons of its origin, went through topic, compared the system of the functioning and evaluated the contribution of this company from the different points of view. The result was that the company was the pioneer in the area of the technical solutions and innovations, in the area of the management and labour organisation, creation and development of the modern business and investment activities. Several of the conference participants pointed out that the Copper Forge-house in Banská Bystrica was the first company in the world having the character of modern industrial company[4].

According to school books of history and technical encyclopaedias[5], the industrial revolution began in England at the first half of the 18th century during the era of King George III. (1738–1820). So, which is the role of Copper Forge-house in Banská Bystrica in the history of development of industry[4]?

The Latin expression „industria“ did not mean heavy industry and production of the goods from the mineral and natural resources, even the collection of the production processes in the period of beginning of industrial era like we are naming it nowadays. It expressed the diligence, industriousness, ability, resourcefulness and invention. All that qualities shared to assure the quantitative higher production and the better effectiveness of the production. Because of that the technological practices, organisational processes and the creation of the specific production buildings and areas that should improve the business output received the attribute – industrial. The original meaning of the word „industria“ (and its adjective industrial) was transformed in the result of the processes it conditioned. It means the specialized production of goods and specially functioning system of production nowadays.

One question is starting up with look back through prism of nowadays, about meaning of the word “industrial”: Does the Copper Forge-house, as an active productive branch of Banska Bystrica´s Copper Company established in the year of 1496, contain the attributes of the industrial plant? Is it possible to consider it to be the historical industrial area? This article tries to find an answer to these questions.

The Banska Bystrica´s Copper Company

The Banska Bystrica´s Copper Company was the capital investment of the Thurzo and Fugger families. Thurzo was the burgher of Cracow lived in Levoča and Fugger was owner of the bank from Augsburg. They signed contract with the Hungarian Mining Chamber about Copper Mining Company in Banská Bystrica in 1495. They promised to build the new metallurgical plant and drain mill (to separate and drain silver from copper)[6]. It was a business connection, which is now called the “joint venture company”: the holder of technology know-how (Thurzo) joined with the manager of free capital (Fugger) for the purpose of building a new production plant with technology and capacity of higher order. Although, the business connection Thurzo-Fugger later disappeared, the production plant worked and developed copper metallurgy further 500 years.

The base of business production was intensive deep underground mining of copper ore. Newly created, interconnected shafts and tunnels, mine works were reaching Europe’s top level of that time: they applied the latest technical achievements and knowledge (winding and treatment machines, detailed mine maps, managed the secure underground mining). The mining operation followed immediately with metallurgical ore processing. The company closely cooperated with a number of primary and specialized copper-works. Ore mined from deep underground was primarily

processed close to point of mining in ore crusher houses and thereafter in smelting works. The crude melt was transported for further processing into technologically specialized metallurgical operations – refining and draining-houses. There was produced copper material of varying quality. Copper was finalized in semi-finished products in a separate metallurgical production works “forge-house”. Forge-house of the Banska Bystrica´s Copper Company processed only copper material, so got attribute “copper” forge-house.

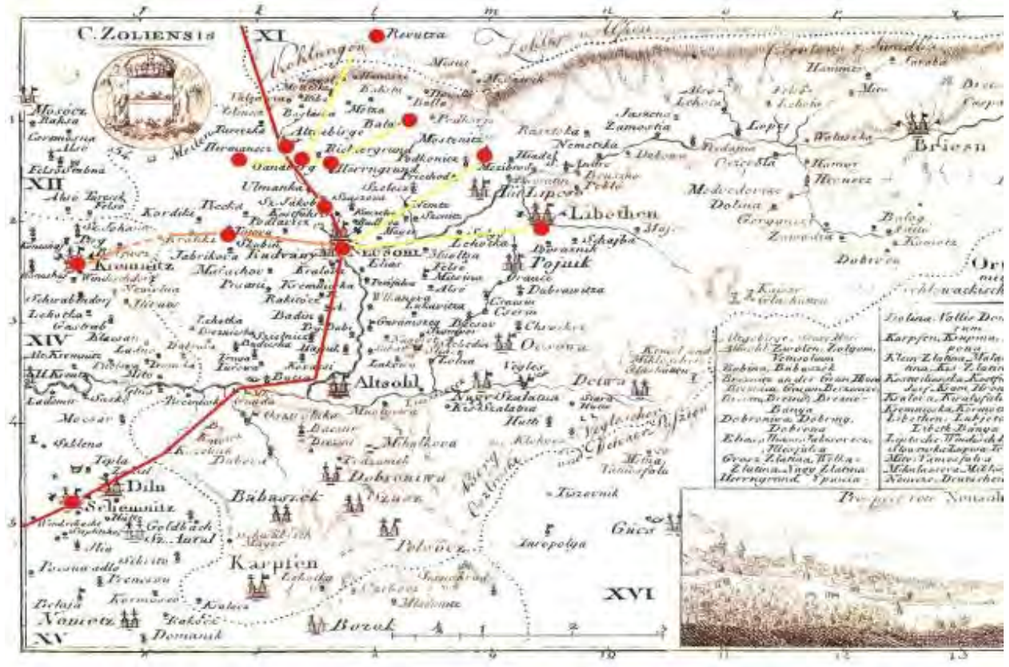

Fig.1
The transport routes among the individual copper excavating and processing plants of the Banska Bystrica´s Copper Company and their relation to the long-distance commerce routes on the map of Zvolen´s district from 1804.
[Ďurišová, 2006]

Among the different processing sites were built good roads and well organized "intra-plant" transportation works here permanently, The transport network of the company was logistically differentiated so the long-distance transport routes were segregated from local and intra-plant roads for the reasons of safety and permanent operation. Products of copper forge-house were at the world market very popular, therefore a substantial part of the production was intended for export to whole Europe[7].

These attributes represent the production co-operation and company management of such innovative range, which is characteristic only for the upcoming industrial period. Copper forge-house played a significant role in this process.

There were published several articles describing the historic documents of Copper Forge-house in Banská Bystrica until now. But confrontations of historic dates with the architectural remains are sparse, partial and limited. It is what this study sights.

Copper forge-house

Origin and location of structures for producing is always closely connected with local raw material resources, geomorphologic and climatic conditions. Except supplies of feedstock, energy resources and access to transport infrastructure of country have always played a key role. The presence of these factors and their sufficient capacity were present at the beginning and during the next long-term functionality of copper forge-house complex in Banska Bystrica.

Establishment and purpose

The new production facility was built in 1496 on place of former Kolmann´s copper-works, which burned down in 1475. After the 1496 the Banska Bystrica´s Copper Company rebuilt the original melting and smelting works, extended facilities to the technologically more complex production area – copper forge-house. It was the facility where the production was finalized and upgraded, therefore had crowned position in production complex of the Banska Bystrica´s Copper Company. It produced copper products for different final use (eg, copper cookware, boilers, etc.), and high-quality pure copper semi-products (rods, sticks, copper loaves) for further processing.

Location

The north of Banská Bystrica, at the confluence of two small but abundant watercourses (Laskomersky stream and small river Bystrička) showed as a very suitable location for placement of facility using the power and energy of the water element in processing of the main wealth of region – copper ore, since the 14th century. The location of new forge-house was the result of logical and practical factors: not only the confluence of two rivers, but also the crossing of roads coming ftom the mining sites at north of the city, from the copper-works at east of the city and at the connecting line of the cities of Banska Bystrica and Kremnica.

Fig.2
The area of former Copper Forge-house in Banská Bystrica is situated on the confluence of two water streams at the crossroad of still living transport routes.
[Photo: Kráľová, 2011]

It turned out the energetic potential of both two rivers was crucial for not only long-term development of production, but also for technological and spatial organization of production facilities.

The development and transformation

The evolvement of technological processes and the subsequent modernization of production during the hundreds of year‘s old history of Banska Bystrica´s Copper Forge-house brought about its buildings complex was continually changed and transformed. However, it retained the original purpose - processing of copper ore - throughout nearly 500 years.

Construction of the copper forge-house in 1496 sparked a major rationalization and upgraded

previous production of copper. Another milestone was the year of 1761. Then in the copper-works a fire occurred and caught much of the nearby town, too. After the fire the plant was completely rebuilt and production was upgraded. Approximately, from this period is the oldest till now known production facilities ground plan of the copper forge-house. In 1764, area was visited by princes of Hungarian Empress Maria Theresa. Before this visit the Gold book of mining[8] was elaborated – as a professional document for purpose of visit preparing. The book is a collection of technical documentation and professional descriptions of the most important economic locations around the country, which the young successors to the throne should be familiar with. The detailed inventory and documentation of all important buildings belonging to mining district of visited the area was done before its elaboration. The book describes the three major economic centers of the central Slovak mining area - Kremnica (Kremnitz), Banská Štiavnica (Schemnitz) and Banska Bystrica (Neusohl),where copper forge-house was also mentioned.

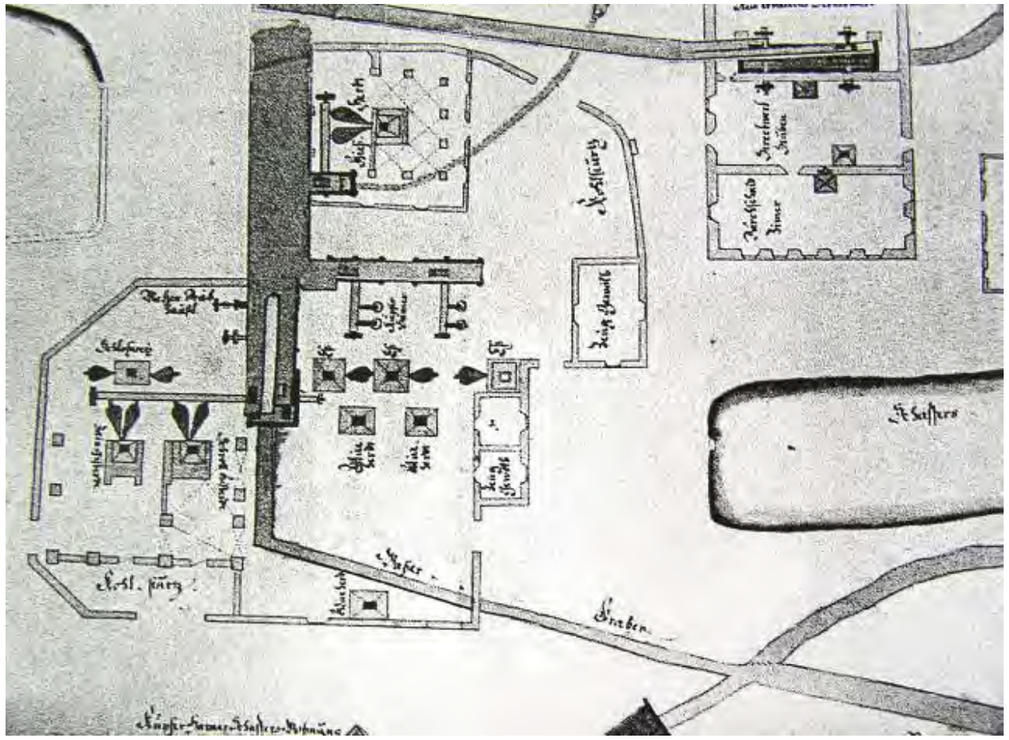

Fig.3
The earliest known ground plan of facility‘s area shows the range and spatial organization of complex approximately before 1764. The map from 1800 documents the Copper forge-house and its colony as a settlement complex.
[Husák, 2005][9].

Another well-known plan of the Copper Forge-house complex comes from 1818 (Fig. 7) when there were working:

- 3 large and 3 small hammers anvil for hammering of copper
- 5 large hammers powered the water wheels
- 13 fireplaces, bellows powered by the 10 water wheels in 7 timber wheel-houses
- workshop for the production of copper cookware, boiler workshop, facility of wire manufacturing, ore crushers-house, carpentry workshop, grindery, copper warehouses, manufactured goods warehouse, wood and coal stocks

- Individual technology units were linked by water raceways among each other
- the residential house for technical staff (reeve of facility, workshop masters, journeymen, watchmen) as well as the trout fishpond, fruit grow and ornamental garden.

Complex of Copper Forge-house included with production facilities and water raceways is documented in the other maps from the years 1859, 1864, 1888, and in several maps of the 20 century as well.

The phenomenon of water

The water raceways system acted as an important and indispensable phenomenon of Banská Bystrica´s Copper Forge-house since the beginning. System provided drawing force to drive industrial machines - wheels, rollers and hammers in the forge. In the past water raceways bounded the whole production area. The main water supply came from the northern site (Starohorskaá valley), where from the individual devices were powered up. The head race branched away from the Bystrička stream at the end and Starohorská valley above the copper forge-house area. The water system was forked into two branches before the entry to the facility area. The north-southern branch passes around the former building of rolling mill to building with furnaces (so-called —heartyll). There were the other forks distributing the water to the wheel-houses with the drive wheels. Underneath the building with furnace the water branch returned back to the Bystrička stream. The second branch deviated to the east site above the rolling mill then passed to the now already demolished objects of copper plates production, and thence directly to the stream. On the territory of forge-house facility there were located approximately 500 meters of water raceways. However, the whole system reached a length up to 1160 meters and about 2.0 meters of difference in elevation.

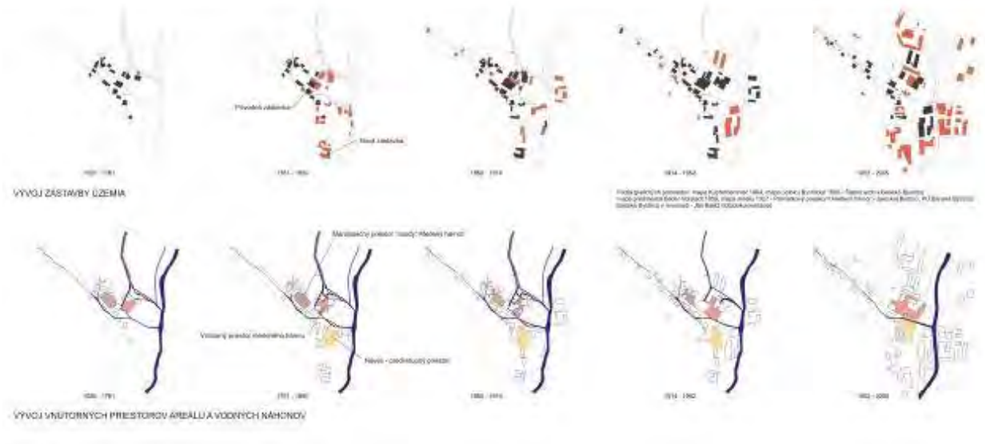

Fig.4
Evolution line of water raceways routing and production buildings utilized the energy of the water flow confirm their basic importance
[Ďurišová, 2006]

Even though the raceway system was crucial for the area, it wasn‘t invariable. As figure out the number of development schemes of raceways (Fig. 4), the routing within the complex has changed several times - depending on changes in the production process and technology.

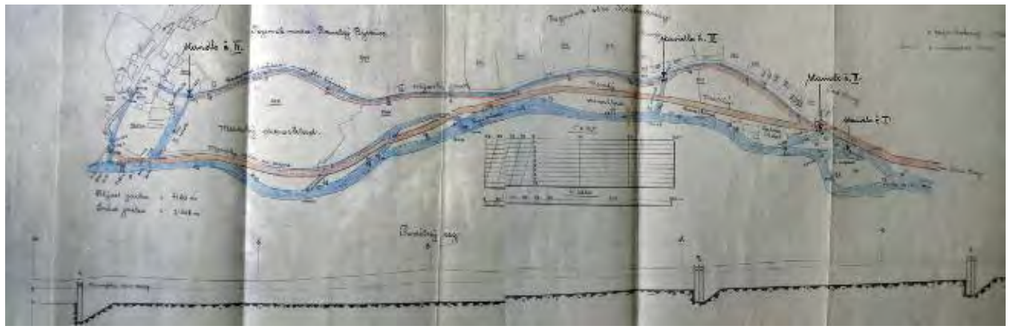

Fig.5
The water stream topography scheme of Banská Bystrica´s Cppper Forge-house from 1925 indicates the fallout in longitudinal section.
[Ďurišová-Kráľová, 2010]

Today, the only preserved fragment of the north-south routes is above the object of workshops. It consists of rectangular concrete drains with preserved parts of the floodgates, coming from reconstruction in early 20th century, when buildings were modernized. The original raceways were wooden, probably. Here appears to be a remarkable and inspiring fact: in the long history of Copper Forge-house, there was used the driving power of water for the production activities (without devastating effects to the environment) until the 20th century.

Fig.6
The rectangular concrete drain on the photo from the 1st half of 20th century and in 2006.
[Ďurišová, 2006]

Further extensive transformations of the Copper Forge-house complex related to the introduction of electrolysis in the late 19th century and early 20th century with the technological innovation processes by new administrator. After the 1945-48 the production was modernized and began the production of nickel sulphate. Since 1958 there is also processed manganese by electrolytic technique. The area of Copper Forge-house served as a test room – hydrometallurgical laboratory of procedures for the polymetallic ores processing. In the seventies of the 20th century the area was curtailed per consequence of the road viaducts over the sites construction. In 1995, metallurgical production at this point ended. The area by followed bulk privatization of property was crumbled. The new owners removed a part of the buildings and water raceways tracks. The area is not protected as a historic or architectural monument.

Locality as an urban settlement development

The technical buildings for productive processes were located out of residential quarters of the town, on the fringe of a town or far from the town, whereby the manager and the technical staff (masters) lived in the houses inside of adjacent town. The complex of Copper Forge-house acts as an exception. Although, the town of Banská Bystrica was located less than 3 km, an autonomous settlement for the managing employers arisen in the immediate proximity of the facility of Copper Forge-house.

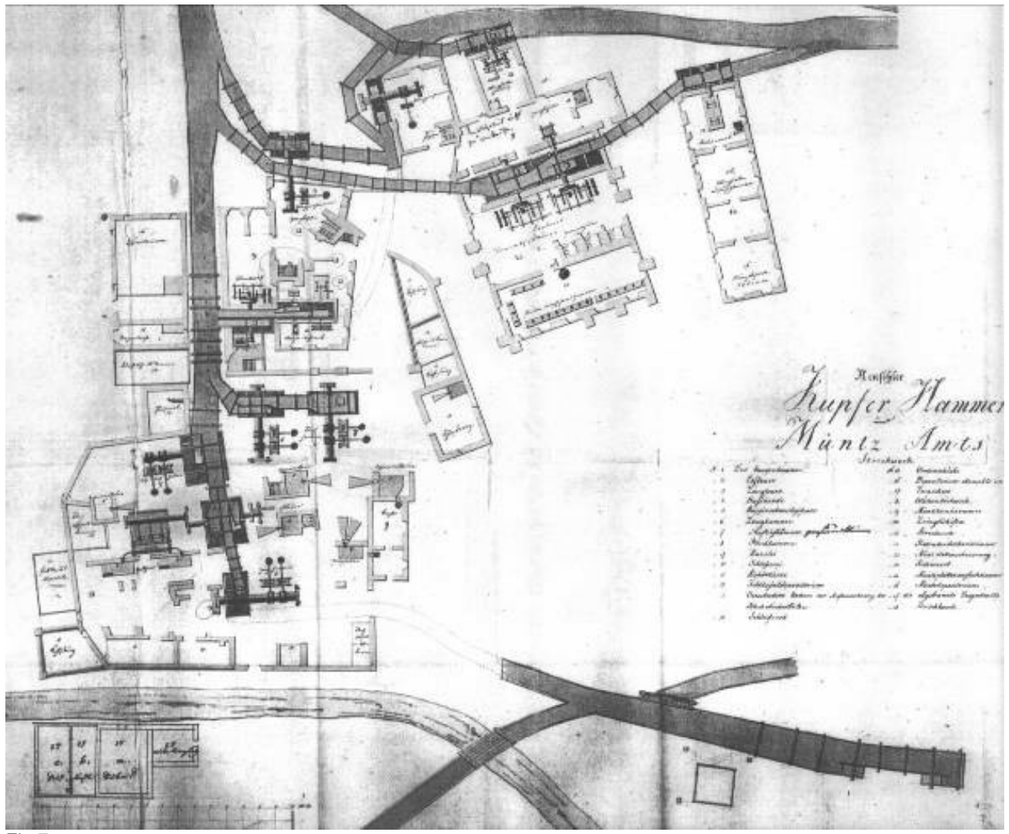

Fig.7
The detailed cadastral map of suburbia Lazovne[10] of the town Banská Bystrica from 1859 shows the location of Copper Forge-house (in the rectangle) in relation to this suburbia.
[Ďurišová, 2006]

The settlement evolved as a productive-residential unit equipped by large scale of services for its inhabitants. The complex of residential and managerial houses – together 15 walled 7 wooden buildings and 6 productive buildings connected by water raceways – extended at forge-house facility as early as the 18th century. The colony with 28 buildings became an urban structure with the evident function zoning. The zones were spaced out depending on the functions: zone of production,zone of management (partially mixed with the function of service residence) and zone of residence for the technical employers.

The respective zones were mutually connected by roads and slack open spaces in form of small square. A rich presence of big trees, they were found on the square and in the immediate surroundings of productive complex, can be seen as a remarkable phenomenon: may be some primal ecological screen?

Fig.8
The view into the spaces of settlement of Copper Forege-house from the route accessing from the town of Banska Bystrica: there is the corner of the building of furnace in the rift of road. The settlement did not have a church, but on the entrance square stood a small votive architecture – devotional pillar.
[Kajba, p. 84]

Following these factors as the historic indication of industry evolving, the settlement of Copper Forge-house can be seen as a reference that functional zoning of specific productive sites was known on the territory of actually Slovakia (then Hungary) for early 18th century.

Urbanism and architecture

Although the area of Copper Forge-house belonged to the cadastral territory of the town of Banska Bystrica, it retained a proper authentic visual countenance until a half of 20th century. It was characterized by low, one or two floor level of build-up area with the isolated houses standing along the road, which ran through the valley of Laskomerska to the copper-works in the village of Tajov. Low density arrangement of buildings without the clear street-line was determined by the operative needs of production, not by an urbanization plan of settlement development. The location of processing buildings was conditioned by short direct contact with the access to transport roads, but especially by inevitable contact with energetic sources for drive of machines. It means, that was in the immediate nearness of the water stream of Bystrička and on the raceways build on the stream. The high chimneys of processing buildings and lank bell-tower indicated the productive purpose of the colony and raised the dynamism of its scenery.

The houses of manager and foremen were situated separately from the processing buildings and water streams – on the counterpart of the road or at the upper small square. Very good view on the forge-house area was all these houses from. Copper Forge-house with its colony lost its character of an independent settlement as late as the 70-ties of 20th century. It was the impact of

new scaffold bridge of the arterial road No. E 77 build over the complex.

The own formal signs characterized the original structure of complex. In the horizontal level, there above mentioned function zoning was present: in the vertical direction there the building arrangement was modulated on the intense slope. The super-elevation of slope reached up to 7 meters in short section. The terrain waves graduated in the background of the colony completing such the lively scenery of all the settlement. The horizontal arrangement of buildings situated on the contour lines – typical for the entire complex throughout more than 400 years – vanished after building of new scaffold bridge.

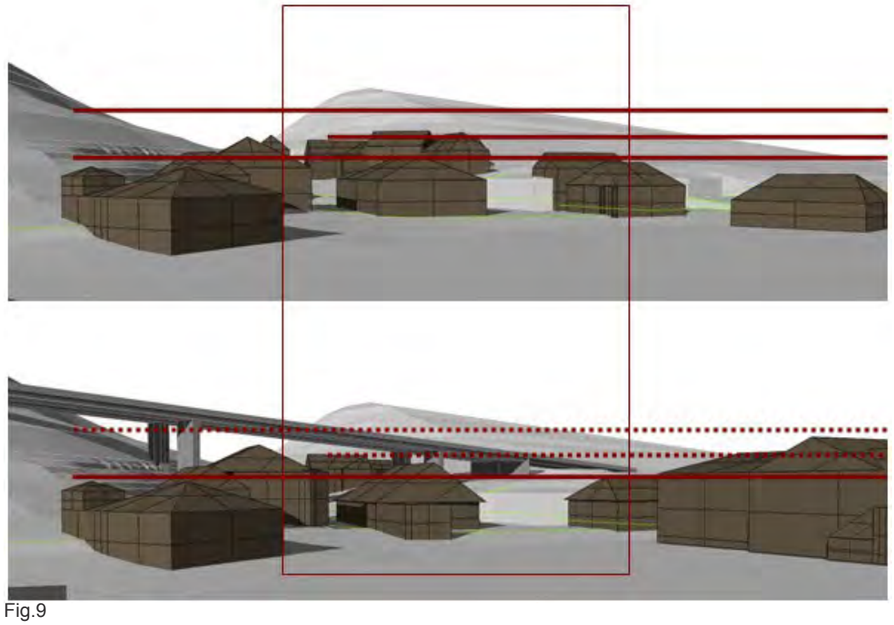

Fig.9
The collation of vertical building zoning of colony in the past and today: on the schemes, there are evidently visible two levels of build-up structure vanished in the result of new road bridge building.
[Ďurišová, 2006]

Fig.10
Two oldest houses indentify the initial settlement of Copper Forge-house: reeve‘s house (yellow on the left of street) and the building of furnaces (coin on the right of street) in early of 21th century.
[Ďurišová, 2006].

The building of original furnaces aisle (called: —hiartyll[11]) is conserved till this time in the part of original complex near of Laskomerska street. It is the oldest of all conserved buildings in the area. The building is without use from the beginning of 20th century, but its remains contain the valuable documentary and testifying qualities about the original technological production process steadily. Originally, it was the main building of forge-house: with the hearths, pantries, storage facilities, grinding-plant and office.

The incoming space vaulting by roller vault of quarry stone is legible from fragment of till now conserved building. The openings with the half-round header joist are visible on the side wall. They served for the water race-way passage in the past, today are brick in. It is possible to date this part of the building to the period when the Neusohl´s Copper Company raised – about year of 1496. It is possible that some parts of the masonry would be remains of yet older Kolmann´s smelter[12]. The masonry of external building walls is made of stone up to 1 – 2 m height; the upper parts of walls have the mixed masonry (brick, stone) passing continuously into the vaults. The three-aisled hall covered by the rolled vaults with lunettes and by Prusian vaults forms the main space. The openings over the former fireplaces are situated in the vaults for the fume exhaust. The dating of the central part of three-aisle could be pose into the 16th century, the part of brick vaults as well as the Prusian vaults probably into the period after the years of 1759-1761. Another space covered by wooden ceiling dated 1843 sweeps back to the three-aisle space in the close of the building. The street façade of this facility is plain; it is latticed only by asymmetrically located openings. In the literature and in the archive funds are conserved the facility photos from the beginning of 20th.century[13] they make possible to realize the reconstruction of façade and the volume of building.

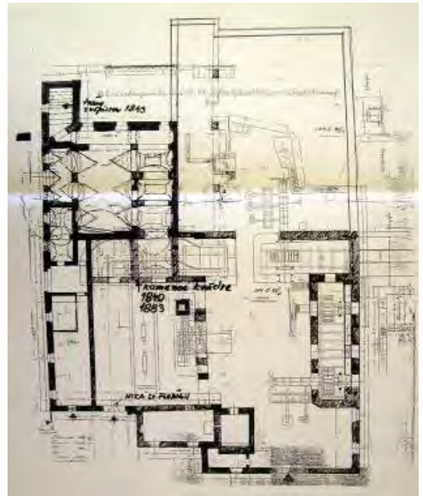

Fig.11
The ground plan of building of furnaces from 1994 presents the remained walls of the initial plant. Until now, there is conserved only the part in the rectangle.
[Ďurišová, 2006].

Fig.12
The expression of the façade of furnace‘s building in early of 20th century and today
[Husovská 1997, Kráľová photo: 2011]

The building of workshops is situated inside of area – on the place of original rolling mill and of forge-house for to smith and to sear the coin‘s bars. It is another conserved building of the original productive facility. Actual building is yet of the later date, it was erected in the year 1851. Probably, there the masonry of the older building was utilized. Actual building is conserved with a few adapting changes.

Fig.13
The actual condition of the building of workshops, momentary it is without use.
[Královᡠ, photo: 2011]

Another building, erected in the second half of 19th century and transformed in the second half of 20th century, has the direct relation to the technological facilities of original productive complex. It is the building of laboratories with the hall of former hall of electrolyse. It is located on the place of former facility for the production of copper coin slates and for their embossing. The hall of former electrolyse adjoins to its side.

There are also the houses of management staff here playing an important role in the life of Copper Forge-house always. Till now conserved houses complete complementary the industrial image of settlement as well as the quality of its architecture. Unfortunately, the residential houses vanished or were demolished. A particular status between them has a house of reeve (Laskomerska street No. 5) that had conserved its intact form, practically as the only, until now. The house is situated under the hillside of cross valley of Laskomer and on the waterside of the same name stream.

Fig.14
The reeve‘s house: three time points of its life in the last hundred years.
[Ďurišová 2006 – Královᡠphoto: 2011]

Initially, the house served as a company‘s service house: the office was on the ground floor with the entrance through the salient of wall on the corner; residential premises with kitchen and pantry of reeve‘s family were on the upper floor. Also the other buildings belonged to the house of reeve: storage facilities, car depot and stables they did not retain. It is two-floor block house with a tower salient of wall on the north-east corner. The house has good conserved and legible original spatial disposition: the premises are arranged around the central space. The central space on the ground floor is vaulted by vault girdles on the central column.

Fig.15
The well-marked rests of polychrome decoration were visible on the vault and lunettes in the sale on the upper floor.
[Ďurišová, 2006].

The three-tract ground plan of the upper floor has the cross oriented middle corridor. The sale in the north-west part has the rolled vault with three pairs of lunettes where the painted decoration from the end of 17th century is visible. Unfortunately, new owner of the house demolished the external plasters whereby the authentic decoration of facades vanished. The house is dated into the 17th century as the provisional measure, but a part of constructions and spaces can be also older: it touches the pivotal space with central column. The annex on the south part comes from the adaptation changes during the 18th and 19th centuries[14].

The house of night watchman (Laskomerska street No. 3.) is located not far away the house of reeve behind the stream Laskomersky. It has a building particularity: it is partly imbedded into the massive rock what is visible in the spaces of basement floor openly. The building arisen

probably in the 17th century as a perquisite belonging to the forge-house area. It was adapted several times in the next centuries. It served for the residence purposes until 1995; nowadays it is abandoned without use.

Fig.16
The house of night watchmen (white) stays near of reeve‘s house.
[Kráľová, photo: 2011]

Fig.17, Fig.18
The area of ancient Copper Forge-house is already curtailed, only its core is survived. But it has a potential to narrate much about the history of industry as well as of the people working there.
[Ďurišová – Kráľová, 2011].

Other houses of initial colony of Copper Forge-house are conserved on the street Laskomerska: house No. 1 (originally a residential house), house No. 10 (house of coin-foreman and tool maker), house No. 13 (house of forge-house master) and the other originally residential house on the street Lazovná No. 71. The origin of these houses can be dated according the conserved vaults and details into the period of 17th century. They were adapted during the later centuries. All here described houses and technology buildings represents already only a fragment of original multifunctional productive settlement. Theirs documentation value is all the more important.

All these buildings – as an urbanity and architecture complex – document the hundreds of year old development of processing buildings typology, of their energetic facilities and of social condition of employers. The spatial and dispositional organization of Copper Forge-house area expressed nearly functionalistic links between individual specialized workshops and energetic sources. In its complex, there diverse buildings for the copper and others metallic components were erect in successive steps. They came into being in dependence of changes of production technology. In spite of losses of building and dimensional structure of colony, the area of Copper Forge-house includes several buildings and technological solutions they confirm important position in the history of European industrialization.

Conclusion

The Copper Company of Banská Bystrica (then Neusohl) was a revolutionary innovative enterprise unit in then world. The high standard of management made felt not only in the productive and management processes of company but it was of use also in the location of singular productive facilities, as well as in theirs spatial organization.

It is possible to assert pursuant to the aforesaid facts that the area of Copper Forge-house (in Slovak: Medeny hamor) meets all characteristics according the definition of international Charter for the conservation of industrial heritage: written documents bear witness the Copper Forge-house perfectly operated and produced capacious quantum of standardized goods for the world markets far away of mother‘s country in the long term. The Copper Forge-house included with subsidiary facilities and residential colony hold the attributes and the elements of manufacture by which was a direct transition to the factory type enterprise. The colony formation with a definite direct connection with the area of Copper Forge-house documents an early phase of countryside industrialization.

It is why a qualifier – a historical industrial area – pertains to it. It is a material document of hundreds of years old continuity of techniques and technologies, of experiences and of copper metallurgy evolvement in one place. The meeting the attributes according the Carter for conservation of industrial heritage confirms the Banska Bystrica´s Copper Company and its Copper Forge-house unambiguously belong to the pioneer production facilities of copper processing and metallurgy they started the period of industrial civilisation in Europe.

Endnotes

1 The historic name of the town called Banská Bystrica today (Slovakia) is Neusohl and it was a territory of then Kingdom of Hungary.
2 TIBENSKÝ, J. (1979): p. 47.
3 In Slovak language: Medený hámor. Under this name, there no only the historic industrial plant is known, but the same name has a settlement it makes quarter of the town Banská Bystrica.
4 Päťsté výročie thutzovsko-fuggerovského mediarskeho podniku v Banskej Bystrici, Conference Proceedings. Univerzita Mateja Bela Banská Bystrica, 1996
5 Ilustrovaná encyklopédia ľudskej vzdelanosti (2001), pp. 248, 260.
6 TIBENSKÝ, J. (1979): p. 50,
7 Vlachovič, J.: (1964): p. 147
8 VOZÁR, J. (1984), Bratislava
9 HusáK, V. (2005), Eurostav No. 7, p.73
10 Lazovne suburbia in German language (on the map): Bäder Vostadt

11 From German language: „Herd— = fireplace, hearth
12 Husovská, Ľ. (1997) p. 52
13 Husovská, Ľ. (1994, 1997)
14 Husovská, Ľ.: (1994)

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·Archive of Ing. Arch. Ľ. Ďurišová
·Archive of Ing. Arch. V. Husák, CSc.
·Archive of author

Dam Project Documentary Films as Industrial Heritage

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Abstract
The object of my presentation is to provide some suggestions about the conservation of Japanese dam project documentary films dating from the 1950‘s.

In the late 1950‘s, Japan entered a period of rapid economic growth, and to provide the necessary power, hydro-electric schemes were started. Specifically, 14 concrete dams over 100 meters high were constructed from 1953 to 1969, including the Sakuma, Ikawa and Kurobe dams. The latest US technology was used in order to speed construction. Civil engineers designed not only the conventional gravity style (Sakuma) but also the hollow gravity style (Ikawa) and arch style (Kurobe).

During the period, electric power companies and construction contractors commissioned the production of 34 documentary films in order not only to record the project and the technology, but also to promote public understanding of electric power development. In addition, some films were regarded as presentation tools to secure funding for future projects. Thus the films record both technical and human aspects of the dams.

Our research showed that the electric power companies, construction contractors and film production companies have preserved at least 26 of these dam project documentary films. However, many companies plan to dispose of the films, because they cannot afford to keep them in a time of recession. Though the films record both technical and human aspects of a major part of our national industrial heritage, there are problems to be addressed with respect to their conservation.

Keywords: documentary film; dam; hydro-electric power plant; civil engineering; energy

1. Introduction -brief history of Japan’s concrete dams-

Fig.1 shows the development of Japan‘s major concrete dams for hydro-electric power generation in brief. As hydro-electric generation capability depends on the head of water (a technical term), higher dams were always needed. In Fig.1, The Nunobiki, Ohi, Tsukabaru, Sakuma, Arimine, Ikawa, Okutadami, Kurobe dams are especially important.

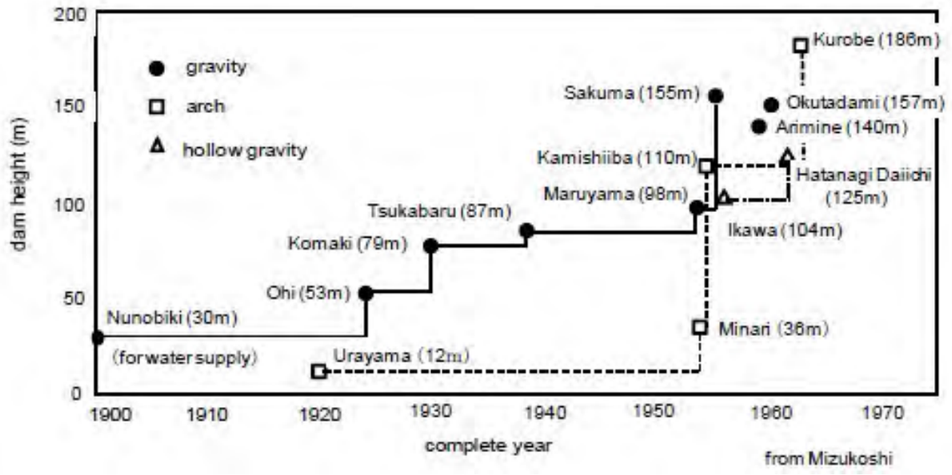

Fig.1
Development of Japan's concrete dams for hydro-electric power generation

Nunobiki, designed for water supply, was the first concrete dam in Japan, completed in 1900. Ohi, dating from 1924, was the first dam over 50 meters high, on the Kiso River, class A. Tsukabaru, finished in 1938, used the latest US technology from the Hoover dam. Mizukoshi1) shows that concrete dams before Tsukabaru had been built based on engineers‘ insights learned by experience, but in contrast those after Tsukabaru were designed by scientific insights. Technically, at the Tsukabaru dam site, lean cement mixture concrete was used and it was compacted by vibrators, based on scientific investigation of the link between cement and the grain size distribution of aggregate. The Hoover dam method was implemented in major dams after the Second World War, including Sakuma, Ikawa and Kurobe.

Sakuma, which was designed as a gravity dam, the conventional dam style, was completed in 1956 as the first dam over 100 meters high. Huge construction machines, including 15 ton dump trucks and 25 ton cable cranes, were brought from the US in order to speed construction. At the same time as Sakuma, Ikawa, dating from 1957, was the first hollow gravity dam. This technique lowered costs because it used less cement. Kurobe, the tallest arch dam, was completed in 1963, and remains the tallest dam of its type in Japan.

From 1964, the major type of power generation in Japan changed from hydro-electric to thermal because of the latter‘s low cost. Kitada2) shows that the US strongly recommended the Japanese government to introduce thermal generation plants. As a result, concrete dam technology gradually became redundant. Nowadays, small dams for flood control are still designed, but they are constructed not by the concrete dam method, but by the RCD (Roller Compacted Dam) method.

2. Over 100 meter high dam construction and their project documentary films

The research results of documentary film annual reports3) from 1953 to 1969 and the dam almanac are shown in Table 1 and Table 2. The Planner in Table 2 is the company that ordered the documentary film. The following three facts are found.

(1) 14 dams over 100 meters high were constructed during the period. Here, Maruyama dam, nearly 100 meters high, is also included because it was a pioneering design, using a mechanized construction method prior to Sakuma.

(2) 34 documentary films regarding 11 projects were made.

(3) As for Sakuma and Kurobe, two or more documentary films were planned by both the electric power companies and the construction contractors.

Table 1 Dams for hydro-electric power generation with over 100 meters high completed from 1953 to 1969

Dam	Construction started/completed	Style	Height	Volume	EPC	Contractor	Numbers of doc. film
Maruyama	1951/54	gravity	98.2 m	497,000 m3	Kansai	Hazama	1
Kamishiiba	1952/55	arch	110.0	350,000	Kyusyu	Kajima	1
Ikawa	1952/57	hollow gravity	103.6	430,000	Chubu	Hazama	2
Sakuma	1953/56	gravity	155.5	1,120,000	Dengenkaihatsu	Hazama	7
Tagokura	1953/59	gravity	145.0	1,949,000	〃	Maeda	3
Okutadami	1953/61	gravity	157.0	1,627,500	〃	Kajima	2
Kazeya	1954/61	gravity	101.0	592,000	〃	Obayashi	2
Arimine	1956/59	gravity	140.0	1,568,000	Hokuriku	Maeda	5
Kurobe	1956/63	arch	186.0	1,598,139	Kansai	Hazama	5
Hatanagi daiichi	1957/62	hollow gravity	125.0	587,000	Chubu	Hazama	3
Sakamoto	1959/62	arch	103.0	175,000	〃	Kumagai	0
Hitotsuse	1960/63	arch	130.0	555,000	Kyusyu	Kajima	0
Nagawado	1961/69	arch	155.0	660,000	Tokyo	Kajima	3
Takane daiichi	1963/68	arch	133.0	327,000	Chubu	Hazama	0

from "Dam Almanac" and "PR Film Annual Report"

EPC : electric power company

Among the films, —The Sakuma Dam Project‖ produced by Iwanami Film Production and planned by Dengenkaihatsu Electric Power Company is a particularly monumental work4). Machimura5) explains why the films were planned at that time.

First, the documentary films were planned to attract funding for future projects. For example, —The Sakuma Dam Project‖ was shown to members of the Diet. In addition, documentary film annual reports were published by the Japan Investment Society. These suggested that the films were presentation tools to solicit backing for the next project.

Second, the films were planned to record both the project and the technology. Machimura compares two films: —The Sakuma Dam Project‖ was a record of the project using huge machines, while another film, —The Sakuma Dam Documentary‖, planned by the construction contractor Hazama, focused on the workers.

Finally, the films were shown in order to promote public understanding of electric power development. For example, —The Sakuma Dam Project‖ was screened in theaters all over Japan, reaching over 3,000,000 people in total. At that time, Japanese people grew wilder and wilder with excitement and accepted the development. These show that the dam project documentary films recorded both the human and technical aspects of the projects.

3. Dam project documentary films as historical materials

Completed dams show the results of practical technology, but the project documentary films show their process. To determine the value of dam project documentary films as historical materials, major films, including Sakuma, Ikawa and Kurobe, were evaluated in cooperation with the Civil Engineering Society in 2010. The following items were pointed out.

Table 2 Research result of dam project documentary films

Dam	Film title	Planner	Film production company（FP）	Found / Not Found
Maruyama	Maruyama hydro-electric power plant	kansai EPC	Nihon Eiga Shinsha	F
Kamishiiba	Kamishiiba hydro-electricpowerplant	Kyushu EPC	Shin Riken Eigasha	F
Ikawa	Ikawa hollow gravity dam	Chubu EPC	Iwanami FP	NF
	Ikawa Goro dam	Hazama	Hanabusa FP	F
Sakuma	Sakuma dam project vol.1	Dengenkaihatsu	Iwanami FP	NF
	Sakuma dam project vol.2	〃 EPC	〃	NF
	Sakuma dam project vol.3	〃	〃	NF
	Sakuma dam project -digest edition-	〃	〃	F
	Sakuma dam documentary vol.1	Hazama	Hanabusa FP	F
	Sakuma dam documentary vol.2	〃	〃	F
	Sakuma dam documentary -digest edition-	〃	〃	F
Tagokura	Huge dam	Dengenkaihatsu	Iwanami FP	NF
	Tadami river vol.1	〃 EPC	Nichiei Kagaku FP	F
	Tadami river vol.2	〃	〃	F
Okutadami	Okutadami dam vol.1	Kajima	Iwanami FP	F
	Okutadami dam vol.2	〃	〃	F
Kazeya	Kazeya dam -temporary facilities-	Obayashi	Yachiyo FP	NF
	Kazeya dam -dam-	〃	〃	NF
Arimine	Arimine dam vol.1	Hokuriku EPC	Iwanami FP	F
	Arimine dam vol.2	〃	〃	F
	Arimine dam vol.3	〃	〃	F
	Arimine dam vol.4	〃	〃	F
	Arimine dam -digest edition-	〃	〃	F
Kurobe	Kurobe hydro-electric power plant vol.1	kansai EPC	Nihon Eiga Shinsha	F
	Kurobe hydro-electric power plant vol.2	〃	〃	F
	Kurobe hydro-electric power plant vol.3	〃	〃	F
	Kurobe hydro-electric power plant vol.4	〃	〃	F
	Kurobe arch dam documentary	Hazama	Takaraduka FP	F
Hatanagi daiichi	Hatanagi daiichi documentary vol.1	Chubu EPC	Nihon Eiga Shinsha	NF
	Hatanagi daiichi documentary vol.2	〃	〃	F
	ICOS wall method	Hazama	Hanabusa FP	F
Sakamoto	not found			
Hitotsuse	not found			
Nagawado	Foundation -the Azusa river development-	Tokyo EPC	Iwanami FP	F
	The Azusa river development	Kajima	Nihon Gijyutsu Eigasha	F
	Dam is completed inJapan's Alpus	〃	Kajima Eigasha	F
Takane daiichi	not found			

from PR Film Annual Report　　Hazama, Kajima, Obayashi are construction contractors.

First, documentary films show the close relationship between the machines and the workers. For example, Fig.2 to Fig.5 show concrete transfer by bucket at Maruyama dam site. Note the worker in the center of each photo. The worker is going to connect an air hose from a compressor to a bucket in order to open the bucket to drop concrete (Fig.2). As soon as the concrete drops, the crane operator slowly raises the bucket (Fig.3, 4). If the bucket remains at the same height, it moves violently up and down because of its reducing weight. Then, as soon as the bucket is emptied, the worker disconnects the air hose (Fig.5). The sequence of operations is carried out by three highly skilled workers: the crane operator the worker who signals to the crane operator and the worker who connects and disconnects the air hose. It is suggested that mechanized dam construction method was based on the workers' skill at that time.


Fig.2


Fig.3


Fig.4


Fig.5

Fig. 2～5 Concrete drop operation


Fig. 6 at Arimine site


Fig.7 at Okutadami site


Fig.8 at Kurobe site

Fig. 6～8 Development of vibulldozer

Second, the films clearly show the development of technology. Fig.6 to Fig. 8 show the development of a mechanized consolidation method. Bulldozers with five or six vibrators were tested at some dam sites. The Vibulldozer, which was named by Japanese engineers, was first used at the Arimine dam site (Fig.6). The technical document written by the chief engineer shows that vibrators frequently broke down. This problem was solved at the Okutadami dam site. Vibrators were inserted with linear motion into the concrete with devices like forklift trucks (Fig.7). This reduced damage to the machines. However, the vibulldozer was temporary at Okutadami. As it was not used near the forms or on cooling pipes, the change from mechanized to manual operation was needed. However, the change was not smooth there. The technical document shows the details.

The Vibulldozer method was first perfected at the Kurobe dam site. The technical document shows that the same vibulldozer as the one at Okutadami was used in the whole construction schedule with few machine failures. This perspective shows that our historical insight is improved by studying both films and documents.

Finally, the films show that the safety first principal was established gradually. In Japan, labor safety and health law was established in 1972. Films show that dust masks were already worn, and that signboards with safety first slogans were displayed at the Sakuma dam site. Workers with no helmets were seen at the Sakuma dam site, but they did not appear in the dam construction films after Sakuma.

4. Conservation of dam project documentary

Dam project documentary films are informative, but their conservation is under threat. In this chapter, the current film conservation issues are discussed.

As a result of our research in 20096) for the film production companies, the electric power companies, the construction contractors and the library of the Japan Society of Civil Engineering, we found that 26 of 34 project documentary films were preserved, but that 8 titles cannot be traced (Table 2).

Major stakeholders with regard to conservation of a dam project documentary film are the film production company, the electric power company and the construction contractor. As the result of the research, it is shown that the state of conservation is as bad as we feared. Sadly, the electric power companies and construction contractors, which took an active part in recording the technology and the projects 50 or more year ago, are not interested in the films now. It is a matter of concern that the electric power companies and construction contractors have kept the films only in the temporary format of VHS or DVD. In this situation, the films will very likely to be lost.

The most serious problem lies in the film production companies, which have the copyrights. They have preserved the original films so far, but the long recession makes it impossible for the companies to keep them indefinitely. It is symbolic that the biggest film production company Iwanami Film Production went bankrupt in 1998. In addition, Hanabusa Film Production and Nihon Eiga Shinsha closed in 2007 and 2009. The original films of Iwanami, Hanabusa and Nihon Eiga Shinsha have been transferred to the Documentary Film Conservation Center (DFCC). Other film production companies, apart from Nichiei Kagaku and Kajima do not exist now. Most original films are probably lost.

Essentially, Japan's only film archive is the National Film Center (NFC), with the latest temperature and humidity control equipment, in Kanagawa prefecture. It has built up a collection of original films on literary classics, but recently it also began to accept documentary films of which the authors renounced the ownership. Additionally, DFCC mentioned above was established in 2008 as a non-profit foundation. DFCC's mission is to prevent original films from being lost and to promote transfer of them to NFC. DFCC has dealt with nearly 4000 titles of Iwanami, Hanabusa and Nihon Eiga Shinsha works, and it also conserves films which are still in copyright.

Conclusion

Dam project documentary films are important historical materials, showing both human and technical aspects. The films are complementary to documents and real objects when Japan's industrial history is studied. In our view, the films should be regarded as industrial heritage objects, and their conservation should be managed professionally. In order to make this concept known, the films should be also regarded as public properties in essence equal to other industrial heritage artifacts, even though they are still under copyright. Meanwhile, not only conservation of original films, VHS and DVD media but also digitalization should be discussed so that they will be preserved in perpetuity.

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Taiwan's Mixing Tracks of Shipbuilding Industry

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Abstract
As a late developed country in industrialization, many of Taiwan's modern industries have absorbed technologies from several possible foreign source, and resulted in technology-mixing. Amongst various modern industries, Taiwan's shipbuilding demonstrates two special characteristics of technology transfer, the well-mixing with traditional technology and the two parallel existing tracks of modern technologies. Taiwan, given its pre-industrialized background with rich and highly developed traditional technology, was firstly a good and important test area for Japan. Even after WWII, it was still a strategic site during the Cold War and received plenty of foreign resources. Considering the circumstances, these two special characteristics of technology transfer are not too surprising but still very rare and interesting.

The shipbuilding industry heritages that have been preserved and studied help us to understand the development of Taiwan's early shipbuilding, the technology transfer from Japanese, American, and European sources, as well as how local engineers and technicians blended them to create a local style. Meanwhile, different shipbuilding scale evolved differently in the means of technology transfer. Boats, fishing vessels, and yachts are usually built by smaller civilian shipyards and share the same path of technology learning and mixing, including the use and the blending of traditional technology. On the other hand, merchant ships and naval vessels are usually built by state-owned enterprises which follow a more stringent technology transferring and learning process without any traditional elements. More interestingly, the inter-changes of these two tracks seem to restrict only on management experience and personnel, and only extend to include technology after the recent development of rising middle size civil shipyards.

In the future, it will be necessary to compare these experiences with other colonial development, especially those with mixed technology transfer. Meanwhile, the roles of middle size shipyard shall be closely monitored to track the process of technology and experience inter-changes between these two tracks.

Keyword : shipbuilding; technology transfer; colony; Taiwan; industrial heritage

1 Introduction

Having developed on an island with a long history of migration and trade, Taiwan's shipbuilding industry is not a new and modern industry. However, how this industry transformed from a traditional handcrafting industry into a modern industry is an interesting case study for a late developed society like Taiwan. A pivotal question in such transition is what is unique about the progress of this industry in its modernization process?

In 'The Tools of Empire', Headrick (1981) has carefully woven together the paths of developing industrial technology and Europe's expanding colonial domination in the 19th century. He suggests that the two events were strongly connected as it was the inventions of steamboats, quinine and such that equipped Europe to conquer the previously impenetrable Asia and Africa. Thus, one can safely assume that when the empires arrived the new frontiers, the wonder of these new 'tools' also arrived. This is certainly the case of Japan and Taiwan, too. During its colonial exploitation over Taiwan, Japan not only demonstrated its naval prowess at every opportunity but also set up Taiwan's first modern shipbuilding plant. But, after the defeat of Japan, Taiwan's shipbuilding industry was left to its own devices and Western technology began to seep in. At first, it was more by accident than design, but the 'imported' knowledge spread around a growing group of small-medium sized companies. Later, when the government elected to build a state-owned shipbuilding plant, systematic and large-scale technology transfer was introduced. Like many developing countries which have resorted to ToT (transfer of technology) can attest, ToT is indeed a short cut to industry know-how, but certain adaptations to local circumstances are always needed.

This article will begin with an overview of the traditional shipbuilding industry of small/medium-sized vessel and follow by an overview of the history of the progress of modern shipbuilding industry of large-sized vessel. Then, a discussion about possible future development of these two tracks of shipbuilding, including a potential merge of both streams, will precede concluding remarks.

2 From Traditional Junks / Sampans to Small/Medium-sized Vessel Shipbuilding

Traditional shipbuilding in Taiwan can be traced back to at least I7th century when the Dutch and Koxinga ruled the southern part of this island. They fixed and maintained junks and ships at Anping (安平，now part of Tainan). In the 18th century, official shipyards were established at Tainan, the capital of Taiwan at the time, during the Ching dynasty (Chen, 2012b). Complete technologies of traditional junks and sampan-like boats had therefore also spread to Taiwan.

These traditional technologies of junks, sampans, rafts and small boats known in Taiwan then were similar to those used in China, Ryukyu, and maybe northern part of Vietnam. The technicians had spread out along the west coast and major rivers. After the Japanese took over Taiwan in 1896, they established small but modern shipyards at major harbors such as Keelung, Tainan, and Kaohsiung, mainly for the production of fishing vessels. (Chen, 2005; Chen, 2012a; Hong & Wang, 2010; Wang, 2011). In the early 1910's, traditional technicians began to learn how to build modern wooden boats, although they still maintained their businesses in old types of vessels (Chen, 2010).

2.1 Chen Family and Yacht Building

One of the typical traditional shipbuilders is a Chen family located on the river bank of Tamsui River (淡水河), Taipei. Shue-yuan Chen (陳水源) and his nephew Tien-chi Chen (陳添枝) went to Keelung to learn modern wooden boat techniques from the Japanese in 1919. Although at first they did not have their own shipyards and had to build ships on customers' homes, they were able to build vessels as large as 10 metter long fitted with engines for sailing to China. Their business was all around northern Taiwan, including Hisnchu (新竹) and Yilan (宣蘭) area.

Chen family finally built their own humble workshops on a riverside near Taipei Bridge (台北大橋) around 1950. The uncle-and-nephew partnership ended and they each built their own shipyards next door to each other. Shue-yuan Chen's son, Chen-Chi Chen (陳振吉), took over his father's shipyard later and named it after himself, while Tien-chi Chen's shipyard was named "Big Bridge." After the river embankment was built, Big Bridge (大橋) Shipyard was relocated to Bali (八里), a small town further downstream of the river on the other bank and Chen-Chi Chen Shipyard to She-tzu (社子), an island downstream. These two shipyards became the first two in Taiwan to build yachts in 1950's (Chen, 2010; 2012a).

Taiwan's famous yacht industry was sparked by a special opportunity during the Cold War. There were many US soldiers and military advisors out posted at Taiwan. Some of the American officers living in Taipei sought for suitable shipyards to built wooden yachts for leisure use in Tamsui River. In 1956, Tom Freidman, a manager of Civil Air Transport Inc. (CAT, an outer organization of CIA), brought with him a design chart of yacht and asked Big Bridge Shipyard to build one for him. But since the technicians of Big Bridge Shipyard had never received modern engineering training nor built any Western-style boats before, they could not comprehend the engineering drawing and had to build the yacht under Freidman's supervision. Coincidentally, other American officers stationed nearby also approached Che-chi Chen Shipyard to build small motor yachts using outboard engines. The pioneer officers, according to the interview of Chen-Chi Chen, included Scanland (spelling?) from MP, Col. Cano, Col. "Cat Face", and an intelligence officer from the US embassy working for secret reconnaissance plane projects (Chen, 2010). The boat built for Robert B. Scanland even appeared on the newspaper Pacific Stars and Stripes (Jan.12, 1969). According to the newspaper, Mr. Scanland was the vice president of William Hunt Corp. and his wife was a teacher in Taipei American School. Their boat, Barracuda, is 33 foot long and had 215 horsepower. US Ambassador (1966-74) and Mrs. Walter McConaughy were honor guests of the launching ceremony.

Both shipyards started to pick up Western yacht building techniques from Americans' instructions and the engineering drawings. The yachts at the beginning were about 13-15 feet long, sailing at 20 knowts. But in the late 1950's and 1960's, they extended to about 46~50 feet long. Old pictures reveal that yachts manafactured included mono-hull, catamarans, and even trimarans, and power source included sail, diesel engines, and outboard engines. Woods were the most popular material. Since white oak, a popular wood used for yachts in North America, is unavailable in Taiwan, local woods used in traditional junks and sampans, were substituted: cypress for hull, beech for keel, camphor for ribs, and Meranti wood for deckhouse. Teak from southeastern Asian countries was also imported for the decks and indoor decorations on high-end yachts. Taiwanese technicians also learned to employ a whole new set of carpenter methods, such as steam bending, screws, and rivets, in the making. The necessary parts, tools, and equipments were provided by American officers or made by themselves according to Americans' instructions (Chen, 2010).

The engineering drawings were left to the shipyards after the yachts were delivered, and became the best educational texts for the local workers. These technicians also saw how a ship was to be tested and surveyed for the first time. They were rather surprised when they witnessed a yacht's water line being accurately predicted by the draft design.

Once American officer's praises on the product quality got out, the local yacht market began to thrive. Americans paid in US dollars and such was good for shipyards when Taiwan was then still

a relatively poor country and needed foreign currencies. This market expanded to North America after some of the American officers brought their yachts back with them. These made-in-Taiwan yachts attracted some attention in the West Coast region of the US, and trading companies started to order yachts from these two shipyards since the mid-1960s. Some American officers even became trading agents themselves after retirement.

This opening of the American market was an important milestone for Taiwan's yacht industry. Thanks to it, many new shipyards were founded in 1970's, mainly located within Taipei basin to build yachts for Americans. Some old shipyards which had so far solely built fishing vessel also caught on and started to build yachts as the second product-line. The customer base was also enlarged to include Japanese and Europeans (Chen, 2010, 2012a).

A common misunderstanding of Taiwan's first modern yacht can be clarified now. It is often claimed that the first modern yacht built in Taiwan was two identical yachts made by Ingalls-Taiwan Dockyard Company (殷台公司) at Keelung under its General Manager McLaughlin's order for his friends in Hong Kong in 1958 (Chen, 2005). Primary sources such as oral history, private documents, and pictures mentioned in the above challenge this claim, and move the earliest recorded Taiwan-built yachts two years earlier to 1956.

2.2 The Usage of FRP

More modern materials were introduced to Taiwan's yacht industry during its industrialization progress. First, in 1961, a company in Kaohsiung started to mass produced sandwich boards. Big Bridge Shipyard quickly adopted this new wood material. A far more durable material, fiberglass reinforced plastic (FRP), was introduced to the industry in 1965 by another customer, Mr. Warner from China Productivity Center (中國生產力中心). At beginning, the shipyards only used FRP to cover the wood to prevent wooden hull from impact and erosion; it was estimated that the usage of FRP could extend the life of a wooden yacht from three years to about eight years. However, at that time, FRP was still a very rare and expnsive imported material.

The first case of having a ship hull being made completely of FRP was not for a yacht, but was still performed by Big Bridge Shipyard. In the late 1960's, Taiwan Navy had a stealthy high speed patrol boat project, designed by two Taiwanese naval architects and built by civilian Big Bridge Shipyard. It was in this project that a FRP hull was made. The technicians managed to complete the task but found it difficult to extract more technique information from American engineers who helped the design and building tasks. Nonetheless, since FRP material was mainly imported from Japan, Taiwanese technicians availed themselves of all opportunities to learn the advanced skills directly from Japanese FRP providers. They also learned of precision manufacturing method of wood works and advanced process management from these Japanese engineers as well. This is a significant step, because since then, these shipyards possessed full FRP boat-built technology, and were able to apply such technology to later yacht building (Chen, 2010).

Chen-Chi Chen Shipyard also learned of the FRP technique, and started to mass produce FRP yachts for Roughwater Co., a Los Angles-based company. Roughwater and Chen-Chi Chen Shipyard had a very good long term relationship stretched back to the shipyard's days of wooden yachts. Unlike custom-made wooden yachts, FRP yachts were constructed faster, cheaper, more endurable, and easier for maintenance. With good design, they also sail faster. Now these shipyards started to see rapidly rising profits. Other shipyards, such as Ke-Chern (克

成), Hampton (寶島) and Ya-mei (亞美), soon joined the club. Hampton became one of the leading yacht manufacturers in Taiwan in the 1970's and 1980's. Interestingly, the boss of Hampton also had a surname of Chen, although he was not a relative of the Chen family of Big Bridge and Chen-Chi Chen[1].

Besides FRP material, yacht industry also integrated all available sources, material and technology then. The engines were mostly provided by American customers; some of the American officers even bought engines from retired trucks and landing crafts. Certain key parts were also imported from the US, and others were purchased from local manufacturers. Later, shipyards also imported engines from Japan, with Yanmar Engine being the most popular brand. The electrical and mechanical works of yacht engines are quite similar to those used on cars, so the shipyards asked local automobile technicians to help them with engine installations. One of the first automobile technicians to help Chen-Chi Chen, Chun-Ming Hsin (辛俊明), was actually introduced by officers of the US embassy because most cars of the US embassy were maintained by Mr. Hsin. Similarly, propellers were first imported from the US and Japan, and later, local companies began to manufacture propellers. Other hardware were also being produced by local workshops or large shipyards themselves (Chen, 2010).

2.3 The Diffusion of New Technology

Located in the southern part of Taiwan, Kaoshing is the biggest port city in Taiwan, and here, we see a growing shipbuilding industry whose developments are similar to those in northern Taiwan; Yacht industry in southern Taiwan boomed later than northern Taiwan, and the diffusion of yacht-building technology was concentrated in Tainan and Kaohsiung areas.

Similar to what we just described, the areas had long had shipyards making traditional wooden fishing vessels as well as modern ones. For examples, the Japanese had established a couple of modern shipyards in both Tainan and Kaohsiung (Hong & Wang, 2010; Wang, 2011). For example, Tainan had two major shipyards, Suda (須田) and Hamada (濱田), founded by the Japanese during the colonial period. After World War II, they were taken over by Taiwan Provincial Government and merged with Tainan Shipyard (台南造船廠), which later became Shin-Sheng (新生) Shipyard and the technology center in Tainan (Chen, 2010; 2012a).

The diffusion of yacht technology to southern Taiwan started with Kaohsiung's Shing Kao (新高) Shipyard's owner Wan-Chih Liu (劉萬池) whom was a friend of Big Bridge Shipyard's owner. After witnessing the bloom of yacht business in the early 1970's, he decided to build yachts as well and sent 25 technicians to Big Bridge to get the know-how. He then founded Tayana (大洋) Shipyard which became the first yacht builder in southern Taiwan. Tayana Shipyard later also obtained some other techniques from Hampton. Ta Shing (大新) Shipyard in Tainan which inherited shipbuilding technology from Shin-Sheng Shipyard also started to build yachts at about the same time. Ta Shing's and Tayana's investors overlapped and understandably, the two companies formed a technology transfer and cooperation relationship. To top this off, Big Bridge even sent engineers to both shipyards to help them get started. They also shared the market by dividing orders according to ship types and sizes. Therefore, the transfer of technology and even technicians were quite common and considered as positive cooperation rather than bad competition.

[1] Chen is the largest family name in Taiwan taking 1/9 of population

Beginning with Tayana at Kauhsiung and Ta Shing at Tainan, yacht building soon expanded to other shipyards: Kuo Rui (國瑞) at Tainan which also inherited Shin-Sheng Shipyard's technology, President (統一) Shipyard at Tainan, and others in Kaohsiung. Song Lin (松林) of Tainan, which is currently one of the large yacht builders, was founded much later with technology from President. In Kaohsiung, the current leading yacht builder, Horizon (嘉鴻), and another large yacht builder Kha Shing (嘉信) also acquired technology from those older shipyards mentioned above. The closely intertwined relations between all these compaines can perhaps be illustrated by Chu-Shou Chuang (莊竹壽), originally a wooden fishing boat builder and later a major shareholder in several shipyards . Mr. Chuang and friends founded United Shipyard (聯合造船廠) at Kaohsiung in 1971 to build steel fishing vessels. After the introduction of FRP in Tainan, he switched to FRP yacht building at Shu-Chi (旭奇) Shipyard in 1976 and then established Kha Shing with others in the following year. Some of Kha Hsing's shareholders went on to found Horizon to build larger yachts in 1987 (Chen, 2010).

Some engineers, like Chuang, not only learned technology from Japanese or American designs but also learned new technologies and theories by attending classes or workshops and from studying Japanese and English books. Hence, the yacht technology diffusion network in southern Taiwan was complicated and had three sources: traditional shipyard network, direct foreign sources, and new yacht builders' network. The key process of yacht technology diffusion can be summarized in a simple figure as shown in Figure 1. It is clear that the key shipyards that diffused technology were Ta Shing at Tainan and Tanyana at Kaohsiung. Both of them were closely related to Big Bridge Shipyard at Taipei at the early stages (Chen, 2010).

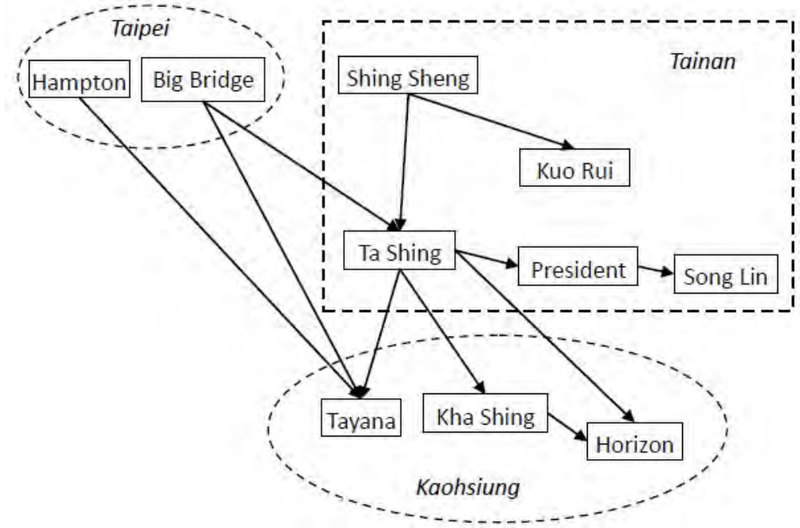

Fig.1
Technology diffusion of Taiwan yacht builders

Other traditional civilian shipyards, such as Hai-Sheng, remained as fishing boats makers and obtained updated technologies directly or indirectly from Japanese fishing boat companies. In fact, shipyards that never switched to yacht building could be found all across Taiwan.(Chen, 2012c). For instance, state-owned small shipyards, such as the shipyard of Taiwan Machinery Manufacturing Co. (TMMC, 臺灣機械公司) continued to focus on steel fishing boats, small cargo

ships and ferries. Like civilian shipyards, they bought design charts mainly from Japanese shipyards, or modified designs by themselves (Chen, 2007). Through building contracts, they learned new technologies related to steel ships of various types, and gradually improved their building capability. The old TMMC shipyard located at Kaohsiung also played an important role in the diffusing of medium steel ship technology and personnel training to smaller local civilian shipyards in Kaohsiung. Some important management and engineer positions in larger civil shipyards had been retired TMMC personnel. For decades, technicians of civilian shipyards and other industries also benefitted from TMMC's training classes of welding, carpenter and other work skills.

2.4 The Golden Age and Upgrading Pressure

The golden age of Taiwan's shipyards' building of yachts and fishing vessels is 1970's and 1980's. That is because the technology had reached a certain level to access the international market; and the labor cost was still inexpensive. A report in 1968 indicated that Taiwan yachts were about 20% cheaper than Hong Kong ones, and 50% cheaper than American ones. In 1972 and 1974, Taiwanese-made yachts made impressive entry in international competitions held in Europe and that surely warranted enough attention. In 1977, Taiwan finally surpassed Japan, HK and Canada and became the largest yacht provider of the US. After winning the title of "Queen of the Show" in 1980 at Miami Boat Show, the reputation spread even further.

With the huge business potential, the first group of yacht builders increased their productivity, and new shipyards were set up in neighboring areas of Taipei, Taoyuan, Tainan, and Kaohsiung, positioned strategically in order to form alliance relationships and to attract technicians of various kinds with higher salaries. Some technicians and engineers also formed their own shipyards. The export number of yachts was 568 in 1976 and jumped up to 1,828 in 1979. Like most of the labour-intensive industries during the taking-off time, the industry received little interferance from the government.

This golden age ended in the mid-1980's when the US government put Taiwanese government under great pressure to appreciate Taiwanese currecny and the labor cost suddenly rised. No longer able to offer competitive price on international market, many yacht-building companies moved to China in the early 1990's, while some chose to close down their businesses. Only a few shipyards that stayed and tried very hard to upgrade their technologies and business models in the 1990's.

Traditional fishing vessel makers faced more or less the same situation. Though they did not enjoy as much profits as yacht makers, they benefitted from the expanding fishery of the same period. Since the demand of fishing vessels increased, their businesses were lucrative in the 1970's. But when they also faced with the rising labor cost and international limitation on ocean fishery in the 1980's, they started to merge with fishery companies, and formed a new model which will be described later in this article.

2.5 Technological and Social Analysis of Small Ship and Yacht Building

From the above historical review about the small ship- and yacht-building industry, we can summarize several characteristics of their technological development (Chen, 2010, 2012a):

1. Multiple sources: Like other modern industries in Taiwan, the learning of new technology had multiple sources which were blended later. Small-sized ship- and yacht-building combined traditional crafts, Japanese and American modern technologies of wooden ships and FRP ships.
2. Government policy: Unlike large ship industry as describe next, small ships and yachts were not the main concerns of the industry policy.
3. Technology and personnel diffusion: Similar to other traditional industries, technology diffusion were usually accompanied by personnel transfer, such as new shipyards founded by technicians or shareholders of old shipyards.

Moreover, previous dynamic actor network theory analysis (Chen, 2010, 2012a) also suggested that:

4. The actor network of Taiwan's yacht industry evolved gradually and successfully when new actors joined and old actors quitted. The change of actors did not affect the network functioning because the new connection co-existed with old ones peacefully.
5. An important result of this evolving of network was the shift of the center of yacht-building and small-sized shipbuilding industry from northern to southern Taiwan, especially Kaohsiung.

3 Modern Shipbuilding Industry of Large-Sized Vessels

The modern large-sized vessel shipbuilding industry in Taiwan started much later than small-sized one and is only about a century old. Its development evolved around CSBC Corp., Taiwan (former TSBC and CSBC), the first and still the largest modern shipbuilding company in Taiwan. CSBC's story relates to many important events of shipbuilding industry, military, politics and diplomacy in the last 100 years. Taiwan's mechanical engineering and machinery development are also highly related to this company, especially in the aspect of new technology transforming and learning. As we said earlier on, it was the Japanese who started this sector in Taiwan as a part of colonial development.

3.1 Organization Change

Taiwan Dockyard Company (台灣船渠株式會社), founded by Japan's Mitsubishi Heavy Industries (MHI, 三菱重工) and other related business and government agencies in 1937, was the single most important player in the industry during the colonial time. It had built its foundation on private Keelung Dockyard Company (the successor of Kimura Iron Works) but expanded significantly under Japanese Southern Expansion Doctrine (1936). After World War II, it was merged with Taiwan Iron Works to form a new company, yet soon separated back to a pure shipbuilding company, renamed as "Taiwan Shipbuilding Company" (TSBC, 台灣造船公司). Benefitted from earlier Japanese support, its two large dockyards were ranked No. 1 and No. 3 in whole China (No. 2 was in Shanghai), and its total capacity represented about 1/3 of all of China's dockyards between 1945 and 1950. During the Cold War Era, TSBC built fishing vessels and ever larger merchant ships by learning technologies from both Japan and the United States, especially from Ishikawajima-Harima Heavy Industries (IHI, 石川島播磨重工) for several decades.

China Shipbuilding Corp. (CSBC, 中國造船公司) was established at Kaohsiung in 1973 as a private company with 40% of government investment. It was initially designed as a new company for building large merchant ships and navy ships. However, due to the unsettling Middle East politics, oil crisis and volatile maritime market in the 1970's, the new company's shareholders subsequently had second thought. CSBC was restructured to being a state-owned company in 1977 and merged with TSBC in 1978. CSBC was renamed as CSBC Corp. Taiwan in 2007 so that its Chinese name changing from "中國造船公司" to "台灣國際造船公司", hence the same

old Chinese abbreviation, “台船,” as of TSBC era.

The establishment of state-owned CSBC in the 1970’s was one of Taiwan’s so-called “Ten Major Construction Projects” and a direct result of the government policy of heavy and chemical industries initiated in late 1960’s. The first ship built at Kaohsiung by CSBC, Burmach Endeavour, truly lived up to the expectation. Untill today, Burmach Endeavour, a 445,000 DWT oil tanker with a length of 378.4m, is still the largest ship ever built in Taiwan.

【Table 1】The Evolution of TSBC-CSBC

Period	Location		Note
	Keelung	Kaohsiung	
1916-1921	Kimura Iron Works 木村鉄工所		Founded by Kimura for repairing boats, mining and sugar machines
1922-1937	Keelung Dockyard Company 基隆船渠株式會社		Expansion based on Kimura Iron Works
1937-1945	Taiwan Dockyard Company 台灣船渠株式會社		Founded by Mistubishi et al.
1946-1973	Taiwan Shipbuilding Company (TSBC) 台灣造船公司		
1973-1977		China Shipbuilding Company (CSBC) 中國造船公司	
1978-2006	China Shipbuilding Company (CSBC) 中國造船公司		TSBC & CSBC merged.
2007-	CSBC Corp. Taiwan 台灣國際造船公司		Renamed.

3.2 A Symbolic Achievement: Passing a Modernization Threshold

Keelung Harbor played an important role in the process of Taiwan’s modernization. It was built as a modern harbor during the Japanese colonial period, and many modern goods, machines, human resources were imported from Japan through this harbor. Taiwan’s first modern shipyard, “Taiwan Dockyard Company”, the later TSBC, was built during this era.

After World War II, Keelung and Kaohsiung both contributed for Taiwan’s maritime transportation. TSBC at that time was only a large shipbuilding company in Taiwan. Without modern technology for designing and building large ships, it repaired ships and built fishing vessels under American’s Aid. Famous technocratic K.T. Lee (李國鼎) was the Deputy Manager-in-General and then Manager-in-General of TSBC in the late 1940’s before he joined central government’s committees in charge of industries and economic development.

During the Cold War Era, TSBC did not expand much until in 1957 when a couple of Chinese American shipping company owners, together with engineers from Ingalls Shipbuilding Company (Mississippi), formed the Ingalls-Taiwan Dockyard Company and rented TSBC for 3 years to build two 36,000 DWT oil tankers. From there, TSBC started to improve its capability by introducing technology from IHI, and built several 100,000 DWT oil tankers between the late 1960’s to the early 1970’s.

3.3 Shipbuilding at Kaohsiung

However, a huge jump in Taiwan’s shipbuilding’s progress took place at Kaohsiung when an ambitious plan was initiated in 1960’s. Due to the space limitation at Keelung and the expansion

of Kaohsiung Harbor, a large area in Kaohsiung was designated for multiple heavy industries’ uses, including shipbuilding, machinery and steel. A new shipbuilding company was scheduled to set up in the early 1970’s. One Japanese company and one British company were shortlisted for international partnership, and after much evaluation, Swan Hunter Group from Britain was selected. But due to diplomatic reason, a Chinese American’s shipping company stepped in as a new competitior and the original plan was terminated. Instead, the later comer was selected and this American shipping company became the biggest shareholder outside the government. The construction was contracted out to IHI, because both TSBC and this American company had long term cooperative relationship with it, and IHI itself had also just built a new large shipyard.

This new shipbuilding company was formed and named as CSBC in 1973. The shipyard construction (950 meters long, 92 meters wide and 14 meters deep) began in January 1974 and the whole plant took two years to complete. The first ship, a 450,000DWT ULCC (Ultra Large Crude Carrier) Burmah Endeavour, laid its keel in the same year, and was delivered to its new owner, Burmah Oil Company, at the end of 1977.

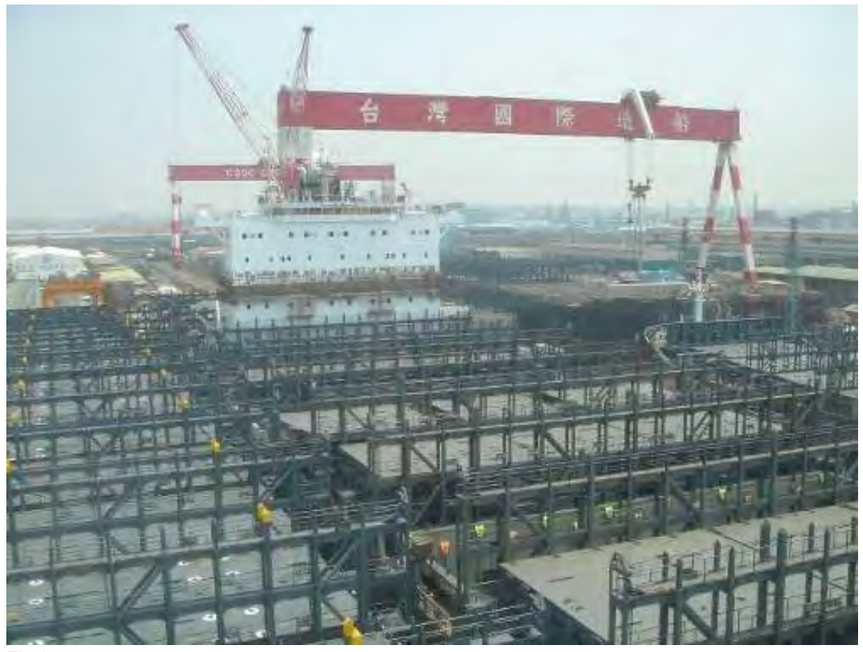

Fig.2
Current CSBC shipyard and newly-built container ships in 2011 (Photo: author)

CSBC’s shipyard construction and work marked several critical milestones in Taiwan’s industrial history:

1. The largest shipyard in Taiwan so far;
2. The largest and the longest ships (Burmah Endeavour and Burmah Enterprise) in Chinese communities (Taiwan, Mainland China, Hong Kong, and Singapore) so far;
3. The highest construction (87 meters) in Taiwan (two 350 ton Goliath cranes);
4. A new piling method introduced from the Netherlands, contributing to other civil engineering work in the future;
5. The first project to finish among Ten Major Construction Projects;

6. Completion of new naval frigates;
7. Building parts of submarines' hulls in an attempt to obtain submarine order from the Navy, but unable to proceed due to political reason. They probably were the first and last parts of naval submarines built by Taiwanese; and
8. Successful financial restructuring in 2002 after long term deficit from 1970's. Since then, CSBC has been making healthy profit and considered a benchmark case for former state-owned enterprises to be privatized.

3.4 Perspectives

In 1970's, Taiwan's government tried to build its own heavy and chemical industries and defense industry. Many investment projects, including CSBC, were carried out in this period. The success of petroleum and related chemical industry, together as well as China Steel Company (CSC), unfortunately, still cannot justify the whole rationale of this policy. The establishment of CSBC and the expansion of Taiwan Machinery Manufacturing Corporation (TMMC) at that time were also part and parcel of the same policy. It was designed that CSC supplied materials for CSBC and TMMC while TMMC and other peripheral private industries supplied various machines and parts for CSBC, so that they could form a product chain of heavy industry in Kaohsiung where the airport and sea port provided necessary transportation.

However, both CSBC and TMMC began to ran up huge debts since late 1970's and stayed in the red for more than a decade. China Steel, on the other hand, was financially sustainable since the 2nd year of the founding. TMMC was separated into several parts to be sold off. The failure to build a "heavy industry triangle" (CSC, CSBC, TMMC) and connection with satellite companies in Kaohsiung indicate Taiwanese government's problematic industry policy in 1970's and 1980's.

The failure of forming a long-standing network to reinforce each other and other peripheral industries attests the failure of that policy, especially when comparing to South Korea's similar but successful policy at almost the same time. There are many interesting issues here, including industry development, industry policy, late developed country, and industry heritage in Taiwan, are still left for further study.

In general, one of the most serious and ignored aspects in Taiwan's cultural heritage is industry heritage. Taiwan's development of modern industries, especially after WWII, are based on profit and national defense purposes only, and little consideration was ever paid to the non-financial or non-utilitarian side. Hence, after the rapid change from product manufacturing's OEM model in later 1980's and early 1990's, many industries' tangible and intangible heritages have been quickly disappearing. The link between industry policy and problematic diplomatic-political related national defense policy is also lack of systematic or multiple-disciplinary studies. Taiwan's industrial heritages represent not only the development of a late developed society in the process of modernization, but also the result of delicate traffic among industry, politics, diplomacy, and military. CSBC case is, without doubt, one of the most vivid evidences of the complications and our negligence. Almost ten years have passed since CSBC's privatization, but despite of CSBC's impact, its heritage from former days has yet received the deserved attention, and more efforts are urgently needed.

4 The sign of the Merge of Tracks

In addition to two independently evolved tracks of development, Taiwan's shipbuilding industry

recently shows a sign of these two tracks merging together. The first track of traditional junk-fishing vessels-yacht by small civilian shipyards, and the second track by state-owned large modern shipyards mainly building merchant ships have more and more personnel and management knowledge inter-change. This began with the crisis of civilian shipyards in late 1980's.

As mentioned in the above, relatively larger civil shipyards building fishing vessels also prospered in 1970's and 1980's thanks to the increasing demand of fishery and the growing size of fishing vessels. Once yacht-making took off and lured out some shipyards's business, those remained behind continued to progress, and larger civilian shipyards gradually managed to find their niche in combining fishery and shipbuilding to take advantage of lower cost and more flexible financial operation. Another approach they tried was to expand their business to low-tech level medium-sized naval ships, patrol ships of coast guard, and large yacht (ex. mega yacht) made by steel or aluminum alloy. This slow progress occured during 1990's and early 2010's.

The successful combination of fishery and shipbuilding allowed them to, just like their yacht-making counterpart, accumulate enough wealth to either expand their own shipyard or purchased more smaller ones. The horizontal integration increased the efficiency of the business and enabled them to upgrade their facilities and technology. Facing the challenge of higher technology, profits and risks, these new medium size civilian shipbuilding-fishery groups also sought for modern management and technology help from outside. TMMC closed near the end of 1990's and its shipyard was sold off to another industry group which merely chose to rent it out for ship repairing. Hence, it was no longer possible to obtain any help from TMMC. But perhaps no help from TMMC was particularly needed now. At this moment, the civilian fishery-making and yacht-making groups had already surpassed TMMC, which since its financial trouble in 1980's had stopped progress for a while.

For fishery-making and yacht-making groups, once TMMC's influence dwindled, the only possible domestic source of advanced technology and management they could turn to was CSBC. So, they both hired high level retired CSBC engineers and managers to take care of their shipyards and introduce new management and technologies. But, admittedly, foreign source of technology was more desirable and suitable for them, especially for the rapidly-rising Jong Shyn Shipbuilding (中信造船). Jong Shyn took the opportunity of building mega yachts, research vessels, patrol ships and large fishing vessels to import new facilities such as laser cutting machine, and new technology such as the welding of aluminum alloy. They also started to hire more engineers with higher (bachelor and master) degree in naval architecture, just like the yacht makers did in 1990's when they tried hard to upgrade and survive. This was a big step; in the past, these civilian shipyards only hired graduates from vocational schools and rarely had any engineers with college degree. In other words, highly-educated young engineers could now choose to go to work for CSBC, large shipping companies like Evergreen, or civilian shipyards.

So, in the future, the personal and business relationship between these engineers, who are likely to attend the same universities, might create tighter cooperation (and competition) in technology and management aspects. These two tracks or streams of technology learning and developing in Taiwan's shipbuilding industry might merge in the near future.

5 Conclusions

As a late developed country in industrialization, many of Taiwan's modern industries have absorbed

technologies from several possible foreign source, and resulted in technology-mixing. Amongst various modern industries, Taiwan's shipbuilding demonstrates two special characteristics of technology transfer, the well-mixing with traditional technology and the two parallel existing tracks of modern technologies. Taiwan, given its pre-industrialized background with rich and highly developed traditional technology, was firstly a good and important test area for Japan. Even after WWII, it was still a strategic site during the Cold War and received plenty of foreign resources. Considering the circumstances, these two special characteristics of technology transfer are not too surprising but still very rare and interesting.

The shipbuilding industry heritages that have been preserved and studied help us to understand the development of Taiwan's early shipbuilding, the technology transfer from Japanese, American, and European sources, as well as how local engineers and technicians blended them to create a local style. Meanwhile, different shipbuilding scale evolved differently in the means of technology transfer. Boats, fishing vessels, and yachts are usually built by smaller civilian shipyards and share the same path of technology learning and mixing, including the use and the blending of traditional technology. On the other hand, merchant ships and naval vessels are usually built by state-owned enterprises which follow a more stringent technology transferring and learning process without any traditional elements. More interestingly, the inter-changes of these two tracks seem to restrict only on management experience and personnel, and only extend to include technology after the recent development of rising middle size civilian shipyards.

In the future, it will be necessary to compare these experiences with other colonial development, especially those with mixed technology transfer. Meanwhile, the roles of middle size shipyard shall be closely monitored to track the process of technology and experience inter-changes between these two tracks.

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An Analysis on the Existing Water Towers in Dependency of Chinese Eastern Railway

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Abstract
At the beginning of 20th century, with the construction of “Chinese Eastern Railway”, a large number of industrial relics was left along the dependency including the water tower that was the important railway structures. This paper analyzes the existing water tower along the northern Manchuria of Chinese Eastern Railway through the functional distribution constructive techniques and artistic characteristics, and shows the important architectural artistic values to hope these important industrial heritage paid attention by the society and protected properly.

Keyword: Artistic Characteristics , Chinese Eastern Railway · Constructive Technology · Water Tower

At the turn of 20th century, in order to enhance its external expanding strength and confront Japan, Tsarist Russia decided to forcibly build a railway of “T” in the Chinese territory throughout Liaoning province、Jilin province、Heilongjiang province and Inner Mongolia stretching to Vladivostok, which is known as “Chinese Eastern Railway”[1]. Simultaneously, its construction really driven the economic development of cities along the railway, and left a large number of railway subsidiary industrial buildings of great value of use and architectural art for the subsidiary region along the railway. As the necessary building in the steam locomotive era, water tower is one type of important industrial heritage buildings.

However, with the rapid development of modern industry, the steam locomotive was replaced by diesel locomotive, and the water tower was also dumped.This paper analyzes the existing water towers along the northern Manchuria of Chinese Eastern railways i.e. the subsidiary region from Manchuria to Suifen River along the railway with Harbin as its center, and tries to completely show this kind of industrial buildings with unique artistic characteristics.

Function and distribution of water towers

From historical documents and current surveys, at that period, the arrangement of water towers was divided into two classes. One type of water towers could be commonly found inside the railway stations along the railways. They were needed to guarantee the operation of railways and were distributed evenly. They were called railway water supply towers as they were set up to provide the locomotives, trains, station production and staff along the railways with domestic water. Particularly, to add water to the steam locomotives at that time was the most important function. Along the railroads, a water supply station was set up every 25-30 kilometers according to the places of the locomotive depots and the quantity of the water the locomotives used[2]. Inside

the water supply station was a water supply office (a water point and a water tower). Along the station tracks, there were water tracks and ash removing trenches etc. The locomotives were added with water in the railway hubs or along the railroads. The bigger water supply station was equipped with a water tower situated in the locomotive depot and back-turning section depot. From 1898 when the railway was started to be built to 1935 when tsarist Russia gave up the control of Chinese Eastern Railway, there were 57 water supply stations along all the railways. Another type of water towers were distributed in the city, providing water to nearby citizens for domestic use and plants to carry out production, such as the water tower inside the Chinese Eastern Railway General Factory and the water tower in Zhenxing Street in Harbin. The former was used to guarantee the normal operation of the factory and the latter provided the neighboring citizens with domestic water (see Fig.1).

With the development of locomotive that the steam locomotive was replaced by internal combustion engine, the water supply stations along the railroads were no longer needed. Therefore, most water towers were deserted and some were damaged. The intact ones are rarely found today.


Fig.1-1
CER's General Factory's tower(a)


Fig.1-2
Zhalantun Station's tower(b)


Fig.1-3
Harbin Zhenxing Street water tower(c)


Fig.1-4
Hailar Station's water tower(d)


Fig.1-5
Manzhouli Station's water tower(e)


Fig.1-6
Balin Station's water tower(f)


Fig.1-7
Manzhouli Station Goods Yard's tower(g)


Fig.1-8
Hake Station‘s tower(h)

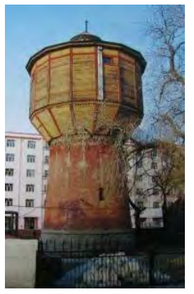


Fig.1-9
Nianzi Hill Station‘s tower(i)

Fig.1
Different forms of CER's water tower

Constructive Technology of the Water Tower

(1) The Shape and Load-bearing System of the Water Tower

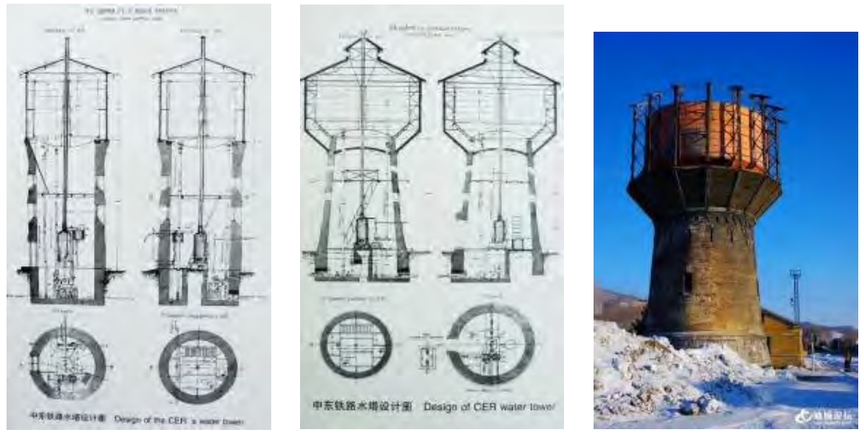
In the period of Chinese Eastern Railway, the water tower was built by wood, bricks and stones, with the capacity below 300 tons. The tank part of the tower body was wooden and closely pieced together, while the tower body was made of two materials, i.e. stones and red bricks. The

stones were widely spread in Northeastern region and they were obtained from local sources. The chosen stones to construct the water tower were solid, with different shapes and similar size. The thick tower body was constructed with cement mortar. The body built with red bricks was widely used in the tsarist Russian construction. There was water mortar pointing on the outer wall which was painted in red or brushed with plaster.

The plane of the water tower is equilateral polygon or circular and most towers are equilateral polygon. There are two kinds of water tower's shapes: one kind is that the outer shape of the water tower is the same from top to bottom, being the cylinder with same diameters. The water tank at the upper part is not single-out. The load falls onto the body at the lower part of the wall vertically. The bottom of the water cistern is spherical shell. The tower body of this kind of water tower is usually built with stones, while the shape feature is rarely seen in contemporary water tower construction. The lower part of the other kind of water tower which is built with masonries is conic load-bearing wall which batters inwards. The upper part has a water tank which is single-out. The wall of the water tank is cylindrical shell, belonging to cylindrical shell water cistern. The extended part of the bottom of the cistern is the obconical shell, the middle part being the spherical shell. The load of the water tank is transferred to the lower part of the wall through steel structure.

Looking from the section of the water tower, the water tank is steel structure frame and the tower body is built with heavy masonries to bear load without supports such as additional columns. As the upper part and the lower part of the first kind of water tower are connected vertically and the water tank in the upper part is support by steel structure, its pressure is directly transferred to the lower tower body without excessive transverse load.Therefore, the structure is comparatively simple. As the upper part and the lower part of the first kind of water tower are connected vertically and the water tank in the upper part is support by steel structure, its pressure is directly transferred to the lower tower body without excessive transverse load.

Therefore, the structure is comparatively simple. The water tank of the second kind of water tower is supported by large-size girder structure.The extended part at the bottom of cistern is not strong enough to prevent double layer iron sheets so small-sized girders are added to some parts. Besides, when this kind of water tank is filled with water, there will be lateral pressure against the ends of conic tower. This will lead to the instability of the tower body and make the whole building collapse. So, tsarist Russian designer built arched support at the bottom of the water tank, i.e. the connecting points of the outer shell of the water tank and the tower body to form stable spatial structure with the conic tower body. As a result, the strength is distributed evenly to the surrounding parts of the tower body and the overall balance is obtained. In this way, the problem is addressed easily (see Fig. 2)



(a) (b) (c)

(d) (e)

Fig.2
Inner construction of water tower

(2) The Heat Insulation Structure of Water Tower and its Ancillary Facilities

The outer layer of the water tank is double-layer wooden heat insulation layer, whose middle part is filled with blankets. There is half a meter air heat insulation layer between the wooden surface and the water tank and the surface of water tank is also double-layer steel board. The iron waterproof roof insulates the heat by using lime saw dust to prevent freezing of water tank in cold region in winter. The windows are long and narrow ones vertically, which have small size to reduce the coefficient of heat convection of the thermal bridge of the interior wall. The hole of the window looks like the bell mouth to receive as much sunshine as it can. In the meantime, it reduces the loss of heat. The heat insulation structure of a simple water tower is so meticulous. The structure built of several materials such as masonries, wood and steel mixing together and the method of heat insulation totally conform to the construction features of Russian tradition construction. We can see from the existing examples that the structure and construction technology of water tower at that time is quite mature.

Apart from water tower, a series of facilities are needed such as collector well, water channel and water crane are needed to providing water along the railways. The water sources of Chinese Eastern Railway are mainly river and stream. The collector well is set up near the water. The water is introduced to the water tower through water channel and the pressure of the water tower makes the water run out of the drainage pipe. Add water to the steam locomotive with water crane. The transverse water pipe extending from the top of water crane can sway and the curve

Fig.3:Water Crane

part in the front looks like the head of the crane which can go above the water tank of the locomotive. It is suitable for cold regions in northern part. It has such features such as large water yield, easy flow of water and the water is not easy to freeze etc. (see Fig. 3).

The Artistic Features of the Water Tower

Water tower, a kind of industrial construction which is ordinary and practical, combines numerous decoration tactics. It shows the cultural flavor of tsarist Russian traditional construction here and there and is full of glamour of the art of building.

(1) The Overall Image of Construction

The shape of the buildings during the period of Chinese Eastern Railway matches perfectly with the practical function of the building. The water tower demonstrates the modest and plain qualities.

The water tower elevation during this period is comprised of several parts, including roof, water tank, tower body and pedestal. The pedestal of water tower is built with regular boulder strips which are arranged in rows. The size of the masonries is far larger than that of the masonries of the tower body. The masonries offer firm basic protection to the water tower. The height of the tower body is limited. So whether the tower is conic or cylindrical, the whole tower is stout and powerful. The thickness of the wall should take the load of the upper tank and the heat insulation in cold areas into consideration. There are only narrow windows on the wall and the tower body is built with masonries. Therefore, the overall building seems thicker and firmer. As a result, the tower body is like a heavy fortress. No wonder many people mistake it as pillbox.

Although the surface of the water tank is wooden, it conforms to the modest style of the tower body. Stripped wooden boards are closely arranged crosswise or lengthways. Colorful steel boards or wooden boards are attached at the connecting parts and at the waist of the water tank to fasten them. There are small square windows at the upper part of the water tank, which looks fresh and agile. This structure avoids leaving people the impression that the water tower is top-heavy without damaging the thick and introverted character of the overall building. We can see that tsarist Russian architects do emphasize a single style. Rather, they make use of different characters of different materials and match them to make the best use of their strength and avoid dullness and vapidity in the meantime.

The proportion of the height of water tank against tower body also contributes to the modest and dignified character of the water tower. As the height of surrounding buildings is limited, the water tower in the railway station is usually short. As to water tower with polygon plane of water tank, the height from the spire of the tower to the bottom of the water tank is the same with that of the tower body, one half of the overall height of the water tower. The water tower with circular plane of water tank is comparatively higher. The height from the spire to the bottom of water tank is 2/5 of the overall height (also see Fig.2).At that time, the difference between the height of water tank of the

tower and that of water tower is small. Unlike the modern water tower which is high and thin, water tower at that period has different characters (see Fig.4).


Fig.4
Comparison of water tower in Chinese Eastern Railway period and that in modern times

(2) Style of Building Elevation

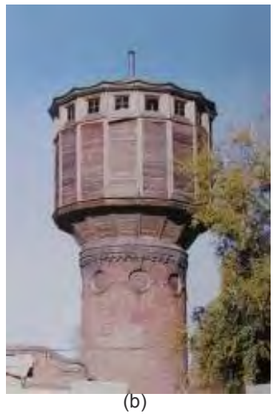
On the one hand, with the invasion of tsarist Russia, the implantation of western culture influenced the building culture of hinterland of Chinese Eastern Railway; on the other hand, to build a new “homeland” in Chinese mainland to ease their homesickness, the tsarist Russian architects brought their local ethnic architecture style to China. And the structure of the building and the decoration details were influenced by this style.

The tower cover of water tower with cylindrical shell is conic shell. A small area to obtain light rises from the middle of the spire. The roof with double layers is double eave roof. The tower cover of water tower whose whole body is cylindrical is usually single-layer conic shell (also see Fig.2). But what is extremely special is that the spire of water tower in Mu leng Station is cross slope roof, which makes the water tank look like a small Russian style house (see Fig.5). This kind of slope roof with Russian tradition cannot only share the load on the roof to facilitate drainage of the roof but also enrich the contour line of the building.

In the construction of Chinese eastern railways, the decorative character of wood was showed thoroughly and perfectly. Taking advantage of its fresh, agile and easy to carve characters, add new vitality to the decoration of the building. Besides, the wood has more national traits which make the temperament of building more amiable and easier. The edge of the eaves of the water tower and the lower edge of the water tank are carved in zigzag shape and stagewise shape to decorate and they are distributed symmetrically. At the upper part of the water tank, vertical short wooden boards which are tightly arranged are placed on the surface of transverse wooden boards. The ends of the wooden boards are carved into inverted triangle with rounded corners (see Fig.6). Every side of the water tank has the same decoration theme repeatedly which is symmetrical and balanced and shows the special national style of Russia.

Fig.5
The roof type of Mu leng Station's Tower

(a)



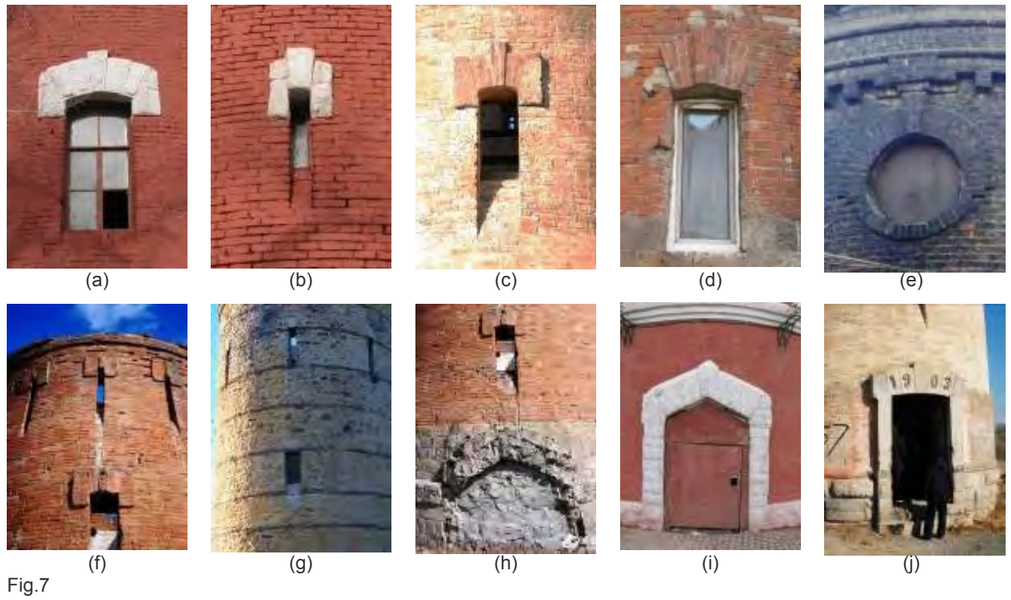
(b)

Fig.6
Different wooden decoration details

Masonry is used to build the wall of water tower. The colors and shapes of stones are sometimes used to decorate the tower body. The architrave of the building is sometimes formed using such building method as overlying. The fine waistline is formed by employing the bricks' character of layer upon layer to make the jagged architrave. This makes the waistline concave-convex regularly and enhances the sense of rhythm of the vertical facade[3] (see the right picture of Fig.6). Sometimes bracket decorations are added to the connecting part of water tank and the tower. The corners are decorated adopting decoration methods of corners in traditional Russian houses, placing the facing of mushroom rock on the tower body (see the lower left picture of Fig.1).

Different compound modes of doors, windows and trims on the tower body also reveal the unique flavor of tsarist Russian architectural culture. Some are narrow rectangle stripped windows; some are stripped windows with arched edge on the top; some are circular windows. But the windows are small in size, which reduce the loss of heat. The window trim is built layer by layer with bricks. Along the edge of the window, the bricks are arranged vertically and sidelong to form inverted trapezoid.

Some are embedded with sapphire and its side is formed by arranging the masonry crosswise. They are decorated in different places of the upper part of the windows. Some are in the middle of the window, while some are in the one quarter part of the window. Some cover the whole side of the window. Some have no masonry decoration on its side. For the circular window holes or window holes with its upper part being arched, fan-shaped trim is formed by arranging the bricks vertically to achieve variability in forms. Most of the doors of water towers are wooden ones with steeple top. Their trims are built around the edges of doorframes (see Fig.7)



(a) (b) (c) (d) (e)
(f) (g) (h) (i) (j)

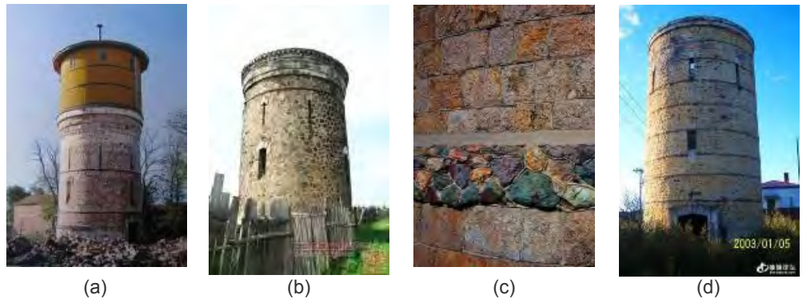
Fig.7
Different forms of trim of doors and windows

(3) The exterior color of building

The vivid color of the building becomes the unique signature style of railway construction in the Chinese eastern railway. The application of color follows the warm color of traditional architecture in tsarist Russia. The use of color respond to the cold weather in northeast, and add a touch of warm color in the howling wind, and increase the mild temperament of the construction.

The main color of the water tank in the water tower building is beige, and some connections between surfaces are decorated in beige. Some tower bodies are regularly constructed with red brick, and maintain its original color. Some are irregular piled up with rocks to form gray tone. Some are plastered in the surface and constructed into smooth and gray surface. The foundation of water tower is regularly constructed with boulder strip, some have the same hue, some have the superimposed and colorful stones of different shapes with exotic feeling (see Fig.8).

The industrial buildings usually pay more attention to their special functional requirements, and often don't put emphasis on decorative craft compared with the civil buildings. However, many towers in the Chinese Eastern Railway period, regardless of size and remote degree of its location, whose facades give full play to the characteristics of different materials · texture and color, use the difference between superimposed constitute and masonry of various materials to enrich decorative construction of the water tower, which fully show the creative talents of the tsarist Russia architects, and the water tower in subsequent different times can't match.



(a) (b) (c) (d)

Fig.8
The color of water tower

Conclusion

Water towers are often regarded as the milestone of regional civil engineering and industrial development and microcosm of industrial development. As a specific stage product in steam locomotive era, the water towers have high historical values, technical values and artistic values. How to not only retain its historical heritage and urban culture and evoke visitors' emotional resonance but also take account of their times and fit modern aesthetic senses and artistic taste through design is very meaningful lesson. There are many successful examples of water towers' transformation. For example, the water tower transformed by Rocha Tombal Architecten design team, which is called ponder tower, maintain the original shape of tower's external outlook, but connect the added built space through the traffic space independent of the original tower body in the transformation. The tower's external has symbiosis of old and new with harmony.There are such examples domestically. For examples, the water tower café in the school campus of China Agricultural University use the plain abandoned tower to transform, and turn the waste into wealth, and increase the quiet and cozy living space in the campus[4] (see Fig.9).

Fig.9
China Agricultural University tower transformation

Water tower with its unique body structure and stable moderate facade image and decorative structure with rhythmic sense becomes a beautiful landscape along the railway line in the Middle East. Its volume is small, but concentrate the traditional construction techniques and national decorative style of tsarist Russia building in that period, and demonstrate the high architectural artistic charm and cultural flavor. A number of industrial architectural heritages which are represented by water tower witness the glorious industrial history, and also witness the great industrial revolution, and also witness the cultural development of a city. Even if they gather the humiliation one hundred years ago and represent the hatred of the country and home, but the back of tsarist Russia aggressors disappears with time going, and the sufferings of Chinese nation go away. The unique industrial architectural art on this special region settles down, and it is a development history and culture on this special region. They need us to permanently work hard and pay much attention on this precipitation.

References Fig

Fig.1 (b)(f)&Fig.2(c)(e)&Fig.3&Fig.4&Fig.7(f)(h)&Fig.8(c)Source:http://bbs.dili360.com/thread-209571-1-1.html
Fig.1 (c)(d) Source :http://www.memoryofchina.org/bbs/
Fig.1 (e)&Fig.2(d)&Fig.8(b) Source :http://www.memoryofchina.org/bbs/read.php?tid=10223
Fig.7 (g)&Fig.8(d) Source:http://bbs.dqdaily.com/forum.php?mod=viewthread&tid=282302
Fig.1 (g)(h)(i) Source: Architecture Gallery ,P239
Fig.2 (a)&Fig.6(b)&Fig.8(a) Source: Architecture Gallery:Tracing the Old Buildings of the Chinese Eastern Railway , P238
Fig.2(b) Source: Architecture Gallery:Tracing the Old Buildings of the Chinese Eastern Railway,P98
Fig.5 Source :Architecture Gallery:Tracing the Old Buildings of the Chinese Eastern Railway , P168
Fig.9 Source :Conservation and Adaptive Reuse of Water Towers in Old Industrial Buildings:Transformation and Design of towers in Rijswijk and Soest the Netherlands ,Author:Cui Chong

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A Study of the Hydraulic Landscape in Taoyuan Tableland: the Past, Present and Future

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Abstract
In retrospect the development in Taiwanese history, the various political regimes all had managed some major hydraulic construction projects in Taoyuan County respectively. In Qing's regime, some major local irrigation channel had been constructed, Taoyuan irrigation channel system had been fully developed in Japanese's period, and lastly, Shihmen Dam and Shihmen irrigation channel system constructed in Nationalist regime. These major irrigation constructions had eventually made some dramatic changes in rural and urban landscape, as the result of irrigation construction, new aspects of landscape appeared with new meanings, thus, transformed as the hydraulic landscape. A detailed interpretation of those hydraulic landscape are become the main part of the research.

In Karl A. Wittfogel's book "Oriental Despotism", he had studied "hydraulic civilization" in the traditional societies and indicated the prime influences by irrigation, in which the governments dominated people in terms of the irrigation technology. Recently, English Scholar Erik Swyngedouw used the notion "to irrigate is to govern "to describe the modernization process of Spain. In other words, hydraulic politics would become a strong factor in developing hydraulic landscape.

Ironically, some Taiwanese researchers, even in the post-colonial era, still followed the Japanese colonist's framing techniques to interpret the Taiwanese cultural landscape. Unfortunately, they forgot the side-effects, mostly negative, which may come along with their findings.

The numerous ponds located in Taoyuan alluvial plain have been treated as the unique hydraulic landscape and presented as the precious cultural heritage in Taiwan. With various historical, cultural, social, ecological and technological viewpoints, the ponds could be presented as the spatial texts that recorded valuable information. The findings of the research could allow people to correctly and broadly interpret the social and cultural meanings. As people acknowledge and discover the precious value of the ponds, they would cherish and protect those valuable resources. This research would be a preliminary study that could be applied for further development.

Keywords: hydraulic landscape; post-colonialism; Taoyuan County

1. Analysis of Cultural landscape

Cultural landscapes, according to Carl Sauer[1] , means an area that owns some characters composed of either natural or artificial elements in a certain period of time. Simply speaking,

1 Carl Sauer, The Morphology of Landscape Land and Life: Selections from the writings of Carl Ortwin Sauer (Berkeley University of California Press, 1925-1963).,p315-350.

the culture is the agent, the natural area is the medium, and the cultural landscape is the result. C. Sauer proposed the “cultural landscape” mainly because of his concern for ecology. After D. Meining[2] added more interpretation, people tend to focus more on the communicational aspects of the cultural landscape, instead of the original ecology concern. In other words, the emphasis is shifted toward the signification of the cultural landscape. For example, J. Ducan[3] treated the cultural landscape as a text; also the cultural landscape can deliver its best expression through the analysis of text vocabulary and principles. However, K. Olwig[4] worried that excessive emphasis toward the definition of signification and symbolism may lead to the loss of material aspect of the cultural landscape. R. Schein[5] indicated that the cultural landscape always stays in the status of “becoming” and also the fact that its shape can’t be finalized. Even if you are able to maintain a proper manipulation among various types of cultural landscapes, their shapes still keeps on changing. Those “becoming” completely reflect that this real world is full of ever-lasting social life formulas. Schein’s interpretations prove that the cultural landscape is not only a discourse of space, but it also expresses the real dimension. The various discussions made the philosophy of cultural landscape more abundant and it even created more space for discussion.

The cultural landscape in the rural areas is emphasized toward the research of vernacular culture landscape. On the other hand, in the urban areas, the cultural landscape is emphasized toward the research of productive cultural landscapes. Either types of culture landscape are endowed with background stories which depict how people live in the world. If those stories can’t be understood, all those local cultural landscape will be meaningless[6] . Therefore, there are more and more NGOs that establish institutions which voluntarily records and keeps various stories of the cultural landscape, those organizations are similar to those of cultural and historical workshops established in Taiwan. The most unique character of the cultural landscape is its legibility, which is as important as its creativity. Therefore, various cultural landscapes are like different space texts. Action in space is actually a form of reading. The landscape is affected by the existing culture, as time passes, it gradually develops into a cultural landscape. The cultural landscape does not always stay the same, in fact, they can still metabolize. New cultural landscapes, especially exotic ones, often replace original local cultural landscapes and form a new definition.

D. Cosgrove and S. Daniels claimed the cultural landscape as a cultural image : “A pictorial way of representing, structuring or symbolizing surroundings. This is not to say that landscapes are immaterial. They may be represented in a variety of materials and on many surfaces- in paint on canvas, in writings on paper, in earth, stone, water and vegetation on ground.”[7,8] also indicated that cultural landscape could express the imperial power, using the colonial empire of the 19th century as the example, he has shown that landscape might be seen as the “dreamwork” of imperialism. [9]

Don Mitchell in his book ”The Lie of the Land”, using California’s hypocritical farming landscape

2 D. W. Meinig and John Brinckerhoff Jackson, The Interpretation of ordinary landscapes : geographical essays (New York: Oxford University Press, 1979).
3 J. Duncan, Sites of Representation: Place, Time and the Discourse of the other, ed. J. Duncan & D. Ley(eds), Place/ Culture/ Representation (London: Routledge, 1993).
4 K. Olwig, "Rediscovering the Substantive Meaning of Landscape," Annals of Association of American Geographers (1996).
5 R. Schein, "The Place of Landscape: a Conceptual Framework for the American Scene," Annals of Association of American Geographers 87(1997).
6 D. Hayden, The Power of Place, Cambridge (The MIT Press., 1995).
7 Denis E. Cosgrove and Stephen Daniels, The Iconography of landscape : essays on the symbolic representation, design, and use of past environments, Cambridge studies in historical geography (Cambridge [England]: Cambridge University Press, 1988).
8 W. J. Thomas Mitchell, Landscape and power (Chicago: University of Chicago Press, 1994).
9 Ibid. 8

to show us the other side of landscape in which the struggle between capitalists and labors is profoundly presented. As presenting in the change of California’s agricultural landscape throughout the century, Mitchell has pointed out that the failure to develop a way to clarify the historical and theoretical landscape before us. That means all the struggles in the fields of California remain invisible, therefore, they remain nothing[10] . More recently, Jennifer Beningfield[11] “the Frightened Land”, indicated that the relations among politics, land and landscape had produced in South Africa throughout the century. She particularly emphasizes how the White rulers, in terms of political imagination, planned landscape, to physically transform the original land. In the meantime, the Apartheid policy, by the excuse of modernization and hygiene reason, is arbitrarily carried out and brutally enforce the colored people move away from their indigenous houses, displaced in newly built districts where are easily under surveillance by Government[12] . During the World War II, the Nazi regime appointed a planning board to reshape the occupied Polish territory into the German landscape so that not only could the new German immigrants feel at home, but could also boost their patriotisms in an ideological thinking[13] .

Taoyuan’s cultural landscape is a network composed of mutually affected elements. However, since there are no obvious transportation and terrain barriers among villages, towns and cities, the whole culture landscape can be viewed as a complete network. By focusing on discussing only individual locations or terrain zones, it will be impossible to deliver a complete view of the whole Taiwan cultural landscape. The aim of this research is to make a further research by viewing the irrigation system (the dam, major irrigation canals, and ponds) in Taoyuan tableland as a complete hydraulic landscape. Moreover, the reason for choosing a proper irrigation system for research is the fact that an irrigation system is composed of the settlements, houses, temples, paddy fields, vegetable gardens, tea gardens, irrigation canals, ducts, ponds, and even dams that are established nearby the irrigation canal system.

Thousands of irrigation ponds spread over the Taoyuan tableland represent the reclamation history of ancestors, and proved their wisdom of exploiting water resource for irrigation by establishing canals and ponds. As Taiwan agriculture falls into recession due to the booming economy, all those ponds are vanishing gradually. The total number of ponds dropped from the ten thousand in the Japanese colonial period to less than 3,000 ponds. Therefore, in hope to make amendments, academic researchers, environment protection activists promoted a campaign saving those ponds. Also, the ponds playing critical role for life are being ignored, ignoring that they have already melted into the culture and life of Taoyuan tableland for over 100 years, and have kept much important historical records.

2. Literatures Review

Among the Western academic researchers who analyzed the irrigation problems from the social cultural view, K. A. Wittfogel explained how irrigation affects social organization in his research of “Hydraulic Civilization”, indicated that the influences of irrigation to the social organizations[14]

10 Don Mitchell, The lie of the land : migrant workers and the California landscape (Minneapolis: University of Minnesota Press, 1996).
11 Jennifer Beningfield, The frightened land : land, landscape and politics in South Africa in the twentieth century (London ; New York: Routledge, 2006).
12 Ibid. 11
13 J. Wolschke-Bulmahn, "The Fear of the New Landscape: Aspects of the Perception of Landscape Planning in German Youth Movement Between 1900 and 1933 and its INfluence on Landscape Planning," Journal of Architectural and Planning Research 9(1) (1992).
14 Karl August Wittfogel, Oriental despotism : a comparative study of total power, A Yale paperbound (New Haven: Yale University Press, 1957).

◦ Wittfogel's research focuses on Egypt, Mesopotamia, India River and Yellow River drainage areas, he calls as "Hydraulic Society", in which agricultural productivity is profoundly developed due to the country- dominate irrigation system. What "Hydraulic Civilization" means not only irrigation but also politic. The civilization that the hydraulic society presents, virtually not only the techniques which could dominate nature, but the techniques dominate people. Irrigation institutions, in other words, are the institutions by which country dominate people. Wittfogel called this as "Oriental despotism", the term which is used for Asia old world connotes an extremely form of absolutist power[15] , in Wittfogel's words, the term "hydraulic" draws attention to the agromanagerial and agrobureaucratic character of these civilizations[16] .

In order to promote average and equal distribution and raise efficiency of irritation, other researches such as the study of 48 irrigation communities in South India provide beneficial social function[17] . On the contrary, some researchers analyzed the negative effects brought by irrigation construction of British colonists in Krishna basin[18] . B. Lankford and T. Franks[19] discussed the mutual sustainable relationship between the irrigation systems and wetland in Tanzania. M. J. Sheridan[20] analyzed the symbolic meaning of irrigation facilities and related ceremonies and taboos from the cultural view. T. Potkanski and W. Adams[21] researched related irrigation facilities and the distribution of managing and operating water authorities. P. B. Trawick[22] researched the irrigation systems and the successful examples of social relationships in Andes mountain areas.

Eric Swyngedouw has spent long time to discuss the relationship of the development between irrigation and nation, he took Spain (1890-1930) in early-twentieth-century modernization process as an example to show that when the ruler owns land and water resources, virtually increase more political and economic power.[23] He applied a 19th century Spanish scholar, who had created "hydraulic politics" notion, Joaquin Costa's famous remark " to irrigate is to govern" [24] ◦ Simply speaking, who ever own the right of irrigation means own the right to rule. The nation ruler, eventually, adopts vigorous measures to promote Spain's hydraulic modernization to upgrade his own position, politically. In the reign of General Franco, more than 600 dams had been built throughout Spain within a short period. In his another paper in which he describes how Spain's hydrosocial modernization process became a very specific geographical project.[25] He indicated that the socio-hydraulic power had strengthen Franco's Fascists regime. Within the reign of General Franco (1939-1975), Spain has the highest number of dams per capita in the world (29 per million). Franco's hydraulic modernization had created a nationally integrated Spain, since his modernization program required a "networks of interest on which his power rested on an exclusively national(ist) visionary to an international geo-economic and geo-political imagination."[26]

15 Ibid. 14, p101
16 Ibid. 14, p3
17 P. Bardhan, Irrigation and cooperation: an empirical analysis of 48 irrigation communities in south India, Economic development and cultural change, ed. 8 (Jul, 2000).
18 B. Wallach, "British irrigation works in India's Krishna Basin," Journal of Historical Geography 11, no. No.2 (1985).
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21 T. & Adams Potkanski, W. M.,Water Scarcity, "Property Regimes and Irrigation Management in Sonjo, Tanzania," The Journal of Development Studies 34, No. 4(Apr. 1998).
22 P. B. Trawick, "Successfully Governing the Commons: Principles of Social Organization in an Andean Irrigation System," Human Ecology 29, no. 1 (2001).
23 E. Swyngedouw, "Modernity and Hybridity: Nature, Regneracionismo, and the Production of Spanish Waterscape," Annals of Association of American Geographers 89(3)(1999).
24 Ibid. , p.456..
25 E. Swyngedouw, "—Technonatural revolutions: the scalar politics of Franco's hydro-social dream for Spain, 1939-1975ll," Transactions of the Institute of British Geographers 32(1)(2007)..

◦ As Franco himself is so proud how his "great hydraulic and irrigation works are changing the geography of Spain." Of course, the truth behind those achievements of modernization construction also implicates a new geo-politic and cruel dictatorship. E. Swyngedouw took Ecuador as an example to explore how the circulation of water is embedded in the political ecology of power.[27] Also, he studied the production of Spanish waterscape throughout the process of modernity[28] .

Among all researching cases of Taiwan,[29] research of Dateh village in Pintong County and Zhongse village in Tainan County, are the most influential. He deduced that the development of irrigation organizations and the tight social relationship resulting from the mutual usage of water irrigations surpassed the formation of ethnic societies, and promoted the formation of multiple-surname villages[30] . Pasternack's research also influenced other researches of scholars. For example, Shei Ji-Chang once researched the irrigation and social culture adaptation problems in Nancheng village of Nantou County, and analyzed many problems between irrigation and religions, irrigation and Chinese Kong-fu gyms, irrigation and political, etc.[31] The research relating to the ground irrigation system development and social culture in Taoyuan tableland include Takeuchi Yoshimi[32] explaining the irrigation development history and land use in Taoyuan tableland; Chen Fang-Huei's research regarding observation space organization change through human groups, irrigation organizations, technology contents, and natural environments[33] ; Yang Shu-Ling[34] discussed the relationship among irrigation space organizations and irrigation society networks, and irrigation facilities[35] . Fang Cho-Dong's analysis of the distribution and functions and operations of pondscapes in Taoyuan tableland in the view of landscape.[36] Chen Zhang-Rui's research of the historical evolution and regeneration of cultural landscapes in Taoyuan tableland focused on the changes of natural landscapes. Kuo Cheng-Zhih[37] took the special region of Qingpu in Zhongli City as an example and analyzed the possible combination of four dimensions, which are production: life, ecology, disaster-prevention, with the notion of sustainable development.[38] Meanwhile, Lin & Liu's cooperative research of the analysis of Taoyuan irrigation canal and pond systems are one of the big-scale researches.[39] However, their researches focused on the administrative boundary of each village and city, and ignored the horizontal relationship along irrigation canal systems. Chiu has tried to apply E. Swyngedouw's Spain cases to study the spatial transformation among irrigation canal, power, and industry in Ershuei of Zanghau County[40].

26 Ibid. 25, p10.
27 E. Swyngedouw, "Social Power and the Urbanization of Water: Flows of Power," Oxford University Press 2003.
28 Swyngedouw, "Modernity and Hybridity: Nature, Regneracionismo, and the Production of Spanish Waterscape."
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36 Cho-Dong Fan, "The research of pondscape and irrigation system distribution and working mechanism in Taoyuan tableland" (Taiwan Normal University, 1997).
37 Cheng-Zhih Kuo, "The Research of Continuity of Cultural Landscape of Irrigation Canals and Ponds Systems in Taoyuan Tableland--Taking Qhingpu Special Zone of Zhongli City as an example" (Taipei Technology University, 2002).
38 Ibid. 35
39 H. C. Lin, Liu, H. P., Research and Investigation Report of Irrigation Canals and Ponds in Taoyuan (Taoyuan: Bureau of Culture Affairs, 1996).
40 Y.Y. Chiu, "The Spatial Change of Irrigation System, Power and Industry of Babao Irrigation Canal, Ershuei Township in Changhau County" (Chungyuan Christian University, 2009).

The irrigation development in Taoyuan tableland

3.1 Emigration phase of Qing dynasty

In Taiwan, until the late phase of the Qing dynasty, the reclamation of all plains, tablelands, and marginal areas, and the establishment of pondscapes were already highly developed. In the Qing dynasty, Taiwan's agricultural irrigation facilities, ponds, were mostly developed privately, and were rarely developed by the government (Wang 1985). According to historical records, it can be found that the big-scale pond system already existed in Taoyuan in the late Qing dynasty, including Xiaoli pond system (built in 1763), Longtang pond system (built in 1796), and Sanchi pond system (built in 1795) (Figure 1). (Chen 1871/1983; Chen 1984)

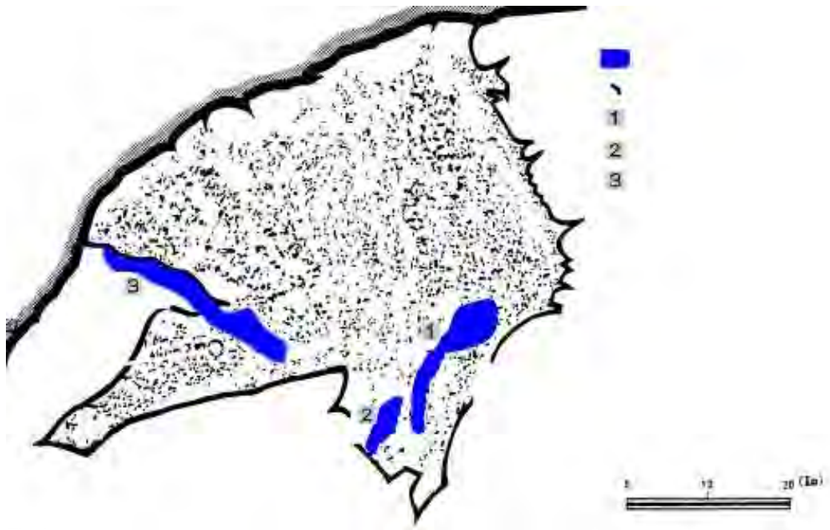


Fig.1
Qing's Period

Since the 1730s until before 1895, the irrigation development in Taoyuan tableland was mainly composed of small-scaled pond systems and irrigation canals, the quantity of ponds was more than that of irrigation canals. Local residents built ponds for water reservation while constructing irrigation channels. Generally speaking, the irrigation development was "privatized", "small-scaled operated", and "water resource partially exploited"[41] .

3.2 The Era of Japanese Colonial

The important acts of irrigation in that period included: (1) in 1901, the Japanese Governor-General Government started to investigate Taiwan's irrigation system while it also promulgated the "Public Irrigation Canal and Ponds Systems Act". (2) "Government-control Irrigation Canal and Pond Systems Act" promulgated in 1908 represented the fact that the government started to use its ruling power for building irrigation systems. After that law was promulgated, all private pond and irrigation canal systems with irrigation capacity over 30 Jia[42] (29.1 ha.) should be registered as public pond and irrigation canal systems, there were total seventy-one and distributed over 143 villages[43] . Even though there was no immediate change in the organization of water resource irrigation systems, the revolution started to appear. The irrigation organization which was expected

41 Chen, "The Historical Changes in Irrigation Development and Space Organizationin Taoyuan Tableland.",1979
42 Taiwan hectares, 1jia = 0.97 hectare.
43 Taoyuan County Government, "Taoyuan County Gazette," (Taoyuan: Taoyuan County Government, 1962).

to expand under the government's strong motives did not only surpass the small groups composed of limited local areas or family ties, but also provided an opportunity for people to assimilate new techniques and to strengthen the operation capability of organizations. The space expansion of irrigation organizations increased water resource development, and provided more opportunities for solving irrigation problems with a broader view.

The water resources were injected from the Dahan River and intercepted from many rivers and streams repetitively. Also, they were inducted into the ponds to provide sufficient water resources for the irrigation zones in the northern and western tableland of Taoyuan. Along the regional range with contour line of less than 110 meters in height, 12 extension irrigation canals were built. That construction changed the landscape in the areas along the seashore of the Taoyuan north tableland completely. (Figure 2)

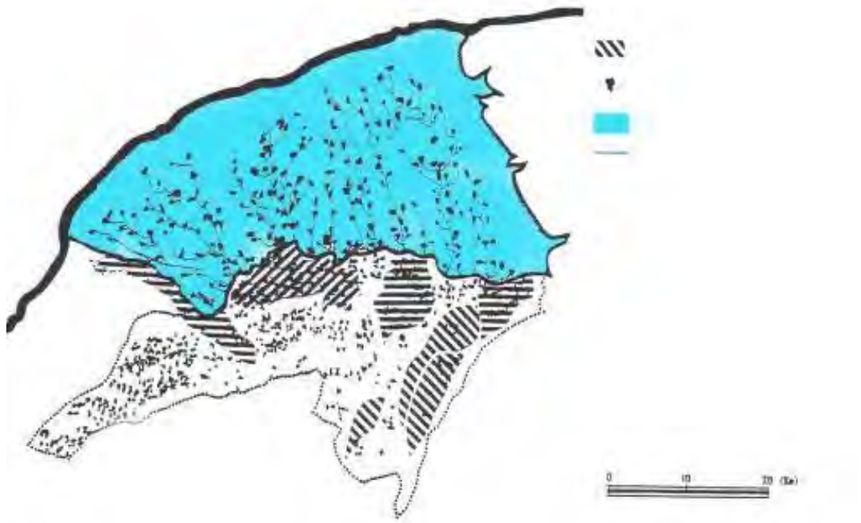


Fig.2
Japanese colonial period

In that period, the construction of Taoyuan irrigation canal and pond systems separated the Taoyuan tableland into 2 regions in which one half is northwestern; and in the irrigation zone of Taoyuan irrigation canal and pond systems, the contour line of less than 110 meters in height. The other half in the southeastern is the non-irrigation zone in which the contour line is over 110 meters in height. The different geography in those two zones led to the differences in the water resource facility mechanism, irrigation organizations, and land use[44] .

3.3 The period after Restoration

The Japanese rule laid a strong domination basis for irrigation development. After the KMT's restoration of Taiwan, the population kept on increasing. Agricultural production was thus increased in order to maintain sufficient food supply and to enhance land use. All irrigations were already exploited then in Taiwan, therefore it was necessary to build the Shihmen Dam and irrigation systems. The whole Taoyuan tableland was thus combined into a complete irrigation system.

44 Yang, "The Qara People: Losting Their Tribes for Thirty Four Years [in Chinese version].".

The accomplishment of the Shihmen irrigation canal and pond system in 1964 made the irrigation system in Taoyuan tableland more complete. In that period, the Shihmen Dam and Shihmen irrigation canals and ponds system mainly constituted the irrigation development. The Dam began construction in 1956 and was finished in 1964. The Dam deposits the water flow of Dahan River. Water resources was inducted from the Dam into the irrigation canal and pond system and then flowed downward along the contour line to irrigate the southeastern part of the Taoyuan tableland, instead of the northwestern of the Taoyuan tableland, which is the region of Taoyuan irrigation canal and pond system. The irrigation water of the two irrigation canal and pond systems were both inducted from Shihmen Dam from 1964 until now. Those two irrigation canal and pond system constituted a whole new water irrigation system. (Figure 3)

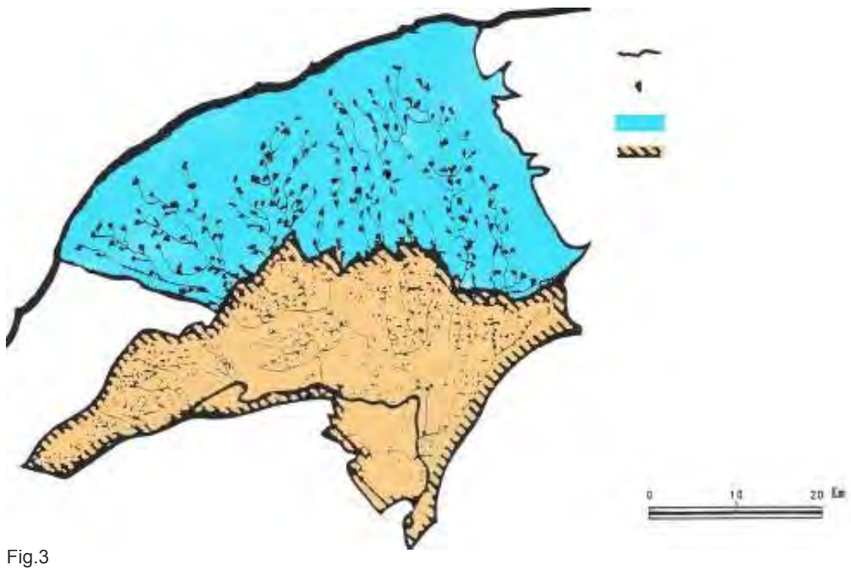


Fig.3
The Nationalist period

4. The irrigation Construction in Taoyuan Mountain Area

From 1910 to 1915, the Taiwanese Governor-General's Office enacted a program of armed repression. During his term of office, Governor-General Sakuma Samata created the “Bureau of Aboriginal Affairs” in the Civil Administration Bureau in 1909, and assigned aboriginal duties to local administrators at the county and village levels in order to prepare for the soon-to-be-enacted aboriginal governance project. The Japanese colonial government encouraged Taiwanese aboriginals to give up their traditional farming ways, and promoted the new emplacement farming system, to decrease big-scale tribal migration for seeking reclamation land. The Japanese concerned that the Atayal’s traditional farming ways by which could not obtain steady harvest, but the precious water and soil resources in mountain area easily be ruined. Thus, the colonial government energetically encouraged aboriginal to change their old ‘burn-reclamation’ ways to more advanced paddy field farming. An Atayal scholar Ivan Nogan who studied the relationship between paddy field crops and Japanese migration policy in Atayal msbtunux tribes. In his study, he indicates that the Japanese had taken ‘paddy field crops’ as the core policy, and attempt to transform Atayal aboriginals from the original hunters into the steady farmers[45] .

45 Huei-Huei Lee, "The Community Experiences and Cultural Changes: Immigration History of Atayal Aboriginals in Shihmen Dam Flooding Area" (National Cheng-Chi University, 2007).,p53

The Governor-General Sakuma Samata was not familiar with political affairs, who thus handed to the chief of ‘Bureau of Aboriginal Affairs’, Ootu Rinpei, in charge of Aboriginal Governance. Ootu Rinpei is the one who strongly supported ‘paddy field crops’ policy, he thought that this is the only way to reduce destroy by aboriginal people to those precious woods resources on the mountain. He took the first step to persuade those ‘allegiance aboriginals’ to accept as the farmers of ‘paddy field crops’. In 1921, Japanese colonial government took a further step to expand paddy field area and construct more irrigation facilities, encouraged more aboriginal people to engage in paddy field crops. In June, 1908, the Taoyuan Magistrate Office started force the allegiance aboriginals migrate to the reserved reclamation land used to be owned by a Japanese company – Mitsu & Co. The agricultural officers taught the Atayal people to construct the necessary irrigation facilities and the new paddy field farming techniques[46,47].

The promotion of paddy filed crops had put paddy filed become the core production bases among the settlements. According to the archives of Bureau of Police, in 1918, Xiayun village of Fuxing Township became the first village where the new irrigation channel had been constructed, eventually, paddy field were therefore become the typical cultural landscape. After Xiayun village, Zhiji village also constructed their irrigation channel in 1934 and started to engage their paddy field crops. Then, Yuxiayuan 1st irrigation channel, and Yuxiayun 2nd irrigation channel were followed in 1938 and 1939 respectively. (chart 1) As recorded in the 1936 issued book”The Survey Book of Taiwanese Aboriginals”, the paddy fields area in those villages are as follows: Zhiji village 7.846jia (approx. 7.61ha.) · dry field 185.0 jia (approx. 179.45ha.), Xiayun village 4.832 jia (approx. 4.69 ha.), dry field 102.0 jia. (approx. 98.94ha.) Thus, the application of paddy field crops has cause tremendous influences as far as daily life, economic, and religious aspects are concerned[48] .

Chart 1

Built year	Tribal name	Name of irrigation channel	The supply river	Irrigation area(Jia)	length (m)
1918	Xiayunpin	Xiayun 1st channel	Shlang River	12.0	
1934	Zhiji	Zhiji channel	Xiayun River	13.0	1000
1938		Yuxiayun 1st channel	Xiayun River		1600
1939		Yuxiayun 2th channel	Xiayun River	8	1616

Resource: Lin 1998:27

The Japanese colonialists had built a monument as they had finished a irrigation channel system, even till today, we still can find the relics of those remained monuments. The Japanese, except developed irrigation construction in Xiayun village, In 1918, they also reclaimed paddy field 17 jia in Gaorao village (16.49 ha.)and in 1924, reclaimed 4.5jia in Zhtoujiao village respectively. Along with the increase of household income from paddy field crop, the attitude toward the Japanese are thus becoming more positive[49] .

46 Xiao-Xia Hu, "A research on aborigine's collective movement of the aborigine's policy in the period of Japanese dominance" (Chungyuan Christian University, 1996).,p129.
47 Zh-Ming Lin, "A research on the transformation of inhabitation of atayal aborignal in Xia –yun" (Chungyuan Christian University, 1998).,p27.
48 Ibid. 45.
49 Lee, "The Community Experiences and Cultural Changes: Immigration History of Atayal Aboriginals in Shihmen Dam Flooding Area.",p53-54.

The author has interviewed and discussed with the remained Atayal elderly to recall their memories of those old day cultural landscape. They are all showing much impressive memories concerning the irrigation cultural landscape that had been submerged by the construction of Shihmen Dam. Myself also surveys the submerged irrigation channel located in Gaorao village area, I surprises to find an irrigation tunnel still remains almost intact condition. the concrete-made water way could be still found where the water way needed to pass over the cliff or gorge. The ventilation ducts, which are used to make water running more smoothly or for some emergency repair and maintenance, are found in every 50 meter along the irrigation tunnel. A 2.3 kilometer long parallel working trail constructed along with the irrigation tunnel that is used as a cruise way for check and traffic. The whole irrigation system is recorded as Guchangjiao Irrigation channel that could prove the Gaorao area used to a well-irrigated paddy field production base, unfortunately, we could only watch them from the water surface, except the dry season when the water level of Shihmen Dam is low enough for people to find the drown cultural landscape[50] .

Except the above-mentioned villages, according to a newly edited 'Fuxing Township Chronicle'has following record: " An Atayal people called Iman Buruna who is from Kapanzan tribe, a branch of Taikokam msbtunux (literally, front mountain areas), had attended traditional school during Qing's reign years and speaking fluent Taiwanese dialect. He held a post of school teacher in Japan rule period, and was told that he, in his old age, had established a practice field for producing rice in Habupin and acted as the administrative person.[51] In today's Xikou Tableland nearby Dahan River, we still could find a relic of monument that is setup in memory of the establishment of the irrigation channel on this tableland. If we check the description of 'Fuxing Township Chronicle' that we have find this following record:"the former inhabitants from Dabao village (now called Sanxia Township) 8 tribal settlements had been enforced to migrate to Xikou Tableland in 1928." (Fuxing Township Government 2012:215) with the document and the remained monument, it confirms that the Xikou Tableland is the producing base of paddy field. The chronicle further indicates that the Japanese colonial government established several A-category vocational schools in such places as: Kapanzan(Jiaobansan), Gaogan, Mawudu, Zhtoujiao ,etc., in 1921. The curriculum includes simple liberal arts courses, and most importantly, the vocational practices: rice farming, afforestation, raise livestock,etc., the main policy of the school is to train so called 'eligible aboriginals'. Thus, the areas around Kapanzan are indeed to become the most successful agricultural model during the Japanese era, it had encouraged other Atayal aboriginal from gogan (literally,rear mountain areas) to visit and learnthe most advanced agricultural techniques and living style.[52] It has shown that not only the tribes living in Taikokam msbtunux but also those living in Taikokam gogan had been engaged in irrigation and agricultural constructions. As in Yeheng Tableland, we still find that a big-scale terraced paddy field had been constructed and remained intact. It records that the area of Yeheng tableland is 15 jia (14.55 Ha.), and there are divided in 1,226 pieces paddy fields. The agricultural construction started as early as in 1928, the irrigation specialists diverted head waters of Dahan River into the irrigation system in which concluded two arteries: the length irrigation channel is 400 meters long, 3meters wide, and the breadth irrigation channel is 500 meters long, 1.5 meters wide. The Japanese agricultural specialists introduced famous Ponlai Rice (Formosa Rice) specie to be cultivated here, a famous agricultural cultural landscape thus appeared. Although, due to the high economic value, the paddy field landscape never remained and transformed to the peach land, yet the complete irrigation system are still

50 Chie-Peng Chen, "The People's Story of Mobility: A Study of Migration due to the Construction of Reservoir in Taoyuan County," Journal of Geographical Science 64(2012).
51 Fuxing Township Government, The Fuxing Township Gazette (Taoyuan: Fuxing Township Government, 2012).,p184.
52 Ibid.49,p233.

remained and becomes a scenic focus for the coming tourists.

5. Maps drawing and Irrigation construction

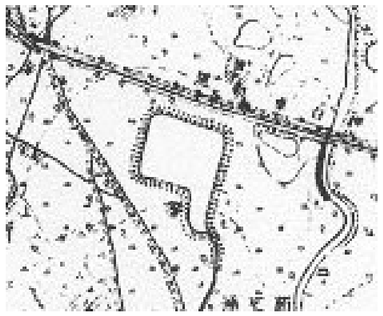
Benedict Anderson also indicated that population census, atlas, and museums has played the most important roles in enframing the imagined communities of the colonies[53] . Benedict Anderson has following notes as he describes imperialism colonial government: " The second avatar was the map-as-logo. Its origins were reasonably innocent - the practice of the imperial states of coloring their colonies on maps with an imperial dye. In London's imperial maps, British colonies were usually pink-red, French purple-blue, Dutch yellow-brown, and so on. Dyed this way, each colony appeared like a detachable piece of a jigsaw puzzle. As this 'jinsaw' effect became normal, each 'piece' could be wholly detached from its geographic context[54] ." Taking 'the Atlas of Greater East Asia Co-Prosperity Sphere' drawn in 1943, the color from dark red to light red was used to describe the Japanese sovereign territory and annexed land respectively. (Wei, et al 2008:212) In the book of 'The power of Map', the author has interpreted map as follow:" the map's effectiveness is a consequence of the selectivity[55] , this focus, this particular attention, this…interest…is what frees the map to be a representation of the past."[56]

After extensive and detailed survey to Taiwanese land resources, the Japanese colonial government started to draw a great deal of maps, to name a few critical achievements, such as: 1:20 000 Taiwan Topographical Maps (1900-1904), 1:50 000 Taiwan Aboriginal Territory Topographical Maps (1921-1929),[57] 1:25 000 Taiwan Topographical Maps (1921-1929), all maps show us the most exact cartographic information. Japanese cartographers used triangulation, a method originating from the West, to create maps. Triangulation determined the positions of an observed object by calculating its distance and angles from other known points, exclusive of the observer himself. The mapmakers had to detach themselves from the observed geographical features. All the observed phenomena were presented by objective spatial coordinate system. Until today, those Japanese set-up triangulation points are still used as the surveying check point. Many of the colonial activities on Taiwan, such as census taking, urban planning, transportation construction and irrigation engineering, were all carried out on the basis of cartographic information.[58] The Office of Taiwan Governor-General not only completely controlled Taiwan society and land, but also unfolded a comprehensive development of social reform and industries. Even today, management and basic administration division in the broad western Taiwan land are hardly escaped from the delineated spatial boundary by the old Taiwan Topographical Maps.

If we take the ponds in Taoyuan tableland as the examples, comparing those maps of different ages, we could thus found the accuracy of the maps drawn by the Japanese. Since the individual ponds in Taoyuan had been given serial number[59] such as: No. 1-1, No.2-6, etc. As in No.2-13 pond, we use Taiwan Topographical Maps in 1904 and Taiwan Topographical Maps in 1925, compare with the map by Combined Logistics Command Office(CLCO) in 1955 and aerial survey map in 1994, (Fig. 4) with overlapping maps, we could the same pond's changes throughout

53 B. Anderson, Imagined communities : reflections on the origin and spread of nationalism (New York ;: Verso, 2006).
54 Ibid.,53, p.175.
55 Anderson, op. cit.
56 Denis Wood and John Fels, The power of maps (London: Routledge, 1993).,p1.
57 Te-Wen Wei, Gao, C.C., Lin, C. Y. & Huang, C.C., Japanese Maps Relating to Taiwan (Tainan: National Museum of Taiwan History, 2008).
58 J. G. Lai, Chen, Y. W.,Yap, K. H., "Geographic Reality Versus Imagination in Taiwan's Historical Maps [in Chinese version]," The Cartographic Journal 47-2(May 2010).,p185.
59 There are 12 arteries of irrigation channel, each concludes several numbers of ponds, e.g. the No. 1 pond of 1st irrigation channel is numbered as No.1-1, and so on.

almost ten decades. The pond did virtually not exist in the map of 1904, it was surely formed before 1925. Once it appeared that its shape of pond was never changed till today, the changes appear in the surroundings of the pond such as roads, houses, etc. also clearly observed.



1925 Topographic map

1955 map by CLCO

1994 Aviation photo

2012 Google Satellite photo

Fig.4
The comparison of No.2-13 pond through various priods

Those maps were drawn so all-inclusive and accurate, in other words, which had put a naked Taiwan in front of the eyes of the colonialists. As a Japanese Diet member, Takekoshi Yosaburo in his book" Japanese Rule in Taiwan"[60] has indicated:" The exact position of every township and village in this island has firmly controlled. Each farm and land, no matter how small it is, is ready to be found from well-prepared maps."[61] 。The following description could be the best reason and footnote for the colonial government to produce the maps :

When we enter the room of placing atlas books of land, Baron Goto Shimpei asks one of officers to show us the map of one village. The officer checks the map index, finds quickly one piece of map,…. on this map, we find paddy fields, tea gardens, creeks, hills, and woods. They are all surveyed by triangulation and accurately drawn. ….Using only one pencil and a map like this, we can easily calculate the terrain and altitude of Taiwan as easily as we look at our own pawns[62] .

6. The Push car Railway and Taoyuan Irrigation Canal

We can clearly read from a map of Taoyuan Irrigation Office Association issued in the Taisho period(1912-1926): a irrigation network combined with ponds and channels. (Figure 5) On the same map, we also could find another related network which is a railway network of Taoyuan push

60 Takekoshi Yosaburo, The Ruling History of Taiwan (Taipei: Cheng-Wen, 1905).
61Jen-To Yao, "Knowing Taiwan:Knowledge, Power and the Japanese Colonial Governmentality of Taiwan," No. 42(2001).,p152.
62 Ibid. 59, p153-15

car system. Roland Knapp has indicated that both Taoyua irrigation channel and push car system has created the agricultural miracle in Taoyuan tableland[63] .

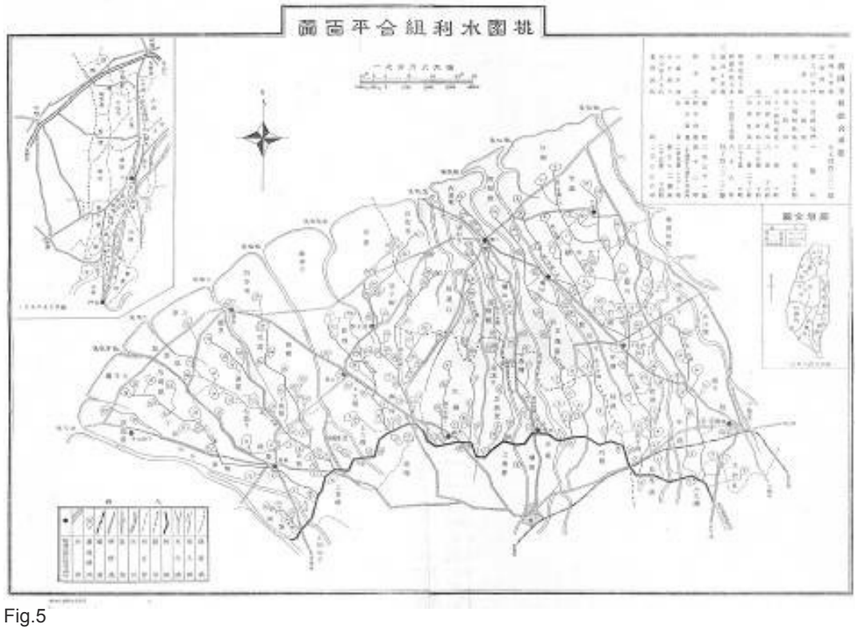


Fig.5
The Map of Taoyuan Irrigation of ponds and channels

The Japanese colonial government started to build the push car system for improving the inadequacies and disparities of military logistic and traffic. In December 1895, a light push car railway was completed between Tainan and Kaoshiung, it gradually expanded islandwide and became the major land traffic system.[64] The push car is simply a light trolley with brakes which is handled by a coolie come along with the car, the average speed is 10KM per hour, but it could speed up to 16 KM downhill. There are two different push car served for passengers and cargo respectively. The construction of push car is very simple: the track is very light line about 18 inches gauge, normally set up in the middle or side parallel to the road. As early as in 1907, the Japanese had started to build the push car railway from Taikokam (Daxi) to Kabanzan (Jiaobansan) total 68 KM long[65] In his book 'Through Formosa', a British journalist Owen Rutter observed the push car of Taoyuan tableland, he could easily acknowledge the unique characteristic of this simple transportation system.[66]

The main transportation of Taoyuan in the past was relied on Taikokam River (Dahan River), when the Taoyuan Irrigation Canal began to construct, the Japanese government built a dam to collect water of Taikokam River for the usage of the irrigation need, but it had also caused the water too shallow to sail the boats. Consequently, it made the marine business to collapse, the newly-built push car railway had taken place and became a new booming transportation business. For the demand of the great passengers and cargo needs, total 14 railway lines had been built in Taoyuan alone. Roland Knapp pointed out:"Without the daisha (i.e. push car) it is unlikely that agriculture

63 R.G. Knapp, "Push Car Railways and Taiwan's Development," Honolulu: Hawaii University Press 1980.,p213-214
64 Ibid.61,p209.
65Government, The Fuxing Township Gazette; ibid.,p230-231.
66 O. Rutter, "Through Formosa: An Account of Japan's Island Colony," Taipei: SMC (1990).,p214.

would have become so commercialized so quickly because peasants would have been unwilling to produce a surplus unless it could be moved to market."[67] Since 1935 the push car business started to decline due to more cheep and popular bus service, the push car companies closed one after another.[68] Finally, the last push car company, Taoyuan Push Car Company, closed in 1943 that it formally declared the end of business of push car. Although came to an end, the former push car company had purchased new buses to replace the out-of-date push cars and changed a new title as 'Taoyuan Bus Company' to sever the public. That also declared a new era of public transportation in Taoyuan.

The new bus routes as a parallel way followed the original route of push car. If we compare the 1925 Taiwan Topographical Map with the map nowadays, it is observed that the old push car route were widen to the highway to accommodate the new vehicles. For instance, two run-through Taoyuan City push car railways have become two prime roads in the city. Thus, the modernization of cities in Taoyuan is seemly accompanying with the achievement of the development of hydraulic landscape in Taoyuan County.

7. Emframing Taiwan

Edward Said indicated in his book 'Culture and Imperialism': "imperialism after all is an act of geographical violence through which virtually every space in the world is explored, charted, and finally brought under control. For the native, the history of colonial servitude is inaugurated by loss of the locality to the outsiders ; its geographical identity must thereafter be searched for and somehow restored. Because of the presence of colonizing outsiders, the land is recoverable at first only through the imagination."[69] In T. Mitchell's book "Colonizing Egypt"[70] , Timothy Mitchell presented a concept of "enframing", in which Mitchell discusses the use of regimentation, geometry, and individualizing to colonize and control the natives of the colonial societies. To Mitchell, this was the essential part of colonialism's effort to separate "container" (the colonizing power) and "contained" (the colonial community), the contained within the container can be isolated, enumerated, and kept.[71] In interpreting "post- expolration" colonial geography in Africa, Garth A. Myers[72] (1998; 2000) also uses Mitchell "enframing" theory to review that the British colonial government in Kenya re-ordered the original disorder landscape into the carefully segmented order, according to the will of British colonialist. Thus, the ideas T. Mitchell has discussed in the chapter "Enframing" could be applied to interpret Taiwan during 1895-1945.

In 1898, the fourth Taiwan governor-general Kodama Gentaro (1898-1906) came to power, and his civil administrator Goto Shimpei was trained in the medical profession in Germany and read in the contemporary literature of colonialism.[73] In the nineteenth-century German science and rationalism had prided itself on the creation of a "scientific colonialism". This approach was based on the passion for methodical research and investigation.[74] Thus, we may say that Goto Shimpei's "Scientific Colonialism" is similar to those emframing techniques as the means for the modernizations in

67 Knapp, "Push Car Railways and Taiwan's Development.", p215
68 Ibid. 65, p216-217.
69 E. Said, Culture and Imperialism (London: Vintage, 1994)., p271.
70 Timothy Mitchell, Colonising Egypt (Berkeley ; London: University of California Press, 1991).
71 Ibid. 67, p44-45.
72 G. A. Myers, "Intellectual of Empire：Eric Dutton and Hegemony in British Africa," Annals of the Association of American Geography 88(1)(1998).
73 M. P. Myers Peattie, R. H.& Peattie, M. P. (eds), Japanese Attitudes Toward Colonialism, The Japanese Colonial Empire, 1895-1945 (Princeton: Princeton University, 1984); Ramon Hawley Myers, Peattie, Mark R., Zhen, Jingzhi, The Japanese colonial empire, 1895-1945 (Princeton, N.J.: Princeton University Press, 1984).,p83.
74 Peattie, Japanese Attitudes Toward Colonialism.70, p5

Japanese colonial period. As Mark Peattie had added this mark to Shimpei's approach to Taiwan: "In particular, his systematic and research-oriented approach to the development of Taiwan and his perception of the island as a "laboratory", wherein experiments to control its social and political environment could supposedly determine the course of social change and evolution in the colony, reflected the pseudo-scientific passion of the time for the application of "biological laws" to political and social institutions"[75] . Taiwanese scholar also endorsed this remark, such as, who indicated that Goto Shimpei's colonial politics, based on scientificism, is virtually "biological colonialism". To Goto Shimpei and his colleagues in Taiwan, biological colonialism meant more than merely research to rational colonial policy, in which is obsessed with Darwinist " biological politics"[76] . Goto Shimpei used this principle to rigorously and delicately proceed to the research and survey of Taiwan: from the whole-scale landform survey to the faunae or florae samples collection; those full-scale inventory include population census, the investigation of land deeds, etc. As G. Barclay mentioned, colonial Taiwan has undergone the most detailed and comprehensive investigation as far as the colonial countries were concerned[77] (Barclay 1954:viii): "While under Japanese rule Taiwan probably had the distinction of being the most thoroughly inventoried colonial area in the world. Huge compilations of statistics and numerous special surveys were made from year to year. The economy, the terrain, the aboriginal tribes, the mineral wealth, the agricultural output, the industrial production and the foreign trade have all been studied and restudied until there is little to be added to this knowledge, unless new evidence is uncovered that is not yet available."[78] (Barclay 1954:viii) Thus, we deliver ourselves from the viewpoint of colonial power by ascribing to these disciplinary procedures as a Foucauldian "micro-power"[79] in which the bodily inscriptions denote the focus of colonial authority.

In Alfred Crosby's ' Ecological Imperialism', he says that wherever the European went immediately began to transform territories into images of what their motherland, the new plants, animals, crops and buildings gradually turned the colony into a new place.[80] According to Mitchell, through colonial process, colonial Egypt was re-ordered to appear as a world enframed, thus, this emframing Egypt was made up as a legible picture-like object, "colonial power required the country to become readable, like a book."[81] Coincidentally, the experiments in Egypt by occidental power had been transplanted to colonial Taiwan.

8. The Immigrant Policy in Colonial Period

During the Kodama Gentaro -Goto Shimpei period, the foundation of colonial political affairs was established, and also, the development direction of agricultural Taiwan and industrial Japan was decided. Furthermore, the agricultural industry began migrating to Taiwan, thus, Taiwan's agriculture migration policy was decided. According to the "Enterprise Report of Civic Immigrants" published by the Office of the Taiwan Governor-General in 1919 pointed out the essentiality of Japan's agriculturist implantation, which are divided into the following points: (1) The reason for governance (2) Country-assimilation (3) To expand into tropical nations (4) The adjustment of the population process in Japan[82]. Regarding the amount of Japanese immigrant villages in

75 Ibid.70, p85.
76 Ibid.70, p85.
77 George W. Barclay, Colonial development and population in Taiwan (Port Washington, N. Y.: Kennikat Press, 1954).,viii.
78 Ibid.74. viii..
79 M. Foucault, The History of Sexuality: An Introduction (London:Allan Lane, 1979).
80 Alfred W. Crosby, Ecological imperialism : the biological expansion of Europe, 900-1900, Studies in environment and history. (Cambridge [Cambridgeshire] ; New York: Cambridge University Press, 1986).
81 Mitchell, Colonising Egypt.,p33.
82 Yanaihara Tadao, Taiwan under Japanese Imperialism (Taipei: Strait Publishings, 1929/2002)., p154.

the Japanese rule period, the most important ones located in Western Taiwan are as follows:[83] located in Zhanghua County are the Akitsu Immigrant Village (built in 1932, 181Jia[84] in area, has 156 households, 780 people, and is now known as Fangyuan Township today), Fengli Immigrant Village (built in 1936, 494 Jia in area, has 149 households, 745 people, and is now known as Beidou Township), Kajima Immigrant Village (built in 1937, 531 Jia in area, has 128 households, 640 people, and is now known as Tianwei Township) In the eastern area, referring to the Hualien area, there is the Yoshino immigrant village (built in 1910, 1270 Jia in size, has 242 households, 1210 people, and is now known as Jian Township), the Fongtian Immigrant Village (built in 1913, has 172 households, 860 people, and is now known as Shoufong Township), Lintian Immigrant Village (built in 1914, 766 Jia in size, has 171 households, 855 people, and is now known as Fenglin Township). According to Yanaihara Tadao, these immigrant villages take up 17% of the Japanese population and 30% of the Taiwan population in Eastern Taiwan. Compared to Western Taiwan, these statistics show that Eastern Taiwan was occupied by the Japanese, not the Taiwanese, thus, inevitably, Hualien Street was simply a Japanese city street. In fact, it is conspicuous that Eastern Taiwan is Japanized, which totally differs from the impressions of travelling in Western Taiwan. Therefore, it is acknowledgeable that, in comparison to the western part of Taiwan, Japanese immigrant residences have already been built in the eastern part. In addition, this mission, the development location of immigrants, is "not only carried out for the satisfaction of being a motherland's colony, but also for a midway or a southbound expansion base."[85]

During the Japanese Colonial Period, besides the fact that the Japanese voluntarily immigrated to Taiwan, the 'Indigenous Collective Migration Policy' implemented during the Japanese colonial period was in fact immigration by force. Except for the above-mentioned case of the Atayals from Dabao to Xikou[86] , taking the Bununs for example, the reason for their displacement firsthand was due to the increasingly lack of food supplement and resources, and population overflow, etc.[87] A great majority of modern displacement is forced displacement that resulted from the power of the state, such as the Indigenous Collective Migration Policy, with which the Japanese forced the Bununs, who were living among the mountains, to migrate to hills near the level ground making it convenient for the Japanese to control and rule, and for them to redevelop forest products, minerals and water conservancy in the area that the Bununs moved out.

9. The Immigrant Community in the Nationalist Taiwan

9.1 The Construction of Shihmen Dam

Early in 1924, after the Taoyuan Irrigation Canal system was completed, Japanese technician, Hatta Yoichi, started to study the possibilities of building dams to reserve water in Shihmen Mountain. During 1930 to 1943, the investigation of the Taikokam (Dahan) River hydrology data during the flood and the geology research of the dam were carried out, which was the so-called "Showa Water Conservancy Project". After the Restoration of Taiwan, the Provincial Water Resources Bureau continued the research of the Shihmen Dam construction project. Nevertheless, the plan in the beginning was as same as the "Showa Water Conservancy Project" of the Japanese Colonial Period. In March, 1954, the first organization established for the Shihmen Dam, "Shihmen Dam Design Committee", was established. This committee devoted themselves to geology, hydrology,

83 Z. F. Lin, "The study of adaptation of Japanese style houses by Taiwanese" (Chungyuan Christian University, 1995).,p58-59.
84 1Jia =0.97 hectares
85 Tadao, Taiwan under Japanese Imperialism., 2001, p155.
86 Government, The Fuxing Township Gazette.,p215.
87 Tanapima Lumaf, "The Hunters on the Clouds: The Representation of Bunun's Settlements and Migration Process in aitongguang" (Chungyuan Christian University, 2008).

and agricultural economic investigation, and also the preliminary construction project and the estimation of construction cost and benefits. In July of 1955, the Shihmen Dam Construction Preparation Committee was established. However, since the government did not have such a large amount of money to build the dam, so in order to borrow and collect funds for building Shihmen Dam, the government turned to America and applied for a loan. The attached subsidiary condition of a loan is that Taiwan government had to employ American design consultancy and construction consultancy companies, thus, they chose Tippetts–Abbett–McCarthy–Stratton (TAMS) Engineering Company and Morrison-Knudsen Engineering and Construction Company to serve as the design and construction directing consultant respectively. Under the help of American technique, qualified engineering workers were sent to the Bureau of Reclamation and the two consultant companies in America for practical training, then they would return to Taiwan to work. In addition, with the help of the consultancy companies, a large number of special technicians were publicly and selectively recruited through exams and then trained. The number of technicians was about ten thousand people.[88] The construction of the Shihmen Dam began in 1956 and finished in 1964.

According to the book "Silenced Rivers" written by P. McCully[89] , from 1959 to 1989, there are approximately thirty million people who have been forced to migrate due to construction of dams. In the face of the many facts that have happened or are happening internationally, the question on how Taiwan finds out the real truth on solving this problem is the issue waiting to be explored by this study. Moreover, there is not a big amount of dam development in Taiwan[90] , and also there are not many individual cases regarding immigrants being forced to migrate, from hundreds to thousands, therefore, these cases are not paid much attention to by people, nor are they overseen by the public voice of the world. Among which, the Shihmen Dam built during 1956 to 1964 caused the most immigrants (i.e. three thousand people), and it also left more problems. Therefore, this study uses the Shihmen Dam migration problems as the main focus of this research.

Built during 1956 to 1964, migration in the Shihmen Dam, the entire process of Shihmen Dam immigrants is the focus in this paper: immigrants from the submerged area of Shihmen Dam being forced to move out are one of the stories, and the story of the original Shiyifen district (mainly consisted of the Hakkas) and the life experiences of the residents that moved in. In general, it can be summarized into two types: (1) The residents that moved out: Aborigines and Han people from the submerged area. 2) The residents that moved in: the staff from the Shihmen Dam Construction Committee, residents that move in temporarily(e.g. dam labors, American consultants, etc), the permanent residents after the construction.

9.2 The Moving-out Immigrants Community

After the construction of dams and the mass development of the Shihmen Gorge area, the Shihmen Dam has become the largest dam of Far Eastern Asia. Cultivated lands and residences that have the area of below 1,024 hectares all became submerged areas[91]. There are 128 Aborigine households, 288 Han people households, and a total of 2,870 people.[92] The Shihmen Dam Construction Committee decided to divide the immigrants into five groups (Figure 6): the first

88 C.C.(ed) Chen, The 40 Years Book of Shihmen Dam Management (Taoyuan: Northern Water Resource Bureau, 2003); ibid., p11.
89 Patrick McCully, Silenced rivers : the ecology and politics of large dams (London: Zed Books, 1996).
90 According to the statistic data of the Ministry of Economic Affairs, there are 16 Dams in northern Taiwan, 9 in central Taiwan, 14 in southern Taiwan, 3 in Eastern Taiwan, respectively, total number are 42.
91 Nai Xu, The Shimen Dam, Taoyuan: Shihmen Dam Construction Committee (1963)., p46.
92 Shihmen Dam Construction Committee, The Construction Record of Shihmen Dam (Taoyuan: Shihmen Dam Construction Committee, 1966)., p607.

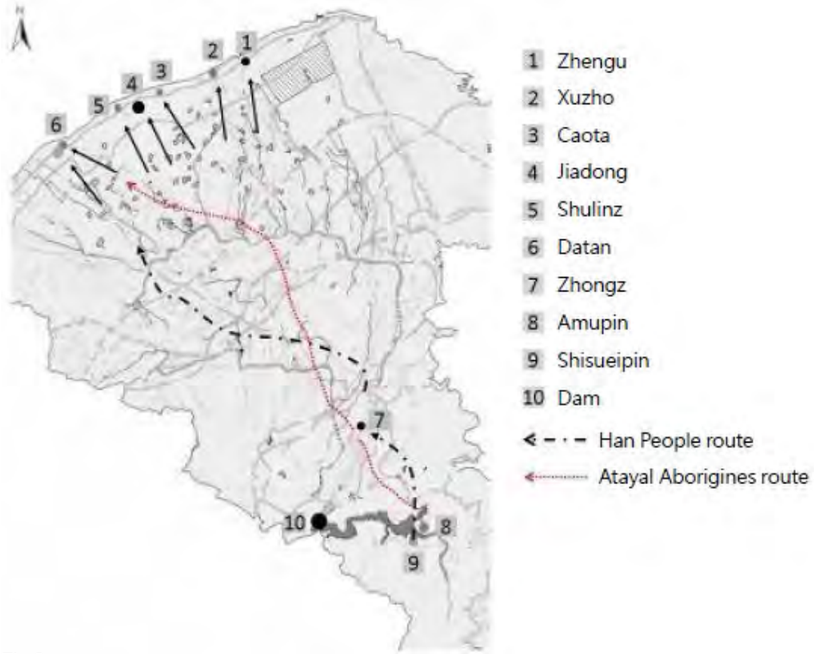


Fig.6
The migration route map

Fig.7
Immigrant model village

group consisted of 29 households and were settled in Caota; the second group consisted of 48 households and were settled in Shulinzih; the third group consisted of 40 households and were settled in Datan; the fourth group consisted of 79 households and were settled in the area from Zhengutou to Jiadongkeng, above four groups are all Han immigrants. The last group was Atayal aborigines, with a total of 82 households that were settled in Zhongzhuang, Daxi Township. However, later due to the Gloria Typhoon that invaded and attacked Northern Taiwan in September, 1963, the original residences of immigrants were severely damaged and destroyed; therefore they migrated to Datan instead.[93] The Atayals and Han ethnicity who were submerged migrated to Datan cultivated area to start new lives. At the same time, the government implemented land improvement, road reconstruction, water conservancy construction, the rebuilding of immigrant model village, the equipping of public facility, and the distribution of cultivation farmlands. (Figure 7)[94] Here, we pick Datan Village as a specific case to describe the immigration stories.

9.3 The Coin Incident

In the 1960s, many factories used the industry development to go deep into what was originally the base of operations of agriculture production. These factories did indeed provide the rural society

93 Nai Xu, The Shihmen Dam, Taoyuan: Shihmen Dam Construction Committee [in Chinese version] (1963)., p46.
94 Committee, The Construction Record of Shihmen Dam., p609-616.

some job opportunities, but they also produced lots of industrial pollution, seriously effecting the living environment in that area. In 1974, the Coin Chemical Industrial Co. set up factories in Datan. It was hard to imagine that when Datan village, which has been already slowly walking out of the dark, grieving and agonizing shadow it was once in, was enjoying the pastoral life of comfort and happiness, it would face the doomed circumstances again. The village would once again face the doomed luck of migration because of the cadmium-pollution poisoning: in 1978, cadmium pollution was tested, in 1982, lands were left fallow, from1990 to1991, Datan was established as a Restricted Industrial District. This long period was also the fall of the once prosperous new immigrant village, after residents received their compensation, each of them searched for new destinations, and slowly the village became an empty and unoccupied place with only a small number of those who refuse to leave or those homeless with nowhere to go left in Datan. At that time, the residents once requested a land-for-land collective immigration. However, it was a pity that, in the end, the government decided to adopt the purchase and compensate method, making it impossible for villagers to reunite in the same place. Therefore, they had no choice but to each search for their own roads and pathways by themselves, breaking their deep friendship. Unfortunately, the solid community consciousness that has been accumulated for a long time is not able to be passed down to the next generation. In conclusion, they can only part there and go their own ways. (Chen & Fan 2002)

9.4 The Moving-in Immigrants Community

(1) Shiyuan (literally meaning “Stone Garden”)

In the beginning of the Shihmen Dam Construction project, Taiwan employed many American engineers from TAMS Engineering Company and Morrison-Knudser Construction Company to teach others how to build a dam. Moreover, in order to make it comfortable for the group of American consultants during their stay in Taiwan, the government built Shiyuan for them to live in. The number of consultants was 65, if adding the number of family dependants, the number of people was 110. The Shihmen Dam Construction Committee built 40 American-style bungalow houses for the Americans to live in, which is also known as the Shiyuan Villa today. The entire Shiyuan had a spacious environment, and many different sorts of public facilities and infrastructures such as swimming pools, tennis courts and sports grounds were built. Moreover, this residential village completely imitates the residence style, which is when single buildings stand separately as independent bungalows, of American communities.(Figure 8) Taiwanese guards would stand on guard to ensure the safety of the environment where the America constructors lived and prevent outsiders from entering.

Fig.8
Shiyuan

(2)Shihmen Dam Administration Dormitory

Besides the Shiyuan first village, the Shihmen Dam Administration also established another dormitory building with 250 households. Under the distribution of government organization, families of employees lived in that building. With its low building coverage ratio, the elegant

environment indeed provided the employees sufficient and good care. Furthermore, in terms of selecting materials and construction quality, the buildings in the community were built with good spirit and high standard. For many years, the family dependents of employees were all under the care of the government. In the Shihmen Dam Administration dormitories, besides basic dorm residences, there were also several public facilities and installations. In the 1960s and 1970s, this type of community living environment was actually extremely unique to the society in those days.

(3) Permanent new immigrants

Fig.9
Shihmen fresh fish of Shiyifen

The prosperous sight of the Shiyifen areas after the Shihmen Dam was built showed that the locality of residents has slowly been established. The regional space that the Hakkas originally lived there, the large amount of laborer family dependents that moved in because of the construction project, and some businessmen; this caused the Shiyifen areas to bloom and develop in a way that has not been seen in hundreds of years. During the construction project, the construction site was desolated and food was not easy to get, it was a long drive to outside if people wanted to purchase goods. It was because of the Shihmen Dam project that the Shihmen fresh fish existed. In the 1960s, small restaurants using “fresh fish” as their restaurant theme started to appear. According to the tourists’ wishes, the chefs could cook varieties of fish meals for them, and this gradually became a big feature of the local dietary business. Moreover, this changed the structure of the Shiyifen areas, changed what had originally been an agricultural region into a tourism place with business as a priority. Shihmen Fresh Fish became the specialty of the Shiyifen areas, and the Taoyuan County Government generously helped advanced and popularized this specialty. Then, in 2004, the first annual Shihmen Fresh Fish Festival was established, and from then on, fresh fish culture has become an intangible culture asset with representative meaning. (Figure 9)

10. Conclusion

Using the concept of cultural landscape to discuss the hydraulic constructions throughout the century, it is not simply to acknowledge the mere hydraulic engineering, instead, it is a hundred years record in which the historical, cultural, ecological, and social histories of the hydraulic cultural landscape has obtained accurate interpretation. The aim of the research is attempt to observe the development process of irrigation in Taoyuan County, in terms of viewpoints through humanistic geography, socio-culture, ecological environment to examine the values and meanings of the cultural landscape. By means of detailed literatures review, especially those researches regarding hydraulic irrigation, this paper has pointed out the cultural authenticity, public history, even the political interpretations. The discussion, therefore, are focused on the reality, not those false impression makeup by various regimes, in order to provide the reference for further practices for the execution of tasks or plans. Taking the Shihmen Dam for example, firstly, in the Qing Dynasty and Japanese Colonial Period, the places which explorers, missioners, ambassadors,

and ethnography scholars were interested in belonged to the colonial frontier. Owen Rutter has said that this place was as a frontier district defended by an army of volunteers[95] . From the 1960s to the mid-1980s, the Shihmen Dam attracted many tourists domestically and globally, creating the summit of tourism popularity of the Dam. Only an endless stream of tourists and travelers were seen on the dam. Actually, the sedentary dam was also corresponding to the group of immigrants living in the seaside displaced area, representing the re-arranged and re-combined lives and creativity of nomadic people.

In the example of the Shiyifen areas, the culture from various backgrounds gradually blended in with the local culture of the Shiyifen areas. During the 1960s and 70s, the Shiyifen areas had attracted the economic immigrants, engineer technicians and many tourists that were from all corners of Taiwan. Yet, when economic capitals attracted even more investments and immigrants to the Shiyifen areas, at the same time, how many people remembered the dam immigrants that were shoved and pushed to the frontier of the Taoyuan seacoast? Except the Datan immigrant community disappeared, the other immigrant communities still remain and keep in ragged shape (Fig.10), yet, lots of untold stories virtually are their treasured memories to evidence a sad tale of mobility.

Fig.10
the ragged house deserted by immigrants

In Nationalist Government’s eyes, the achievement of Shihmen Dam is the pride of nation since their retreatment from Chinese Mainland. Coincidentally, General Franco in Spain also responded his achievement：”Great hydraulic and irrigation works are changing the geography of Spain”[96] The chief executive officer of the Shihmen Dam Construction Committee at that time, Xu Nai, described: “ Therefore, after all the immigrants were safely arranged and settled down, they were excited and full of undying gratitude.[97] “ Another official also vowed solemnly, promising: “You will all have good houses to live in, and your children will have schools to go to. The government will make up for the consequences and pay you back ten times more in return.”[98] The saying can compare with the happenings in South Africa. The memorandum, entitled”Slum dwellers happy in their new homes”, emphasizes that：”The native families who have been moved from the slums of Sophiatown, Johannesburg, are happy in their separate brick houses and have no intention of ever going back to Sophiatown. They never had such decent housing in their lives.”[99] Ironically, both Franco’s Spain and South Africa before Mandela’s rule are treated as the dictatorship political groups. It could give a good judgement to evaluate the Nationalist government in Taiwan.

95 Rutter, "Through Formosa: An Account of Japan‘s Island Colony.", p228.
96 Swyngedouw, "—Technonatural revolutions: the scalar politics of Franco‘s hydro-social dream for Spain, 1939-1975Ⅱ." , p14..
97 Xu, The Shimen Dam, Taoyuan: Shihmen Dam Construction Committee., p46..
98 Yang, "The Qara People: Losting Their Tribes for Thirty Four Years [in Chinese version]."1994.
99 Beningfield, The frightened land : land, landscape and politics in South Africa in the twentieth century.2006, p252.

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A Study on Preservation, Restoration and Reuse of the Industrial Heritage in Taiwan: The Case of Taichung Creative Cultural Park

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Abstract
Taiwan's former industries, such as sugar, wine and tobacco factories, have been forced out of production due to changes in the business model or from the impact of globalization and now these industrial complexes lie idle. This industrial heritage is very different from the generally understood traditional cultural heritage and monuments. Currently in Taiwan the question of how to preserve, reuse and transfer old industrial buildings into a base for cultural and creative industries is an extremely relevant concern for government, academics and local organizations. In this article, we explore some overseas cases that concern the issue of industrial heritage and then further discuss a case history from Taiwan, namely the preservation, restoration, reuse, and management of Taichung Creative Cultural Park. In conclusion, the article considers the interpretation of cultural connotation and the inner values of a pluralist society by means of the recent achievements in Taichung Creative Cultural Park.

Keywords: industrial heritage; restoration and reuse; Taichung Creative Cultural Park

1. Introduction

Due to industrial shift and structural change of society and economy, encountering the challenging social environment, industrial production can no longer continue to satisfy the demand and has to cease. This situation leaves the facilities vacant, which are regarded as "industrial heritage". Because of the great change of production technology, transportation, and life and working style, the structure of urban space must be adjusted accordingly, and the renovation and transformation of unused industrial space and function located in the city become a major issue. To some degree, the industrial heritage presents itself in many aspects, such as historical rapid expansion, prevalent urbanization of societies, and issues of spatial structures. Instead of a product of naturalization, it is rather a spatial and cultural mechanism of reproduction. In Taiwan, owing to the specialty of space, which is created by vacant factories or abandoned facilities, the perspective of appropriate preservation, restoration, and reuse obviously should be built and can further transform the space into the base of a creative culture field.

1.1. Literature review of restoration and reuse

When industrial heritage is under the transformation, both current architectural laws and cultural property conservation law have been against the process of preservation, restoration and reuse of the assigned historical monuments buildings in recent years. The measures governing procurement for the restoration and reuse of historic buildings in the cultural heritage conservation law only specify the historical monuments but not the restoration standards for historical buildings. This

situation has often been discussed by the professionals from various fields. Regarding original properties, buildings and facilities, the regulations and some perspectives of Burra Charter hold around 5 types of ethics. On the other hand, advanced countries preserve their cultural properties with different levels, which are adopted with either different projects or different sections of the same building, or even one single project can contain a few buildings. Since those projects have their own authenticity and specialty, the perspective of restoration shall adopt an appropriate strategy according to the conditions. During the process of preservation, restoration and reuse, equivocal regulations are often encountered, and the inconsistent standards of the preserved and restored projects also limit the development of the follow-up functions for reuse. In Taiwan, the management of reused districts is still at experimental stage and requires further study.

1.2. Research method

This research is to study the achievements of the preservation, restoration, and reuse of industrial heritage in Taichung Creative Culture Park from several aspects, such as the development and mechanism of the Park, spatial transformation, and management. The report is also to evaluate the inner information and values required by the transformation of the Creative Culture Park and finally to provide the suggestion. Chapter 2 reviews an overseas case of reuse. Chapter 3 studies the development of urban space during the transformation of the Park. The industrial heritage (such as space, building, and machinery) remains after the function shift from the original winery to the Park. It encounters the function orientation during the reuse of industrial site and new functioning mechanism for old buildings, which are also discussed in Chapter 3. Chapter 4 analyzes the design projects which execute the restoration and reuse of the historical buildings. Since the design strategies aim to transform in various levels, the relevant architectural elements are analyzed, generalized, and evaluated. Finally, the characteristics and performances of integrating old and new architectural elements for each project are reviewed in this chapter. Chapter 5 reviews the management strategy and outsourcing mechanism of the Park. The last chapter is to make conclusion and suggestions.

Fig.1
Historical photos of Taichung Creative Cultural Park.

2. Case study- Granville Island Cultural and Art District in Vancouver

2.1. Strategy for preservation and reuse of industrial heritage

The reuse idea of Granville Island Cultural and Art District, which was transformed from an industrial island to a cultural space, is to preserve the industry's spatial structure. The structure

can be divided into three parts: one is for industrial use, so the cement plant and boat-building area remain in this district; one is for public facilities, public market, kids market, and shopping street; the other part is for artist-in-residence plan. Instead of developing the island with only one function or monotone feature, the company transforms it into a district of culture and entertainment, combining theater and outdoor stage. Along with exhibition centers, galleries, and studios, in this district, spaces, which are suitable for group meeting, are also combined with the abovementioned cultural theme and educational factor for theaters' use. Educational institution and product display center are established as well.

Fig.2
Historical condition of the industrial usage

2.2. Management of the District

By transferring the ownership of national land and house to the trustee, the District uses the fund earned from operation to achieve sustainability. Not only the operator can earn revenue from the transference, but also the public can benefit from the heritage. However, the trustee is only in charge of the revenue from the fund, and through its professional management, the efficiency and security of property use can be improved.

3. The Project of Taichung Creative Culture Park

3.1. Development and preservation in urban

Fig.3
Functions and usages. (Including outdoor performance space, cement factory, supermarket, and design workshops.)

The Taichung Creative Culture Park, former Taichung Winery, is the best preserved one among the top five existing wineries in Taiwan. After the removal in 1998, Taichung Winery was planned as a mixed-use joint development district of Taichung Rear Station by the Government. However, during the period, although the buildings in Taichung Winery were well-preserved, a historical building area was not designated. Fortunately, due to the preservation program promoted by the workers of culture and history in Taichung, the complete block of the Park was preserved. After taking over it, the Council for Cultural Affairs (CCA) actively promoted the works, such as overall development planning, land-use readjustment, investigation, restoration, and establishing strategy of management. By integrating the management from private sector with the policy making and leading mechanism from public sector, the original wine industry can be transformed into the base of culture and creativity site.

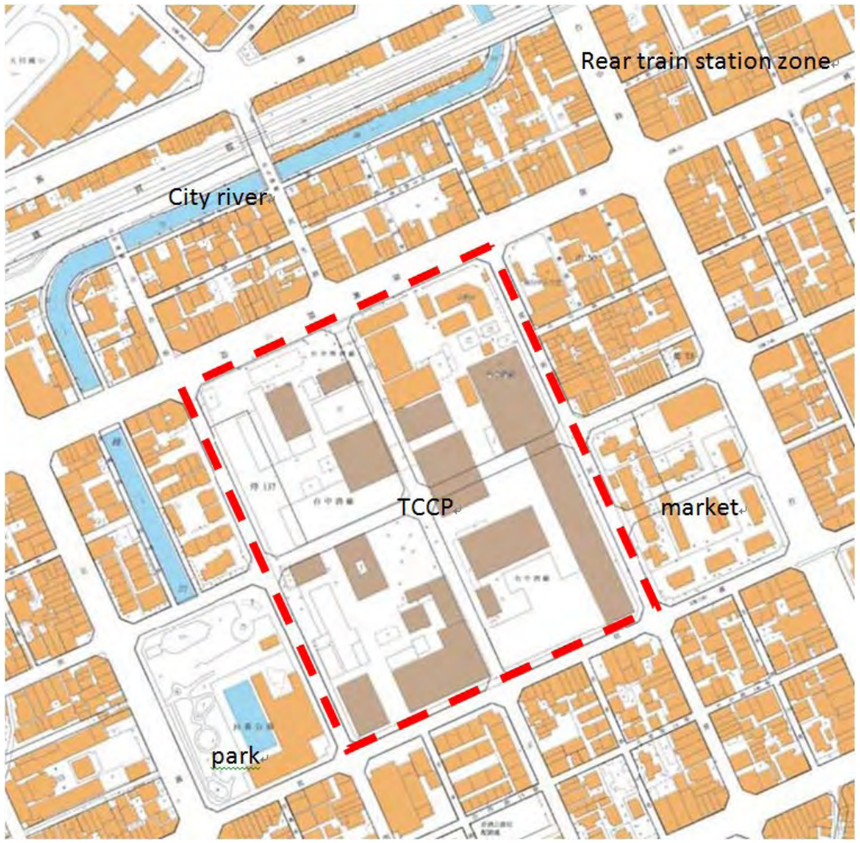


Fig.4
Location and the surrounding environmental analysis site plan of Taichung Creative Cultural Park.

3.2. Orientation and function

In 2005, the CCA orientated the Park as Taiwan Architecture, Design, and Art Center (TADA Center), and it will evolve around the concepts of architecture, design, and art. To aim to advance the developing condition of Taiwan's architecture and design industry to be in line with the world standards, to construct the professional field of architecture and design, and to promote Taiwan to be the center of creativity and design in Asia. The Park will continue to promote the educational popularization and research of architecture and design, to hold international seminars and exhibitions, to host annual design theme conventions etc.

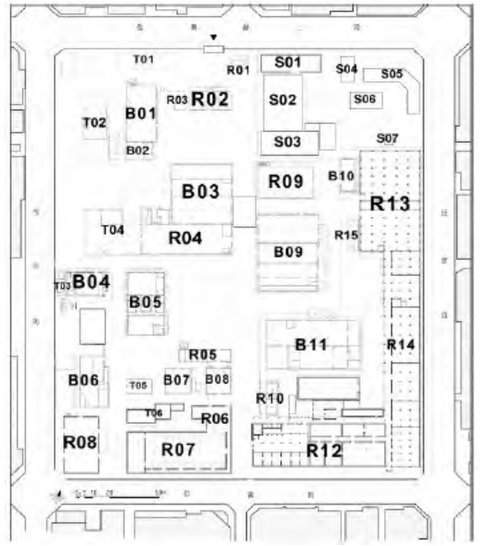


Fig.5
The original buildings in Taichung brewery factory.

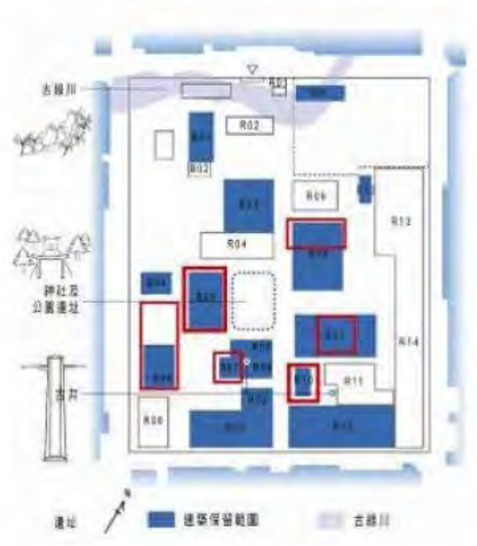


Fig.6
The historical buildings in Taichung brewery factory.

4. Analysis of the restoration and reuse of historical buildings

4.1. The mechanism of restoration and reuse

Due to the developing conditions in different phases and areas, the orientation of function and the strategy for each building also vary. The CCA invited experts and scholars to establish the function for each building and then to plan details by areas. The functions of each area are: 1. commercial area 2.exhibition area 3.professional training center 4.wine museum 5.office area 6.creative product store. Then through a public contest recruiting design projects, the proper projects were chosen to present the spirit of restoration and reuse of historical buildings.

Fig.7
Overall configuration site planning of the Park.

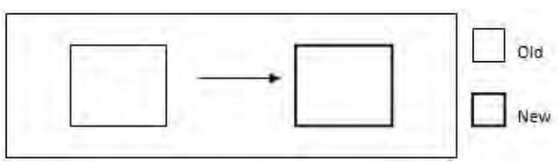
4.2. Old-new mixed spaces

The buildings were largely built during the Japanese colonized period, and they were remained wee, also been protected by laws. During the planning phase, the architects pay close attention to the dual direction design of restoration and reuse (preservation/renovation and old/new). One issue is how to preserve the historical factors, and another is how to transform the historical buildings from old to new. In the Park, the architects execute 7 projects, which can be the subject of discussion regarding restoration/reuse. Furthermore, the projects can also provide the reference for the issues.

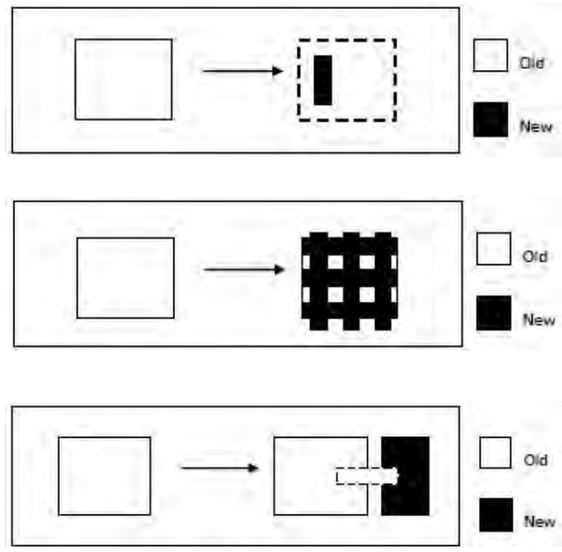
4.2.1. 4 strategies for old and new

The four strategies are according to the relative proportion of preservation(old) and transformation(new), can be divided into “original preservation”, “partial change”, “partial preservation”, and “co-existing”. The strategies are explained with figures below (the following figures are exclusively produced for this research.)

（1）Strategy 1：Original preservation



The strategy of preservation for old buildings is to restore the original appearance, including structural system, form and style, material and texture decoration and finish, and physical environmental system. The old items can be replaced with new ones of the same material, which may have slight difference in color.



（2）Strategy 2：Partial change)

The main features of the old buildings are preserved, and the minor space or element is partially changed and adjusted to provide new functions.

（3）Strategy 3：Partial preservation)

The critical parts of old buildings are preserved, and the space and form are largely changed to adapt to new functions.

（4）Strtegy 4：Co-existing

Respecting the old buildings, the new ones develop in a proper and harmonious way. The new and old co-exist to reveal, transit, contrast, and recall each other or to be mutual background.

4.2.2. Constructing elements of new and old

When handling old and new issues, a proper constructing method must be adopted after the strategy confirmed. This method directly affects the structural logic of each element of the buildings. In the projects of Taichung Creative Culture Park, the main constructing elements to execute the design are: 1. outline shape 2. structure 3. height 4. roof type 5. opening 6. material and color 7. style.

4.2.3. Processing methods

The co-existing concept of old and new buildings lies mainly in the ole-new structure and esthetics. Therefore, basing on the abovementioned 4 design strategies, the main constructing elements to execute the old and new co-existing design can be concluded with 7 methods. Strategy 1, original preservation, develops the method of “restoration”. Strategy 2, partial change, develops the methods of “within” and “inter-cross”. Strategy 3, partial preservation, develops the methods of “penetration” and “enclosure”. Strategy 4, co-existing, develops the methods of “above” and “beside”. The 7 methods are explained with actual projects below.

(1) Warehouse B05

□design strategy：original preservation

□method：restoration

□Relation between old and new：The old elements are preserved, and new elements imitate the old style if necessary.

Constitute elements between old and new. Old

Fig.8
The original view of warehouse B05.

Fig.9
The warehouse B05 is converted into an auditorium and a exhibition space.

(2) Warehouse B11
□design strategy：partial change
□method：within
□Relation between old and new：New elements extend the overall outline, while the inside largely applies white background, which is suitable for exhibitions, with gobo to smooth the natural light; the rest old elements remain.

Constitute elements between old and new.

Fig.10
The original view of warehouse B11.

Fig.11
The warehouse B11 is converted into a exhibition space.

(3) Warehouse B09
□design strategy：partial change
□method：inter-cross
□Relation between old and new：Two brand-new paths are created to re-define the old space; by reducing the space around the buildings, the inside part is enriched enough to create a new space for activities.

Constitute elements between old and new.

Fig.12
The original view of warehouse B09.

Fig.13
The warehouse B09 is converted into a exhibition space.

(4) Warehouse R09
□design strategy：partial preservation
□method：penetration
□Relation between old and new：The original beam and column structure is preserved, and the originally closed wall structure is destroyed, while the front side is reduced by a span to become a semi-outdoor corridor and the center floor slab is demolished to create an atrium. This method is to bring in some natural elements, such as light and wind.

Constitute elements between old and new.

Fig.14
The original view of warehouse R09.

Fig.15
The warehouse R09 is converted into a office building.

(5) Warehouse S02/S03
□design strategy：partial preservation
□method：enclosure
□Relation between old and new：The building surfaces, “skin”, of warehouses S02 and S03 are integrated to adapt to the form and structure of the buildings in the Park and the regulation of physical conditions.

Constitute elements between old and new.

Fig.16
The original view of warehouse S02/S03.

Fig.17
The warehouse S02/S03 are converted into a library.

(6) Warehouse R04
□design strategy：co-existing
□method：above
□Relation between old and new：The entire roof and space is removed while the L shape wall is preserved. The concept is to create a mega roof with space.

Constitute elements between old and new.

Fig.18
The original view of warehouse R04.

Fig.19
Warehouse R04 is converted into the Taichung City Hall.

(7) Landscape project
□design strategy：co-existing
□method：beside（new piping esthetics）
□Relation between old and new：Newly overhead piping weaves through the historical buildings to satisfy the requirement from the equipment and to form a motif of industrial esthetics.

Fig.20
The new tube system and paving to attach the historical context.

Fig.21
The concept of the canvas ground floor pavement added to provide activities.

4.3. Analysis of the projects

In the projects, analysis of old and new elements, material/color is the highest used element, followed by opening and roof type. In order to transform the original warehouses into exhibition and meeting space, the modern materials and methods are applied to modify and supplement the old buildings. Since the warehouse B05, warehouse B11, and warehouse B09 are historical buildings, the architects partially adjust the buildings and preserve the original appearance; at the same time, they enjoy using their full creativity on the transformation of interior space. Warehouse R04 is dramatically transformed, and with its application of new material and technique in use of space. The landscaping project place emphasis on the esthetics of newly overhead piping, which to adjacent and respond to the existing pipes and buildings. The pipes also highlight the vertical beauty of the historical buildings.

原樣保存	部分改變		部分保存		新舊並置
還原式	內皮層式	中介層式	穿透式	包覆式	上部式

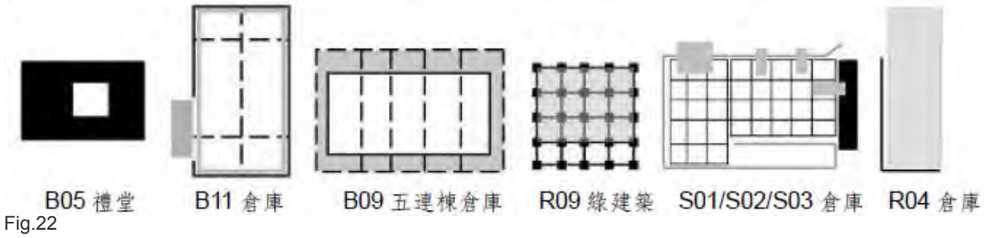


Fig.22
Analysis of restoration and reuse style between old and new.

【Table 1】Analysis of constitute elements between old and new.

□ old elements ■ new elements

	outline shape	structure	height	roof type	Opening	material and color	style
B05	□	□	□	□	□	□	□
B11	■	□	□	□	□	■	□
B09	□	□	□	■	■	□	□
R09	□	□	□	■	■	■	■
S02/S03	■	□	■	■	■	■	□
R04	□	■	■	■	■	■	■
Landscape	□	■				■	□

4.4. Functions of reuse

The management of the Park can be divided into 4 sections. The first section, exhibition area (figure 22, blue area), is now operated by the CCA. The area can be applied for exhibition use, and the exhibition team plans the annual large-scale exhibitions and events in this area. The second section, studio area (figure 22, pink area), is open to designers and artists for residency or use. The third section, design center (figure 22, purple area), is now to establish a a wine museum. The fourth section is office area and library, which is open to the public for using the cultural properties. Furthermore, this year, the culture and creativity shop, theme gallery, restaurants are outsourced, and in the future, the wine museum will be open to the public as well.

Fig.23
The site plane of the Taichung Creative Cultural Park.

Fig.24
The exhibition of Modern Architecture in Taiwan, 2006.

Fig.25
The exhibition of Verner Panton, 2006.

Fig.26
The photo is about the Taiwan Design Expo in 2009.

Fig.27
The exhibition of invisible cultural heritage in the Park.

5. Conclusion

5.1. Multi-methods of restoration and reuse of historical buildings

In the Park, the restoration is to rationally intervene basing on the actual situation, while the reuse is to perform the creativity following the review of historical thinking, design strategy, and constructing method. During the process, not only the authenticity of historical buildings and winery functions is considered, but also both caring and innovative attitudes toward building activation are taken. New and old elements seem to co-exist to form a rational relation in which they are complementary to each other. The preservation of historical value, satisfaction of new function, activation of buildings, and performance of creativity can prove the New-old elements.

5.2. New urban texture form and new industrial form

The successful transformation from old winery to exhibition and cultural space can redefine the urban context. The restored historical buildings can not only extend the memories of history, but also actively provide the public with fine exhibition space and provide the buildings with multi-level variety of space (ex: gallery, lighting, and fixture). As the old winery is the production base of culture and creativity industry, by reusing and activating the industrial heritage, the culture and creativity industry is developed. The reuse project of the Park can be carried out in art, design and cultural properties when founded in the environment of humanity.

5.3 Value of culture and creativity industry and future direction for the Park

Taichung Creative Culture Park is essentially similar to Granville Island Cultural and Art District. Currently, the Park is transforming the wine warehouse into exhibition center and is also planning to transform the winery into the function of wine culture to further invite the business of wine industry. The space of carpentry workshop has been used for structural carpentry courses, which can enhance the cooperation of carpentry and traditional carpentry industry. Due to the convenience of being next to the market, the function of commodity market can also be integrated. Finally, the primary plan for the design museum focuses on the warehouse R12, which can refer to the art studios.

5.4. Suggestions

Most of the events held in the Park are only for public interest, so they are operated by non-profit organizations. In the future, we suggest evolving the Park with “Mixed-use Developments” to invite many sectors to participate in. Through the interaction between the government, civic associations, and artist groups, this symbiotic relationship between culture & art events and profitable recreational equipment is established. Furthermore, the sustainable operation and development can be achieved with the financial support. As a result, we suggest establishing the third legal entity or using the management of trust for the operation, and with the supervision and partial fund provided by the government, it is very possible to benefit each party.

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A Study of Tianjin Binhai New Area's Industrial Heritage

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Abstract
Although China is generally considered to be in the middle age of industrialization, the economic and social structures of coastal cities are changing in some important ways. When faced with rapid transformation and turbulent change, how to properly protect industrial heritage becomes an important and urgent new subject in our cultural heritage protection career. In 2006 the exploration of the Binhai New Area in Tianjin was part of the national Eleventh Five-Year Planning authorized by the State Council. Construction activities are fully underway in the Yujiapu peninsula, which is located in the center of Tianjin Binhai New Area.

There is a common saying that Tianjin shows the most recent one hundred years of the history of China and Tanggu shows the most recent one hundred years of the history of Tianjin. Tianjin is one of pioneers of the China's modern industry. Its important modern industries are mainly located in the Tanggu area as the main body in the Binhai new area inside. By the end of 2012, the preservation situation of Binhai's industrial heritage is more complete, and includes the war industry in the late Qing Dynasty, the nationalization of the chemical industry during the period of the Republic, the new port construction in the period of the Japanese Occupation, and the manufacturing industry after the establishment of the new China. For instance, some of the industrial heritages in Binhai include: the Northern navy dockyard in Dagu, which is the earliest manifestation of the Westernization movement in northern China; the Yongli Soda factory and Huanghai Chemical Industry Research Institute, which were established by the national industrialist Fan Xudong and scientist Hou Debang, are China's earliest national chemical companies and research institutions; China's first telegraph line, which was the starting point of the earliest sea postal line; and Tanggu station on the Tangxu Railway, which was the first standard railway constructed by the Chinese. The Binhai new area of Tianjin is a miniature of China's industrial development and records nearly one hundred years of history of the industrial development in Tianjin.

Keywords: colonial cities, sustainable, building laws and policies

1.Introduction

In the 2012 survey of the world's most competitive city, Tianjin ranked first in the economic competitiveness index out of a total of 120 cities around the world. However, it ranked lower in the social and cultural characteristics index. Why might this be? The likely reason is the development of the Tianjin Binhai New Area. The cultural characteristics of the Binhai New Area are weaker as compared to its economic development. Of course, the cultural soft power should also be considered.

As the birthplace of modern industry in North China, Tianjin has witnessed its industrial process from the beginning. The Binhai New Area, the main part of which is Tanggu, is not only used as a seaport, but is also the base for a variety of industries, such as modern traffic, military activities, saltworks, soda manufacturing, chemical plants, shipbuilding, and so on. In 2012 a general investigation of thirty-six important industries in the Binhai New Area was conducted by the International Research Center for Chinese Cultural Heritage Conservation in Tianjin University. By the end of 2012, industrial transformation had spread to the Binhai New Area, and Tianjin soda factory, Dagu chemical plants, XinHe shipyard, XinGang shipyard, and other large enterprises had moved or were planning to move to the port area. Accordingly, the convergence of industrial heritage and new industries has become an important research topic in the process of industrial restructuring. Therefore, a brief overview of the formation of the Binhai New Area Industrial Heritage group, its characteristics, and value are given.

2. The Growth of Industry in the Binhai Developed Area (Fig. 1)

2.1Historical background

From the middle of the eighteenth century, a war of aggression against China was launched from the sea was by the western powers again and again. Although the dynasties of the past paid much attention to frontier defense[1] , it was difficult to set up defenses everywhere because the coastline stretched for miles. What's more, the Western powers executed strong military attacks, and the Chinese were unable to defend themselves because of poor artillery. Therefore the Chinese were defeated most of the time. Defense from overseas had become the main threat to modern China, which made historical change in China's national defense.

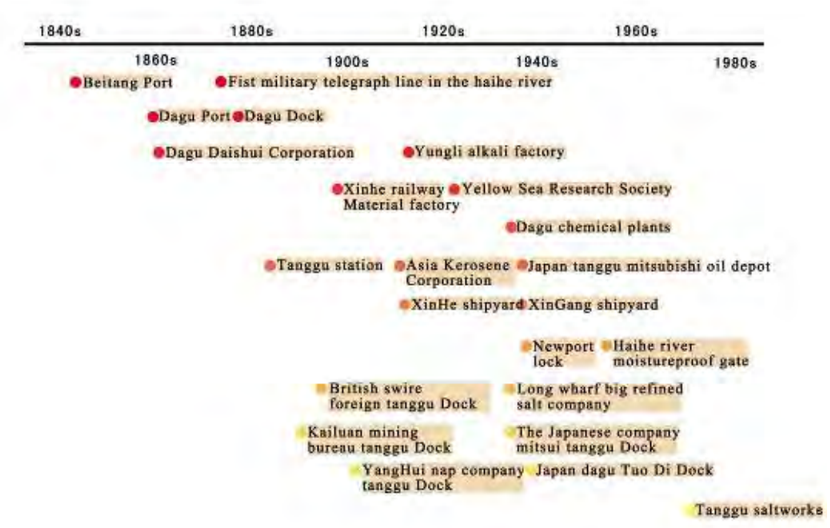

Fig.1
The growth process of industrial heritages in Binhai developed area (Source: Mi Yan)

1 In Booklet of Exchanging Views on Coastal Defense, it was pointed out that "the frontier was guarded in all dynasties, especially the west and north. They were equal in force and power, features and forms. Besides, there were demarcation lines within it to distinguish inner and outer. Nowadays, boarder areas in the southeast extended for tens of thousands of miles connecting Peking and the hinder lands of every province, where trade and missions contracted with facility. The location had special meaning——it pretended to seek peace and ingathering in public while it plotted to occupy and gobble up other countries under the table. Once one country started warfare, others would be involved. In fact, it was safe for thousands of years there."

Faced with invasion from Western powers, various measures were taken by the Qing government to develop the national economy and to promote the modernization of the military, including the introduction of advanced equipment, the founding of the military-industrial complex, the establishment of a new navy, and the purchase and replication of ordnance and ammunition. In addition, students were sent abroad to learn advanced Western technologies. In terms of coastal defense discussion, Hongzhang Li, who had been appointed as chancellor of the warlord government of northern China, concluded that the coastline stretched very far and ports stood in great numbers. If armed units were sent to each port, the military would be scattered and it would cost a lot of money to implement. Based on this, the government decided to fortify and arm Dagu, Beitang, and Shanhaiguan because they were the portals to the capital city and its environs, which was considered to be the most important district to defend. Jiangsu and Zhejiang provinces were considered second important to defend because the Qing government collected tax from these places.[2] Therefore, Tianjin was built as the frontier defense and guard post managed by Hongzhang Li.

2.2 coast defence

During the reign of Ming Jiajing(1522-1566), the Qing government built forts and Strengthened the fortifications in Dagu. Construction also began on the second forts: the Beitang Fort, the northern wing of Dagu's defense system. The Qing Dynasty also established batteries. When the First Opium War (1840-1842) broke out, the British attacked north of Dagu. After the war, the Dagu and Beitang forts had to be refortified so that together they could withstand a double-pronged attack.

With the development of the shipping and military industries in Tianjin, the need for coal, which was the main source of energy, quickly increased. China was forced to import expensive coal because little coal could be extracted from the existing handmade coal pits, and most of it was substandard. In order to guarantee the continual development of military enterprises and to prevent mineral rights from falling into the hands of foreigners[3] , Hongzhang Li suggested that the government should set up a coal industry, and he sent Tingshu Tang to explore potential mining sites. They decided to start mining operations in Kaiping, Luan county, Hebei province. Named the Kaiping Mineral Bureau, it started formally drilling in 1878 and began producing coal in 1881.

The ways in which modern warfare was conducted changed quickly. While Western powers communicated about the progress of battles using the telegraph, China still had to deliver military intelligence by letter. Not only did this mean that China could not conduct timely rescues and make appropriate war plans, but it also meant that military aircraft could be delayed— all of which could lead to defeat. In the fifth year of Guangxu (1879), Hongzhang Li erected military telegraph lines in Danggu, Beitang and Tianjin. After success, Li wrote to the Guangxu Emperor requesting the establishment of telegraph lines in the northern and southern districts that same year. In 1881

2 In Booklet of Exchanging Views on Coastal Defense, it was noted that "it is hard for somewhere to be guarded. The length and breadth of land stretched for miles along the sea and seaports for business stood everywhere. There was no need to set a large number of troops for it consumed great manpower and material resources, and once in short, it would bring about huge damage. Only by distinguishing light and heavy and choosing the vital parts, just as Dagu, Beitang, Shanhaiguan, which were doors to Peking and areas around could we succeed. Areas from Wusong of Jiangsu to Jiangyin were less important than the places above -mentioned as doors of the Yangtze River. Others were much less important ports where less attention should be paid to because they counted little in macro sense. "

3 In the booklet of exchanging views on coastal defense, it was noted that "foreigners who made firearms always bought the whole set of machines with ten more thousands of money, then introduced materials like iron and steel by sea, which was too expensive. It was necessary to exploit coal on the land of China by using the technique from Western countries. In addition, buying machines like huge stoves, air-hammer and pressure tanks made it possible to realize proving the resource of energy for ourselves. "

the General Telegraph Exchange was set up in Tianjin, which became the hub telegraph city at the end of the Qing Dynasty.

As the Beiyang Navy Fleet expanded, the Tianjin Machine Bureau's original dock could no longer handle the fleet's ship repairing and ship building needs. In the sixth year of Guangxu (1880), Hongzhang Li requested the Guangxu Emperor to construct the Beiyang Navy and Dagu Dock in order to serve the Beiyang Fleet and agreed by the Guangxu Emperor in the same year.

In the mid-nineteenth century, pit coal was transported from Kaiping County to Lutai County by animal-drawn carts, and then to Tanggu by ship along the Ji Canal. Core was, at last, available everywhere. Since transportation was limited and costly during the winter months, officials of the Kaiping Mineral Bureau wrote a letter requesting the construction of railways. Hongzhang Li delivered this message to the emperor of the Qing Dynasty. In June, the seventh year of the reign of Qing Emperor Guangxu (1881), construction began on the Railway, which stretched from the Tangshan mine to Xuge County; construction was completed in November of the same year. It was the first standard-track railway built by China and is still in use. In 1887 Hongzhang Li proposed that the Kaiping Tramway should be extended to Tianjin since Dagu and Beitang defenses could be easily damaged. If they were damaged, a railway would ensure that troops could be dispatched in time[4] . This proposal was approved by the Qing government, and in March of 1888 the Railway reached Tanggu. Xinhe and Tanggu stations were set up soon afterward.

2.3 National industry

The rich sea salt of the region was probably the most important component of the Changlu Saltworks in Tanggu and Hangu. People introduced brine into the empty ponds and crystallized it into salt in the sun. But the dry sea salt was of a low purity and costly to produce, so this process could not be used in industrial production. In 1915 the industrialist Xudong Fan began construction of the Chiu-ta (Jiuda) Refined Salt Company in Tanggu, where refined salt was isolated from saline that included calcium ions and magnesium ions by recrystallization.

After World War I broke out, the amount of soda －which had traditionally been imported－ in China sharply declined, and quite a few factories that used soda ash as a raw material felt obliged to suspend production. Because of this, Xudong Fan and several other industrialists were determined to build factories to produce soda in China itself. In 1917 Fan started production, deciding to adopt the advanced ammonia soda process, or Solvay process, to produce soda, but his efforts were blockaded by the Solvay Group. Around the same time, Fan and some other relevant scientists conducted an experiment on soda and finally succeeded in producing them in Tianjin, solving the problem of core technology. In 1918 chief engineer Diaofu Chen traveled to the United States to invite engineers who were good at designing, acting as purchasing agents, or soliciting elites to help construct an soda factory in China; their members included the engineer Debang Hou, who was working on his doctorate in the US. Diaofu Chen then returned to China

4 In Memorial to the Throne for Building Jingu Railway from Navy Yamen, it was noted that there were few defense battalions set around 500 miles between Dagu and Beitang, where there was a definite lack of armed forces. If railway networks were set there, the military could set out earlier and arrive sooner when it received an alert. Stationing a branch of troops would cost more, and so much could be saved. Railways were built for another sixty-five miles to the south of Yanzhuang along the Ji Canal, though the Kaiping Coal Mine Bureau had constructed railways for twenty miles in the seventh year of the reign of Qing Emperor Guangxu (1881), since it was not convenient to transport coal by ship. Soldiers were transported on the so-called Beitang-Shanhaiguan central railway. The railway was built connecting to the south of another, which lay north of Dagu for eighty miles, then the railway lay from Tianjin to Dagu for about one hundred miles. Ru-cheng Mi, Chinese Modern-time Railway History Materials: 1863–1911 (Beijing: Chinese Publishing House, 1963), 131.

with the final design. In 1919 construction began on the Yongli Soda Factory. Some machines that had been specially designed for the factory were produced in the Daxiao ironworks; others were imported from foreign countries. The factory finally began producing snow-white soda ash on June 29, 1926.

In order to solve the soda ash and salt production problem, Xudong Fan founded the Yellow Sea Research Society instead of a laboratory in the Jiuda Salt factory in 1922; scientist Xuewu Sun was appointed as president. The society gathered together a large number of chemical industry professionals. Fan also established several professional magazines like Neptune, which had numerous great achievements in technology research.

2.4 foreign enterprise

Because of the Convention of Peking, UK-France allied forces began using Tianjin as a trading port, and so the number of ships entering and leaving by sea gradually increased. Although the channel between Dagukou and Tianjin was twisty and narrow for one hundred kilometers, fishermen who were familiar with the waterway well acted as navigators to pilot ships for Western powers. In order to monopolized Tianjin's industries, the Dagu Interest - the earliest pilot business - was established by the British in 1865. In 1869, it was renamed the Dagu Daishui Corporation. In 1911 Asiatic Petroleum Corporation set up a subsidiary corporation in Tianjin. Four years later, oil depots were built up in Tanggu, and the district became the hub of transportation and sales. In 1916 the French opened the Yonghe Company to the north of Tanggu, managing large-scale ship manufacture. After switching many times, it became the Xinhe Ship Industry, Which remains in operation.

North China fell after the all-out war of aggression against China was launched by the Japanese in 1937. A new port was constructed from 1939 to 1940 at Tanggu because the left ports could not transport goods and materials in large numbers. Although the port was small, When it was built in 1940, it settled a dispute on the producing and mending of small-sized ships. Tanggu was a rich source of bittern salt, an extract that was needed to produce war materials.[5] In 1940 the Dagu Factory was built in Tanggu, producing bromine, magnesium chloride, and chlor -alkali.

3. The Features of Industry in the Binhai Developed Area

3.1 Military industries were based on coastal defense

Binhai's military industries thoroughly embodied Hongzhang Li's plans to reinforce the littoral batteries and send massive forces to guard Dagu and Beitang, aiming to strengthen coastal defenses and resist the invasion of Western powers. In order to keep abreast of new developments and situations, telegraph lines were set up from Dagu to Tianjin. Guns and ammunition were produced in the Tianjin Machine Office to serve troops with arms. In addition, the Kaiping Mine Bureau served the military industries with resources. The Kaiping Tramway was built both for the transportation of resources and the transfer of troops. The Beiyang Navy and Dagu Docks were constructed to build and mend ships.

Batteries, military industries, telegraphs, railways, and docks were all built to improve the coastal defense system. Weapons and ammunition were provided for the navy by military manufacturing, and docks were built for the making and mending of damaged warships, both of which require

5 Bromide can be used for making knock inhibitor, and this process electrolyzed magnesium is the material of manufacture airplanes.

energy, so the drilling of coal mines and the rapid, low-cost transportation of coal (which in turn promoted the railways) was also needed. These industries act as a chain, as well as a clear path of development.

3.2 The types of industry were based on the ocean's resources and had the distinctive characteristics of Binhai

When many ports opened in Tianjin, the shipping business began growing day by day. Every company in Tianjin used the ports as a base for the transport of goods and materials. As a result, the number of docks gradually increased. When the railways were extended to Tanggu in 1888, many companies set up private railway sidings at the docks, forming transportation networks connecting water and land. Inexpensive resources, convenient transportation, and an abundance of sea salt led to the birth of oceanic chemical industries. Industrial products like refined salt, soda ash, and chlor-alkali were created from the dry coarse salt produced at the Tanggu saltworks, and were sold all over the country using the convenient transportation network .

3.3 Industries were widely distributed along the shore of the Haihe River

Shipyards and docks needed water resources, and thus were spread along the shore of the river and the coast of the sea. The Yungli (Yongli) Soda Factory, the Dagu Factory and the oil depot were situated near the Haihe River in order to take advantage of the convenient transportation (Fig. 2).

Fig.2
Tanggu area industrial heritage distribution (Source: Mi Yan).

4. The Value of the Industrial Heritage in the Binhai Developed Area

4.1 The industrial heritage group includes industries from each period that witnessed the modern industrial development process in Tianjin.

In different historical periods, different industries existed. For example, the military-industrial were built during the Haiphong construction period, the warehousing and transportation industries existed during the Tianjin port opening time, and Newport and its affiliated industries existed during the Japanese Occupation period. The Industrial heritages group in the Binhai New Area reflects the process of industrial development in Tianjin. The character of modern industrial development in China is also in indicated. Unlike Western countries that insisted on market orientation and used light industry the most in the Industrial Revolution, the first industrial development in China

was the military industry conducted using heavy industry, Because of this, China had to advance its industries with a lack of funds and technology.

4.2 The industrial heritage group in the Binhai developed area represented the technology used during - the initial stage of industrialization in China, which was revolutionary at that time.

Several of these industries meant engaging technicians from foreign countries and trying to adopt advanced technology and machines. Many types of production in the Kaiping coal mine, such as drilling, digging wells, water pumping, and coal mining were carried out using advanced machines from other countries, such as the Diamond Drilling Machine, the David Water Pump, and steam machines used for lifting. The normalized unit of British railroad tracks, whose gauge was 4 feet and 8.5inches (1435 millimeters), was used in the Kaiping Tramway. After that, the rest of the country adopted this gauge for transportation.

However, the unit "Yongjiuhuang" was the pioneer of national industries. It not only broke the technology blockage and mastered Suweier's technique to produce soda, but combined the production of soda and ammonia together to invent a new money-saving and rational method called ammonia synthesis production. Huanghai Chemical Industry Institute was the first private chemical industry institute in China, which not only solved the technique problems in Yungli (Yongli) Chemical Institute Company and Chiu-ta (Jiuda) Refined Salt Company, but also trained a group of scientists for a profession in scientific research.

4.3 Industrial development in the Binhai developed area accelerated the urbanization of the districts.

The booming transportation industries, which included transport by both water and land turned Tanggu into a city where goods and materials were easily distributed and business flourished, Mass transit brought people pouring into the city, which contributed to the development of the service industry. The unit "Yongjiuhuang" was set up to promote the construction of urban infrastructure facilities. This development also led to the construction of public buildings, such as Yongjiu Hospital——the first modern hospital in Tanggu in 1920, Mingxing Primary School —— the region's first primary school built in 1925. Between 1929 and 1933 the Xincun Department was built for Tanggu's permanent workers and staff members. The infrastructure promoted the development of cities and accelerated the process of urbanization.

5. conclusion

The results of the investigation show that the Binhai New Area Industrial Heritage group as a typical example not only has diverse characteristics, but also reflects the important characteristics of the military, transportation, and chemical industries in Binhai: the port city where much of China's modernization took place. This is the material embodiment of the cultural position of the Binhai New Area .Furthermore, the region plays an indispensable role in adequately developing cultural soft power.

Acknowledgements

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Selective Interpretation of Chinese Industrial Heritage Case study of Shenyang Tiexi District

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Abstract
The meaning of heritage is multi-explained by selective interpretation. The representation and interpretation of industrial heritage are usually partial and selective due to its special nature. Through the emotion selection and power discourse, the dark or shameful parts are removed while only clean and manageable versions for contemporary purpose are left. This paper takes a typical Chinese industrial region – Tiexi district in Shenyang city as a study case, by analysis of second hand data and interviews, to explore the selective representation of Chinese industrial history. It has been showed that as an old industrial district, the industrial past in Tiexi is rich but complicated. The beginning of modern Chinese national industry can be traced back to the aggression and colonial history of Russia and Japanese imperialism. After the Mukden Incident in 1931, Shenyang became a colony of Japanese invaders for 14 years. During this period, Japanese aggressors plundered Chinese resources to support the war but also left industrial development base at the same time. Shenyang's industrial heritage is marked by distinctive colonial imprint and becomes evil witness of economic resources predatory in Northeast of Chinese by Japanese imperialism. However, this colonial history is ignored emotionally and deliberately in the industrial heritage representation. Instead the national and glorious aspects are illustrated. In addition, as a heavy industrial base, Tiexi district was also regarded as bad environmental and poor living condition region because of industrial pollution for almost half century. But the city underwent great changes in the early 2000s when all industrial enterprises were moved out. Tiexi was transformed from industrial production into commercial and residential use. Furthermore, in 2008 Tiexi won an international award of Habitable City District and an official 'China Habitat Environment Award' in 2011. In this rapid development and urbanization context, the dark sides of industrial heritage are confronted with the desired vision of a better future and therefore were diluted and erased. However, the significance of industrial heritage is to leave an objective and complete industrial past to later generations. From this perspective, in the interpretation of industrial heritage, an open attitude towards the history should be developed and the dark sides be intertwined and in parallel with industrialization should be carefully but clearly presented.

Keywords: representation; dark heritage; China

1. Introduction

Heritage is our legacy from the past that we can pass on to future generations[1] , but it is a highly selective view of a small fraction of possible pasts or envisaged future[2] . Industrial heritage is a new concept that only appeared in recent decades. It emerges with the development of 'industrial archeology' , which originated from Britain in the 1950s[3] . In 2003, TICCIH (The International Committee for the Conservation of the Industrial Heritage) held its 7th congress, in which 'The Nizhny Tagil Charter for the Industrial Heritage' was passed. A international consensus about industrial heritage is defined as[4] :

Industrial heritage consists of the remains of industrial culture which are of historical, technological, social, architectural or scientific value. These remains consist of buildings and machinery, workshops, mills and factories, mines and sites for processing and refining, warehouses and stores, places where energy is generated, transmitted and used, transport and all its infrastructure, as well as places used for social activities related to industry such as housing, religious worship or education.

In the context of a 'post-industrial' society, some components of the natural environment are considered as resources to be experienced in aesthetic or recreational terms[5] . The mines and industrial remains are being set up as tourist attractions[6] . However · people concern more about the glorious historical and cultural heritage as a symbol of rights and art. Old remains associated with industrial technology and industrial productivity is regarded as a transitional product of social development. Industrial regions are considered dirty and dangerous. The landscapes are lack of aesthetic value and seem to be ugly or out of fashion. The obsolete collapsing plants as a sign of economic recession often become the first of removal in urban renovation. For instance, the first reaction in the period following the closing of an area's mines is to erase all traces of the past, to eliminate the old landmarks and the scars on the landscape and, as far as possible, to return to the natural landscape of the pre-industrial stage[7] . On the other hand, successful experiences from western counties are challenged in the different context of Chinese culture and dissimilar stage of industrialization.

The interpretation is not a simple description but rather intended to reveal the intrinsic significance and linkages of things[8] . It can contribute to the understanding of the history, culture and landscape[9] . Interpreters are used extensively in leisure and recreational activities by national parks, museums, historic sites, and industry exhibits[10] . The interpretation has entertainment and educational role[11] , it can enhance the tourism experience and make Build Heritage more meaningful[12] , so that people can understand, appreciate and enjoy the natural and cultural resources[13] . Interpretation is an effective visitor management strategy[14] . It is also very important to correct misconceptions

1 World Heritage Centre UNESCO, Identification and Documentation of Modern Heritage · 2003.
2 Brian Graham, G. J. Ashworth, J. E. Tunbridge, A Geography of Heritage: Power, Culture and Economy,(London: Arnold · 2000), 5-20.
3 Marilyn Palmer, "Industrial archaeology", Encyclopedia of Archaeology, no 3(Sep.2008) : 1511-1521.
4 TICCIH, The Nizhny Tagil Charter for the Iidustrial Heritage · 2003.
5 David Saurí-Pujol, Joan Carles Llurdés-Coit, "Embellishing nature: the case of the salt mountain project of Cardona, Catalonia, Spain", Geoforum · no 26 (February 1995) : 35-48.
6 Stephen Wanhill. "Mines—A Tourist Attraction: Coal Mining in Industrial South Wales", Journal of Travel Research, no 1(July 2000) : 60-69.
7 Myriam Jonsen-Verbeke, "Industrial heritage: A nexus for sustainable tourism development", Tourism Geographies, no1 (January 1999) : 70-85.
8 Freeman Tilden, Interpreting Our Heritage (3rd ed.) (Chapel Hil: University of North Carolina Press,1977): 12-18.
9 William T. Alderson, Shirley Payne Low, "Interpretation of historic sites: Nashville, TennNashville, Tenn" ,American Association for State and Local History,1985.
10 Douglas M. Knudson, Ted T. Cable, Larry Beck, Interpretation of Cultural and Natural Resources (Venture Publishing,1995): 40-60.
11 Gianna Moscardo, "The heritage industry: Social representations of heritage interpretation", Annals of Tourism Research, no 18 (March 1991) : 537-540.
12 Crang Mike, "Magic kingdom or a quixotic quest for authenticity?", Annals ofTourism Research,no 23 (Feb. 1996) : 415-431.
13 Hollinshead, "Heritage interpretation", Annals of Tourism Research, no 21 (Jan. 1994) : 183-185.
14 J. E. Tunbridge, G. J. Ashworth, Dissonant heritage: the management of the past as a resource in conflict, (John Wiley & Sons,1996):11-14..

and prejudices of tourists[15] which is conducive to the sustainable development of tourism[16] . Interpretation plays an essential role in the protection and management of heritage resources.

Heritage is a concept of dissonance due to its multiplicity of different roles and different scales in the heritage concept. Heritage is a complex composed of many elements which include the phenomenon of multiple sales and multi-interpreted. The same resources can be made to be the different products[17] . Like other heritage, interpretation of industrial heritage is often one-sided and selective, to purify the industrial dark side, leaving a better past to meet comtemprary consumption needs. As Massey's view is that “heritage reflects a sanitised recovering of the past[18] ”. A similar point of view is hold by Knox[19-20] . This sanitised image is commodified for public consumption, frequently within a highly-contested process. Johnson pointed out that heritage landscapes need not be “bogus, sanitized and hypnotic renderings of an invented past[21] ”.

Therefore, most scholars doubt about the issue of authenticity of industrial heritage and believe that heritage is reconstructed by created memories and process of commercialization and consumption. The industrial image is displayed and reinterpreted to commemorate, commodify and consumpt by selective industrial history and form the place identify. Historical heritage are taken as the goods consumed by tourists and are represented and symbolized and then become a false reality. There is discontinuity in the landscape of industrial history and heritage tourism. The negative effects of the industrial history are covered and authenticity are under threat while ecotourism, education, quiet lifestyle and high-tech upgrade the image of the city[22] .

This paper takes a typical Chinese industrial region – Tiexi district in Shenyang city as a study case to explore the selective representation of Chinese industrial history. The colonial history and industrial pollution are considered as “Heavy and humiliation”. Tiexi reflects the denial attitude of industrial culture, as well as the existence of a common phenomenon in the industrial heritage interpretation that dark and shameful parts are removed or ignored and only left a version fit for the contemporary needs. This selectivity is the result of emotional tendency and development-oriented and therefore reasonable. However, considered from the point of view of the heritage spirit, the dark sides are special properties of the industrial heritage which should be presentated and explanaed more comprehensive and carefully.

2. Research Method and Background of Tiexi

This research takes Tiexi district in Shenyang city as the typical study case. Tiexi district of Shenyang is a typical case in China - it is illustrative both for its new approaches and remaining deficiencies. Tiexi is called ‘Eastern Ruhr’ with nearly one hundred year industrial history and abundant industrial remains, including industrial urban layout of residential area in south and

15 David T. Herbert. Heritage Tourism and Society, (Mansell,1997) : 22-30.
16 I-Ling Kuo, "The effectiveness of environmental interpretation at resource-sensitive tourism destinations", The International Journal of Tourism Research · no 4 (Feb. 2002) : 95-96.
17 G. J. Ashworth, "From history to heritage–from heritage to identity", Building a new heritage Tourism, Culture and Identity in the new Europe, no 1 (Jan. 1994):13-30.
18 Doreen Massey, A Global Sense of Place' Marxism Today, (London: Arnold,1997) : 2-6.
19 Paul L. KNOX, "The restless urban landscape: economic and sociocultural change and the transformation of metropolitan Washington, DC", Annals, Association of American Geographers, no 81(Oct. 1991) : 209.
20 Richard H. Schein, "place of landscape: a conceptual framework for interpreting an American scene", Annals of the Association of American, no 87 (Dec. 1997) : 660-680.
21 Nuala C. Johnson, "Where geography and history meet: heritage tourism and the Big House in Ireland", Annals of the Association of American Geographers, no 86 (July, 1996) : 551-566.
22 Robert Summerby-Murray, "Interpreting deindustrialised landscapes of Atlantic Canada: memory and industrial heritage in Sackville, New Brunswick", Canadian Geographer-Geographe Canadien · no 46 (Jan. 2002) : 48-62.

factory district in north, industrial enterprise agglomeration, workers living areas. These industrial heritages carry many industrial history in Shenyang and reflect the history process and cultural change of this old industrial base.

In June 2008 and February to March 2010, field researches are hold in Tiexi district government, Tiexi Tourism bureau, Tiexi archive, Shenyang Foundry Museum and Shenyang workers’ village. The formation of industrial heritage is discovered according to literature review and attitudes of different stakeholders such as officials, local residents and tourists are studied by qualitative method including observation and interview. Total number of interviewees is 32 which chosen by purposive sampling method, including 5 officials, 2 museum staffs, 17 local residents and 8 tourists.

Tiexi is a district of Shenyang, which is a famous old industrial city in northeast of China. It has almost one hundred years of industrial history. The urban layout was based on industry planning that factories were in north while living areas were in south. Tiexi area experienced process from industrialization to de-industrialization and then began to recover from 2002. Tiexi area is still in the process of industrialization and therefore it has a lot of living industrial heritage. Its industrial remains not only represent the local landscapes but also compose of the living memories among the local residents and are still having substantial impacts on daily life of ordinary people.

Tiexi old industrial district was established in 1938. It is related with the history of war and the modern industrial formation of Tiexi is the product of colonialism and economic exploitation of Japanese imperialism. From 1905 to 1948, Tiexi has gone through the Tsarist Russia, Japan and the Kuomintang, and occupied by Japan for more than 40 years. After the founding of new China, Tiexi became the important industrial area in Shenyang and Chinese largest and most intensive heavy industry and equipment manufacturing base, known as the " the eldest son of new Chinsese industry, the hometown of the machine”. There were thousands of state-owned enterprises and over 20 million industrial workers in Tiexi.

Before China started its reform and opening-up drive in 1978, the country had two major industrial bases, one was in Shenyang, the capital of Liaoning Province, and the other was in Shanghai. However, in the late 1990s, Shenyang fell upon hard times. Among the 99 large and medium-sized state-owned enterprises located in that city, 90 were located in Tiexi Area. Over 130 thousand workers were laid off there when 90 percent of those enterprises ceased production because of outdated machines and old-fashioned management. The people had to live in crowded slums in the northern part of Tiexi Area while the factory buildings crowded around the southern part. All they had in that district were chimneys, dust and noise.

Since 2002, the local government has been determined to move factories out of Tiexi Area as part of efforts to inject vitality into the old industrial base. The program of ‘moving heavy industrial factories from east to west’ was carried out, which obtained funds for redevelopment of old industrial enterprises by selling the industrial land downtown. 7 billion Yuan has so far been invested into the relocation project which covers 214 industrial enterprises. Commerce and service industries were gradually introduced into Tiexi so as to create jobs and improve the living standards of laid-off workers. From then on, Tiexi area has been in a fast urban reconstruction, the former urban layout based on industry has been changed. Industrial land in the north has been transformed into a commercial land, ‘the tertiary industry of real estate, commercial and modern logistics industry

expand rapidly, taking the place of old industrial symbols'.

Fig.1
The comparison of streetscape along the JianShe Road in 1970s and early 21st century

3. Industrial Heritage in Tiexi

The remained industrial heritage is the carrier of industrial culture. It is a selection and filtering process, in which those do not meet the mainstream demand are naturally deleted. In the process of 'moving heavy industrial factories from east to west', whether retain the old meaningful industrial buildings or not captured the attentions of experts and scholars. The importance of industrial heritage and industrial culture is accepted by government. Conservation of industrial heritage in Tiexi area began in 2002. The authority used 'Eastern Ruhr' as the city's brand, attempting to establish an image of industrial culture. Furthermore, Shenyang foundry museum and the workers' village life museum were opened to develop industrial heritage Tourism in 2007.

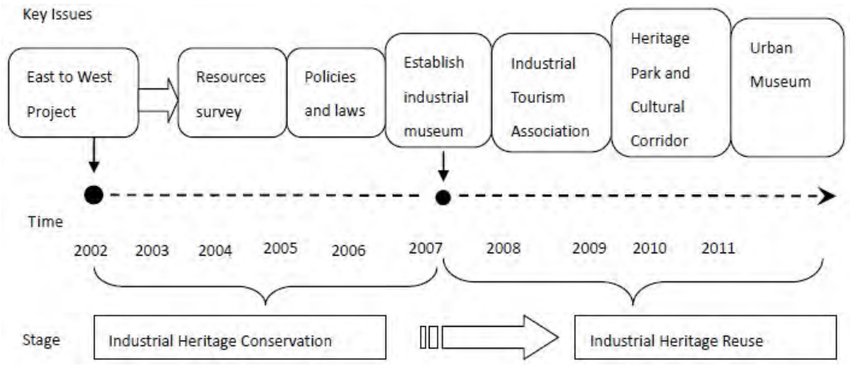

Fig.1
Formation and tourism re-use of Tiexi industrial heritage

"East to West" in 2002 is a key time and event node of Tiexi. Before that it was a typical industrial city of high concentration and integrity. The layout of South House North Factory was distinctive together with the smoke stacks, factories clouds, the roar of the machine and a strong industrial culture. After 2002, the integrity of industrial landscape gradually changeed to a distribution of points and lines. During only ten years, the urban style and culture of Tiexi have undergone tremendous changes.

The protection of industrial heritage by government began in 2005. Shenyang Foundry Museum, Shenyang workers Village living museum, Planning Exhibition Hall and cultural centers and other public cultural facilities have been built. The linear industrial heritage are the Jianshe road from east to west and Weigong River Linear Park from north to south. The points of industrial heritage consist of four categories: 15 units of cultural relics protection, three industrial Museums (Shenyang Foundry Museum, Shenyang workers Village living museum, Tiexi figures Museum), an industrial cultural square (Heavy Machinery Plant Square) and one creative industrial park (Tiexi 1905 Cultural and Creative Industrial Park). Tiexi industrial heritage are strongly emphasized the industrial development after the founding of new China. It combined with landscapes and leisure activities in order to increase the culture and image of city.

4. Interpretation of Industrial Heritage in Tiexi

Industrial heritage protection and tourism development in Tiexi area are supported by government and mainly depend on Shenyang Foundry Museum and Shenyang workers' village. since opened to public in 2007, visitors to Shenyang Foundry Museum are about 60,000 with 30,000 in 2007, 9,600 in 2008 and 20,000 in 2009 (source: statistic of Shenyang Foundry Museum). The number of Shenyang workers' village is 81,143 with 29,761 in 2007, 40,322 in 2008 and 11,060 in 2009 (source: statistic of Shenyang workers' village). Visit to these two museums are free until May 2009. Visitors are mainly in the government groups or tourism groups.

Shenyang Foundry Museum is rebuilt from one workshop of a former Shenyang Foundry Factory. The exhibition museum occupies 40,000m2. The main building is 17,800m2 which is separated into four sections including ten decades of Tiexi industrial history, industrial exhibitions, creative industry and athletics activity center. It reveals one-hundred-year Tiexi industrial history that has developed since 1905 with real industrial objects, articles, pictures, patterns and video profiles.

Fig.2
Shenyang Foundry Museum

Shenyang workers'village is the largest reserved workers'living area in China. In 2007 · government of Tiexi area, in order to reserve historical industrial remains and inherit industrial culture, reserved seven enclosed buildings and changed one of them into today's workers' village life museum. These buildings keep original architectural style according to principles of cultural relic conservation. The exhibition rooms cover an area of 1,500 m2, which recovered the living scenes of the typical residence during the 50th and 90th in the last century. Their recreation and culture in different period are also recovered. It reproduces exactly the three-period workers' village's track from peak to bottom then to redevelopment and represents workers' living symbols and historical industrial culture which are precious.

Fig.3
Shenyang workers‘ village

In the Tiexi industrial development history exhibition, there are five parts according to the time: the first part-heavy history (1905-1948), the second part-flaming age (1949-1966), the third part-wasted time (1967-1977), fourth part-reform (1978-2001), the fifth part-brilliant again (2002-2009). The represention of the Tiexi's colonial industrial history is interpreted as "humiliation and heavy" due to the relation with war, colonialism, and national resistance. It was considered to be for the purpose of purely colonial rule and war plunder. The rapid development of industry was based on the humiliation of the Chinese nation and the blood and sweat of the working class.

When it comes to the industrial pollution, people hold negative attitudes and happy for the disappear of old industrial factories. Tiexi has completely changed the face of the past into today's high-grade residential and office space. Shenyang Smelter Plant was built in 1936, with a complete smelting industrial processes and equipment. Three large chimneys were once the industrial landmark of Tiexi and Shenyang. When Smelter Plant declared bankrupt in 2002, there was a suggestion to retain the transformation of the industrial heritage of the planning. However, for the overall regional development, they were finally all removed.

Industrial heritage is a product of industrialization and industrial civilization. The process of industrialization brought human technological progress and economic development. However, at the same time, there are dark sides, such as industrial pollution, environmental degradation, the colonial history and class oppression. This relationship between industrialization and industrial heritage, forms the emotions of ambivalence. People are tired of industrialization and urbanization as well as missing the rural landscapes and farming civilization. The industry is ugly and should be forgotten even without a trace[23] .

5. Conclusion and Discussion

The selective interpretation of the industrial heritage is a common phenomenon in China. The emotional identity of industrial civilization is lack in China due to the characteristics of the industrial heritage, such as a matter of time, a special course of industrialization, construction quality, industrialization negative impact. First of all, industrial relics produced in modern times with a short time. People do not realize that only a few decades the history of industrial have the same meaning with a thousand years cultural heritage[24] . In the World Heritage List, there are

23 Judith Alfrey, Tim Putnam, The industrial heritage: managing resources and uses, (London: Routledge, 1992):18-27.
24 Leilei Li, Dietrich Soyez, "Evaluation of Industrial Tourism Development of China: form a Western Perspective(In Chinese)", Human Geography,no 18(June 2003) : 20-25.

olny 5 the modern industrial heritage which accounted for only 0.5%[25] . The only ancient industrial heritage in China is Mount Qingcheng and the Dujiangyan irrigation system[26] . Secondly, Europe and other Western countries are the birthplaces of the Industrial Revolution, industrial civilization had a profound impact on the entire social and cultural. Chinese industrial society is short and of smaller influence of culture. In addition, Chinese industrialization began with the obvious external forces from colonial powers of capitalist countries while early industrialization was marked by the colonial imprint. Finally, the negative impact of industrialization with a dark side, makes the industrial heritage ambivalence.

The colonial history is ignored emotionally and deliberately in the industrial heritage representation. Instead the national and glorious aspects are illustrated. However, the significance of industrial heritage is to leave an objective and complete industrial past to later generations. From this perspective, in the interpretation of industrial heritage, an open attitude towards the history should be developed and the dark sides be intertwined and in parallel with industrialization should be carefully but clearly presented.

25 ICOMOS, Industrial and Technical Heritage in the World Heritage List,2009.
26 Cui Weihua, Liu Feng, "Industrial heritage protection from the city planning perspective(In Chinese)". City,no 6 (June 2010):

Economization or Heritagization of Industrial Remains?Coupling of Conservation and Urban Regeneration in Incheon, South Korea

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Abstract
By looking at the heritagization of the old town in Incheon, South Korea, this paper investigates firstly, how the notion of 'modern industrial heritage' has been integrated into the discourse of urban regeneration. Secondly, it examines whether such integration has turned a heritage project into an implicit economic policy. Specifically, it scrutinizes the relationship between the urban regeneration discourses of Incheon in the last 10 years and the process of making the Treaty Port Cultural District (CD), which was enforced in 2011. Thereby, the paper seeks to elucidate a conceptual mechanism that has converted a heuristic attempt to industrial heritage into a development project. Based upon the analysis of the Incheon's experiences, this research proposes that political commitment to decide what values to be evaluated and what rules to be established should be seriously accounted to stabilize a new field of industrial heritage.

Keywords: heritagization; economization; urban regeneration; Incheon; South Korea; conservation

Introduction

By looking at the heritagization of the old town in Incheon, South Korea, this paper investigates firstly, how the notion of 'modern industrial heritage' has been integrated into the discourse of urban regeneration. Secondly, it examines whether such integration has turned a cultural and heritage policy into an implicit economic policy, "whose objectives are explicitly cultural but whose real through covert intention is economic" (Throsby, 2009, p. 182). The paper observes the process that modern industrial heritage has emerged as a new subject of urban regeneration in the midst of a post-industrial urban reformation towards the knowledge-based industries. Thereby, it focuses on exploring an epistemological transformation revolving around the rise of industrial built forms in heritage discourses rather than verifying them as heritage or not. In other words, the paper seeks to elucidate a conceptual mechanism that has converted a heritage project into an explicit development policy and an implicit economic policy. Then, it examines the impact of such a shift on the re-configuration of social meanings as well as urban landscapes. Specifically, this paper scrutinizes the relationship between the urban regeneration discourses of Incheon in the last 10 years and the process of making the Treaty Port Cultural District (CD), which was enforced in 2011.

The Old Town Incheon: Becoming the place of Korean Modernity

Incheon is located at the west side of Seoul facing the Yellow Sea. It is the third largest city in South Korea with almost 2.9 million and the site of the third largest harbor and the biggest international airport. Yet, it used to be a small fishing port until 1883 when it became an open

port, where Japan, China, Russia, Britain and the US created their own concessions and settlements. The port area soon became one of the most international and modernized places in Korea. In 1905 Japan won the Russo-Japanese war and colonized Korea. Consequently, Incheon became one of the Japanese colonial ports. Then, the port and the concession area, which is now called as the old town, became the center of the municipal administration, housing, education and commerce during the Japanese colonization period. Later during the Korean War between 1950 and 1953, the city was heavily destroyed, because it served as a crucial battlefield, where the UN troops landed in order to counter-attack the North Korean troops. After the war,

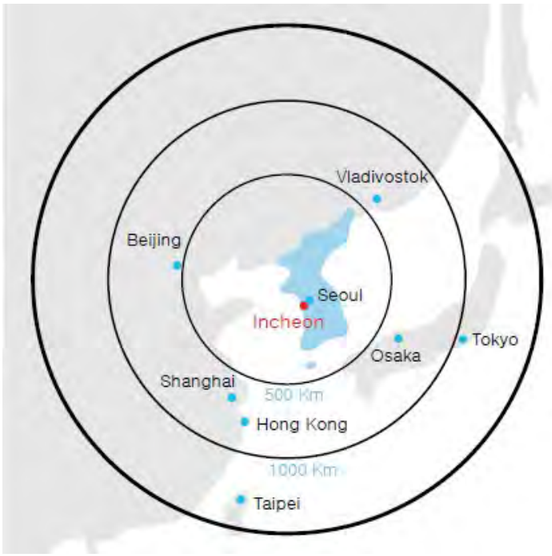

Fig.1
The newly constructed colonial street (Shin, March 2012)

it became an outer harbor city of the Great Seoul Metropolitan Industrial Complex and mainly facilitated the manufacturing industries. Since the mid 1980s, the development of new towns and the degenerating manufacturing industries have made the old town the most de-industrializing and poorest area in the city. Facing the transition of the national economy towards the knowledge-oriented industries, the Incheon Metropolitan Government (IMG) has sought to re-structure the existing industries towards the service and advanced manufacturing industries. For that, the IMG has endeavored to attract investors and talents. In order to appeal to them, the IMG has sought to make Incheon a global city of East Asia, which offers vibrant cultural and touristic services.

One of these efforts is to host the 2014 Asian Games, which is expected to stimulate the service industries and to advocate a new image of Incheon.

Under this municipal vision, the policy think-tank of the IMG, Incheon Development Institute (IDI) proposed to brand Incheon as a “the first modern and historical city of Korea” and to promote the old town as a representative of Korean modernity and cosmopolitanism (IDI 2002, p. 50). Since the early 2000s, there have been a series of regeneration projects in the old town. For example, abandoned warehouses were converted into an art center, one main street in front of the former Japanese provincial office was refurbished as a replica of a street in the early modern period and a fraternity club for foreigners and Japanese banks were renovated as museums. The idea of preserving built forms that were constructed between the late 19th century and the early 20th century evolved into a plan of creating a heritage quarter under the theme of the old treaty port. Later in 2011, the district office enforced the cultural policy called ‘Cultural District (CD)’ in the old town and named it as the Treaty Port Cultural District (CD). This plan was a spatial storytelling scheme to reify Korean Modernity by connecting urban landscapes and historical narratives. Yet, it should be noticed that modernization in Korea is a complicated issue, as its process was concomitant with colonization by world powers, especially Japan, and industrializing processes. Thus, the heritagization of the colonial old town posed a question of how to define the modern and the industrial and what to be remembered as such.

Fig.2
The art centre, which were warehouses during the colonial period (Shin, March 2012)

In general, the modern used to be associated with the Japanese colonization period. Thus, historical remains of the modern period were linked to colonial legacies, which meant disgraceful memories to Korean people. In this respect, modern built forms in the old town were not seen as significant historical remains for a long time. In Korea, it is in the mid 2000s that the authorities have come to see industrial built forms as an object of heritage (IDI 2009; IDI 2010; Kang 2009). The concept of industrial heritage was crucial for planning the Treaty Port CD, because this made it possible to identify industrial remains as historical and cultural assets. In fact, these industrial built forms were generally constructed between the late 19th century and the early 20th century and thus, can be categorized as the legacies of the modern period (IDI 2002; 2003; 2004). On the other hand, the IDI pointed out that industrialization processes in Korea continued till the

early 1970s (IDI 2009). Thus, the definition of modern industrial heritage given by the IDI includes some built forms constructed after the colonial period. In terms of traits of industrial heritage, the IDI adopted the description in the Nizhny Tagil Charter, which attributes it to the demonstration of architectural, technological, social, historical and cultural values of industrial culture (IDI 2009)

Fig.3
The one of the main streets in the old town in the 19th century (Hwadojin Library)[1]

The heritagization of the old town, to some extents, endorsed cultural re-use of industrial built forms, such as using them as cultural centers and museums (IDI 2007; IJDO 2011). Yet, some of these built forms were private properties or some were still used as living and working spaces. Therefore, it should be examined whether living environments of local residents were staged as heritage sites for creating new amenities for the imagined public, in other words, customers and visitors. The emergence of industrial built forms in public policy, or “coming to see” them as heritage sites is a political practice, in the sense that it involves transformation of what has been taken for granted as the contested or vice versa (Lessig, 1995, p.). This heuristic moment occurs when the contexts that used to define the given meanings alter or when re-associations of the given meanings happen. In other words, ‘coming to see’ takes place, when people change social contexts or re-organize interpreting and signifying systems. The Treaty Port CD, which is crucial part of the heritagization of the old town, is about imagining and making a new place. Thus, it involves not only the process of ‘coming to see’ but also its materialization in urban spaces. In this respect, the paper adopts a spatial analysis framework, which inquires dialectical relationship between meanings and material practices (Jackson 1991; Martin 2003; McCann 2002; Mitchell 2000; Muehlebach 2001; Richardson and Jensen 2003).

Overall, this paper approaches the whole process of the heritagization of the old town as a political arena, in which struggles and negotiations about meaning-making and place-making happen. In particular, the paper limits its scope on the process towards the construction of the Treaty Port CD. It focuses on scrutinizing policy discourses about the old town regeneration and heritagization and thereby, it discusses knowledge-making processes and political intensions

1 In general, it means eliminating differences in economic development among places (ibid., p. 67).

embedded in the notion of modern industrial heritage. Based upon such analytical emphasis, the following examines how the notion of modern industrial heritage has been incorporated into the discourses of urban development and its impact on envisioning the Treaty Port CD.

Modern Industrial Heritage as a Toolkit of Urban Regeneration

In 2002, the IDI adopted place-marketing as one method for the old town regeneration (IDI, 2002). Through this interpretation, the IDI approached images and identities of a place as marketable products (ibid., p.50). Then, it advised the district government to identify target customers and to design appropriate products for them. Based on this framework, 'a modern and historical city' was proposed as the identity of the old town (ibid.). The restoration of a hundred years ago of the old town and the reification of the Korean modernity were chosen as focal strategies for accentuating the place identity of the old town (ibid.). In general, the place-marketing framework effectively crystalizes policy agendas and objectives and thereby, contributes to generating feasible solutions and methodologies. It should be, however, noted that adapting the notion of place-marketing in public policy conveys that policy makers and administrators are expected to produce products or to provide services to meet the demands of their customers, such as tourists, capitalists and potential residents. This assimilation of public policy rhetoric into managerial language indicates a conceptual merger or a re-organization of social meanings, which might obscure a distinction between customers and citizens and between the public and the entrepreneurial. Under the notion of place-marketing, the regeneration of the old town and conservation of modern heritage became overlapped.

In 2007, the notion of industrial heritage appeared in policy discourse for the first time in Korea, when the Ministry of Culture, Sports and Tourism produced a report about recycling industrial remains and creating art production zones (IDI 2009). The IDI also produced a report about making the industrial remnants in the old town as historical and cultural assets (IDI 2007; 2009). The IDI proposed to look at industrial remains as part of every day life world, where people experienced industrialism through daily labor and mundane consumption activities (IDI 2009). The IDI asserted that the remains in the old town contained not only architectural significance of the early modern period but also the lifestyles of the early industrialization period (IDI 2007). In order to protect such places from the pressure of demolition and to memorialize vernacular heritage, it proposed to recycle them as museums and cultural centers, which could keep nostalgic memories of the early industrialization period. Under the current industrial re-structuring processes towards the knowledge-oriented industries, manufacturing factories, old commercial districts and industrial belts have been shut down in Korea. Some people have lost their jobs and resisted against mergers and closure of their working places. There have emerged concerns about the disappearing working life, middle class status and optimism towards progress. The IDI's proposal of creating nostalgic spaces reflects uncertainty about the current industrial reconfiguration and self-contemplation of ruminating the modern and setting a new path towards post-modern. Significantly, the framework of place-marketing was adopted as a tool to maneuver the discourse of industrial heritage to fit the urban regeneration vision of the city. Thus, industrial remains were evaluated as valuable cultural resources, which could enhance the place-identity of the old town and attract new visitors and investments to the old town. The place-marketing framework justified the governmental intervention in preserving industrial remnants. It, however, turned the question of how the modern and the industrial should be remembered into that of how they should be customized and sold. Nostalgia became the brand of the old town and old buildings were to offer consumption opportunities for target customers.

In Korea, architectural valorization of vernacular built forms which were constructed between the late 19th and the early 20th century spread to re-evaluation of colonial modernity and industrial culture. This process was influential in policy-making, in the sense that new objects of the cultural and heritage projects were discovered. Yet, on the other hand, such a discovery process was selective, as the place-marketing framework filtered contentious elements of colonial modernity and industrial culture in order to produce salable products. As the place-marketing framework was interpreted as strategizing policy practice as providing target customers with their desired products, historical contextuality of spatiality and historicity of built forms was beautified or romanticized to create attractive places. For example, to what extent do foreign concessions, colonial and capitalistic edifices and segregated settlements represent cosmopolitanism rather than colonialism? Considering that Incheon has been a place of labor movement, to what extent do industrial built forms illustrate experiences of laborers and a repressive aspect of industrialization? The old town heritagization process shows a concomitant process that on the one hand, a new epistemological perspective towards what is memorable history has emerged and on the other hand, this new framework has re-imagined the old town as a historic place that drifted apart from its historical contexts.

In 2008, there emerged a new concern about an integrative urban regeneration concept in Incheon (IDI 2008). The IDI pinpointed that diverse urban regeneration projects were not operated based on a coherent theoretical concept, which might create incongruity among various projects (ibid.). It criticized the major rationale of urban regeneration in Incheon, 'balanced growth' for generating an ambiguous interpretation about 'development' and 'balance' (ibid., p.71). Specifically, the IDI argued that a state of unbalance in a free market economy should be seen as a result of rational choices of individuals, who are free to stay in one place or move to another place according to their own interests (ibid.). It explained that endorsing a state of equal development and balanced growth can be theoretically and practically misleading. Then, it claimed that regeneration projects should adopt a theoretical basis, which enables to conceive scientific and achievable planning. In this respect, the IDI introduced the notion of equilibrium as the integral rationale of urban regeneration projects in Incheon (IDI, 2008, p. 99). According to the IDI, equilibrium means a state of maximized efficiency through operating a well-functioning market system and an effective distribution of a resource system (ibid.). This notion was supported by an example of how a balance between prices of assets and space density finds an equilibrium state and how market prices can adjust spatial density and capital investment into places (ibid.). Despite the IDI acknowledged a necessity of governmental intervention in urban development, basically, it endorsed the idea that market function should lead development.

It should be, however, questioned whether market functions can tackle normative and value-specific cultural, political and spatial agendas, which oftentimes overlap with those of urban development projects. The IDI explained that demolishing shabby low-rising buildings and creating high-rising ones in the old town should balance space density and price of space and thereby achieve desirable urban development (ibid., p.95). Yet, the initial idea about the old town regeneration was not concerned with pursuing a balance between price and density through a market adjustment function. Rather, it aimed to keep its low-density as a way of increasing its value. For that, policy makers tried to discover new historical, architectural and cultural values of old and low-rising buildings. In other words, values and normative ideas attempted to counterbalance market functions and to intervene in price-setting. If the notion of equilibrium becomes a dominant

conceptual framework of urban regeneration, it is likely that any form of conservational, cultural and political projects might be condemned as being unscientific based on a set of subjective notions and values. By adopting an economic theory as a neutral framework, policy-makers and administrators might objectify their own value judgment and decisions about what to be kept and demolished in urban spaces. The growing influence of economic reasoning in public policy should be questioned whether it is used as a means of achieving “apolitical justification for political choice” (Silbey, 1988, p.124). Furthermore, it should be examined how this tendency might influence value transformations and political choices.

Fig.4
The first public park in Korea, which was in the old town in Incheon (Hwadojin Library)

Fig.5
The public park now (Shin, March, 2012)

To sum, since the early 2000s, the historical recuperation of the old town has been associated with its cultural and economic empowerment. Place-marketing justified budget-spending and also crystalized policy directions and strategies for the city government. The city authorities sought to use the history of the old town for boosting the tourism, culture and service industries. Transforming the image of the old town from a ‘degenerated port’ to a ‘modern and historical city’ was seen as essential for spatial re-configuration towards a post-industrial era. The combination of entrepreneurial rationality and scientism provided the conceptual basis of the integration of modern industrial heritage into the old town regeneration in Incheon.

Heritagization of the Old Town and Construction of the Treaty Port CD

In 2007, the IDI conducted research about how to preserve and utilize modern architectural resources in the old town and proposed to enforce a cultural policy called ‘Cultural District (CD)’(IDI, 2007). The CD policy was conceived in 2000 in order to promote local cultural activities and businesses and is regulated by the Culture and Arts Promotion Act. In general, by supporting particular cultural activities and businesses in a locality, the CD policy justifies governmental intervention in offsetting capital-driven urban development. Basically, the IDI recommended to institutionalize old built forms as vernacular heritage sites, which display architectural significance and lifestyles of the early modern period in Korea.

Previously, the early modern period was equated with the colonial era, a dishonorable moment within the national history. Demolishing vestiges of Japanese colonial regimes was seen as a national task. As a result, various built forms, which were built in the colonial period, were intentionally destroyed. However, the IDI emphasized that the built forms of the colonial period

could inspire a new perspective in interpreting the modern (ibid.). As an example, the IDI said that diverse constructions illuminated exogenous contributors to Korean modernity, such as Japanese regimes, western colonial powers, foreign capitals and Chinese diaspora. This approach made it possible to re-interpret the treaty port and foreign concessions and settlements as the place of communication and cosmopolitanism, where Koreans encountered others. Warehouses, sweatshops, embankments, stairs, restaurants, schools, social clubs, hospitals, and temples came to be seen as heritage sites, which people internalized modernity in everyday practices. Overall, the IDI proposed that valuable cultural and historical resources should be protected from the “pressure of development” (ibid., p.162).

In response, in 2009, the district government conducted the feasibility study about implementing the CD policy in the old town in the name of the Treaty Port CD (IJDO, 2009). It aimed to create a heritage district, which would recover social memory and community bonding, form strong place-identity and subsequently tbuttress the market competence of the old town in tourism markets (ibid.). After the feasibility study and the administrative planning were completed, the policy was enforced in 2011. As examined earlier, the IDI suggested that the CD policy should be used for protecting old built forms from the redevelopment pressure (IDI 2007). Yet, at the same time, the IDI supported the equilibrium theory as the modus operandi of urban regeneration in Incheon. Significantly, this notion clashes with the rationale of the CD policy, which prioritizes interventions and corrections of capitalistic development. Thus, the fact that the CD policy was implemented as part of the old town regeneration project entails a tension between cultural and economic reasoning. However, it should be noted that the CD policy itself involves eclecticism for tackling cultural, spatial and economic concerns, as it ultimately aims to construct a cultural environment where cultural activities and businesses are promoted. This eclecticism made it easier for the Treaty Port CD to address conservation and regeneration simultaneously. For example, the rationale of the CD policy validated old industrial built forms as modern and industrial heritage. Then, the spatializing strategy of the CD, such as building regulations and zoning, converted the historical value of old industrial remains into new value-added constructions and tourism products. Thereby, the Treaty Port CD was presented as to seek cultural re-use of vernacular and industrial built forms for regional development.

The main scheme of the CD policy is oriented to zone a special quarter by way of appointing recommended cultural spaces and businesses in a designated district and granting them institutional and financial aids. Such aids are focused on tax-reductions, low interest loans, specialized space regulations and legal exemption rather than direct regulations on built forms. The Treaty Port CD, however, was proposed for preserving functionally non-cultural built forms. Thus, in order to institutionalize such built forms as recommended cultural spaces and business forms, how to facilitate cultural activities and businesses in the venues came to the forefront of the policy practice. According to the administrative planning of the Treaty Port CD (IJDO, 2011), old built forms demonstrate cosmopolitan architectural styles of the colonial period. Thus, those businesses that could revive cultural diversity of the colonial period were regarded as ideal forms for the Treaty Port CD (ibid.). For example, Chinese restaurants, Japanese style inns and Western style bars and cafés, which could revive the memory of foreign concessions and settlements, were recommended as cultural business items fitting to the ordinance of the CD policy.

This re-use strategy as a conservation project can be seen as recycling old buildings as themed urban attractions and amenities. A critical issue is that old buildings would become re-modeled as

a cultural tourism product for the imagined public, while local interests and needs are relatively neglected. The Treaty Port CD administrative planning clearly states that the old town, which lacks industrial infrastructures, should utilize cultural resources to re-structure the local economies towards the service, tourism and culture industries (ibid.). Primarily, the district government was concerned with improving "economic sustainability" of the old town (ibid., p.175). To a significant extent, the Treaty Port CD endorsed economic re-use of culture for local development. This poses a critical question whether, without penetrating fundamental questions of industrial capitalism and economic systems, cultural or spatial policy could effectively conceive alternative economic systems (Bennett, 2006). Cultural policy, which asserts economic transformation by affirming the contribution of cultural values towards economic production, is likely to be subsumed into economic policy and ultimately, threatens its legitimacy (ibid.). In a similar vein, eclecticism embedded in the heritagization of the old town at large should be interrogated whether it caused subsumption of cultural reasoning into economic reasoning. Also, it should be investigated whether eclecticism inevitably led to confusions about the aims subjects and objectives of the Treaty Port CD among the corresponding authorities and citizens.

During the public hearings about the policy enforcement, the corresponding authorities from the district government commented that the project would animate consumption opportunities and thereby, boost the local economy (IJDO, 2011). Simultaneously, a researcher from the IDI emphasized that the policy should be seen as a conservation project, not a panacea for solving various challenges that the old town was facing (ibid.). In response, on the one hand, local residents showed their concerns whether conservation planning might impose more rigid building regulations (ibid.). On the other hand, they were doubtful whether making their neighborhood a heritage district could effectively improve their living conditions and revitalize the local economy (ibid.). Local residents treated the public hearings as a forum to address their concerns about deteriorating living environments, lack of public spaces and infrastructures, inflexible building regulations and declining populations (ibid.). One resident said that the area remained as the same as 60 years ago and regulations should be loosened to develop more public facilities and infrastructures (IJDO, 2011, p. 384). Another resident said that making a good place for residents would eventually attract visitors (ibid., p.385). Other resident expected that abundant consumption opportunities would pull new residents and visitors to the area (ibid., p. 396). During interviews conducted in 2010 by the authors, some residents and local shop owners said that active commercial activities were the only remedy for recovering the local economy. These responses show that local residents approached the Treaty Port CD as a regional development scheme rather than a conservation project. They prioritized economic revitalization, as they felt that the recovery of the stagnant local economy would regenerate the locale. In general, local residents expressed whether a conservation project could tackle economy-oriented agendas.

In brief, the strategic eclecticism, which addressed cultural and historical values for the sake of regional development, justified the enforcement of the Treaty Port CD. Eclecticism, however, challenged the Treaty Port CD to synthesize complicated causalities across social spheres and to unpack them in the language of cultural policy, which resides in its exclusive reasoning and legal realm. The whole heritagization process of the old town, which includes value creation, discourse synthesis, and the execution of the Treaty Port CD, elucidates that economic reasoning can rhetorically convert values into the value-added and thereby, empowers heritage as a catalyst for urban development. This might lead economic reasoning to unify different principles of evaluations and to make itself a dominant value system. The way the Treaty Port CD was justified, envisioned and understood illustrates how a heritage project came to be seen as an implicit economic policy.

Conclusion

This paper has examined the assimilation of the Treaty Port CD into an urban regeneration project. It has demonstrated how the place-marketing framework positioned governmental bodies as product developers, the public as investors and consumers, and local residents as providers of cultural content or service. Governance meant an entrepreneurial partnership between the local government and investors. This re-framing basically resulted from the tendency that economic reasoning and managerial discourses have become a dominant ethos of urban development. Yet, the old town regeneration in Incheon, to a significant extent, attempted to create new values and ethics of conserving old mundane built forms. The whole process of constructing the Treaty Port CD was intrinsically a heuristic and political practice to institutionalize new notions, values and methodology for urban development. Thus, justifying such political thinking in the economic reasoning and management discourses seems to be self-defeating. In effect, the Treaty Port CD re-valorized shabby built forms as cultural assets for the sake of economic re-use of heritage.

The conservation of modern industrial heritage requires scientific knowledge concerning architectural technology and urban design (Loures 2008). In addition, this research highlights that political commitment to decide what values to be evaluated and what rules to be established should be seriously accounted to stabilize a new field of industrial heritage. Especially, the paper proposes that concerned policy should be clear about establishing its legitimacy and practicable regulations based on theoretical consistency.

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Preservation and Reuse of Industrial Heritage along the Banks of the Huangpu River in Shanghai

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Abstract
The Huangpu River is known as Shanghai's mother river. The extensive distribution of industrial heritage sites along both banks of the river has not only great significance in the history of the city's industrial development, but also a profound impact on its urban landscape and cultural character. This paper provides an overview of the evolution and characteristics of industrial heritage along the river and measures adopted in Shanghai for their preservation and reuse.

Keywords: industrial heritage, preservation, reuse, Huangpu River, Shanghai

Shanghai rose as a river town with a wealth of cultural heritage along the banks of the Huangpu River. The historic riverfront has long been a symbol of the city. Up until the end of the last century, much of the riverfront areas had been occupied by factory buildings, warehouses, wharf structures and shipyards, which resulted not only in waste of land resources and ecological degradation, but also a landscape of desolation and rundown buildings, with local residents being prevented from being close to the water. Beginning in the 1990s, a period of rapid transformation of functional and spatial structures of the Huang River riverfront began alongside the development and opening up of the Pudong area.

1. Historical Evolution of Industrial Development along the Huangpu River

As a result of the 1842 Sino-British Treaty of Nanking, Shanghai became a treaty port opening up for foreign trade. Areas of foreign concessions in Shanghai were granted to the United Kingdom, the United States, France and other countries which brought about increased volumes of international trade. Due to lack of rail and road transportation, waterway transport became a primary mode of moving the goods and people.

Shanghai occupies a central location in the Yangtze River Delta and China's eastern seaboard, with close connections to the vast hinterland of east China through the Yangtze River. The Huangpu River, which meets the Yangtze River just before it empties into the sea and is known as the mother river of Shanghai, is one of the earlier dredged and maintained rivers recorded in Chinese history and flows for 114 kilometers through Shanghai with a width of roughly 400 meters. By the end of the 19th century, there had been a steady increase of docks and warehouses densely built along the river to cope with growing river traffic, witnessing the production and export of silk, tea, cotton and agricultural products, as well as imports of kerosene, coal, industrial equipment, and even opium which accounted for major volumes in the early years of trade.

By the 1930s, Shanghai had become a cosmopolitan city serving as the financial and shipping centers of the Far East. Most of the riverfront development clustered in areas from Fuxing Island to Longhua Wharfs on the west bank and from Pudong Donggou to Zhoujiadu on the east bank (Pudong side) of the river, creating functional divisions of the Bund Finance and Commerce district, Hongkou Wharfs, Pudong Xinhua – Minsheng Wharfs, the Lao Bai Du Wharfs, Yangshupu Industrial District, South Shanghai Industrial District and Longhua Airport area.

After 1949, Shanghai became the economic center of new China, seeing further development of its shipping and manufacturing industries. The riverfront industrial areas extended upstream to Minhang and Gaoqiao and downstream to Baoshan. The three industries - finance and commerce, shipping, and manufacturing - were the most representative of the industrial and business activities along the Huangpu River, playing a significant role in Shanghai's economic growth and urban structure and forming the foundation of Shanghai as a modern city with three core economic functions.

2. The Industrial Heritage along Banks of the Huangpu River

2.1 Overview of Riverfront Industrial Heritage

Industrial heritage sites in narrow and contiguous strips along the Huangpu River account for a majority of industrial remains in Shanghai. Such a concentration was largely the result of two factors. First, given less developed road and rail systems, waterway shipping became an inexpensive and reliable means of transportation to support industrial growth, greatly reducing costs for shipping raw materials and finished products. Second, proximity to water was also necessitated by manufacturing processes, e.g. cotton textile mills needing large amounts of water for production, power plants needing water for cooling and condensation, water works requiring good quality source water and large shipyards needing to be close to the river. Thus, over the course of more than a century, the Huangpu River remained the central axis of Shanghai's economic and industrial development and the emergence and growth of industrial enterprises along the banks of the river fundamentally changed the old subsistence economy previously characterized by traditional cottage industry in southern China.

The government policy for Pudong development initiated in the 1990s and the 2010 World Expo in Shanghai presented two historic opportunities for transforming the functional layout and spatial structure of urban space along the Huangpu River. The industrial enterprises along the river mostly fell into two categories, i.e. heavy industry and traditional manufacturing, taking up much land space and being heavily polluting. Many SMEs lacked advanced technology. In the economic and policy context of the new era, many of the ailing manufacturing enterprises were gradually phased out, while shipbuilding, steelmaking and other pillar industries were relocated in accordance with new area planning.

Studies have shown that the large industrial areas along the Huangpu River were rare examples of a small number of remaining riverfront industrial heritage zones around the world. In the 15.5-kilometer stretch of riverfront within Yangpu District downstream on the Huangpu River alone, there were rows of densely built docks and industrial warehouses with floor areas totaling more than one million square meters, which filled almost all available riverbank spaces. A little upstream, the 2010 World Expo grounds on the riverbanks and beyond overlap many strips of former industrial land, on which large-scale old industrial buildings of Jiangnan Shipyard, Shanghai No. 3 Steel Works and Port Machinery Plant have been kept as historical and cultural remains

for perpetual preservation, conserving the heritage base of modern industries in the riverfront landscape of the 21st Century Shanghai.

In order to carefully evaluate the industrial heritage sites for preservation or reuse, Shanghai has established evaluation methodologies based on a matrix of cultural, social, economic and environmental indicators and unique mechanisms for site investigation and assessment, drawing upon past experiences in the city's urban renewal and redevelopment. Up until now, a total of more than 400 buildings on 63 heritage sites along banks of the river (heritage buildings on the Bund not included) have been designated as buildings under preservation, of which more than 50% are industrial, warehouse, transportation and utility related structures. Such a ratio of industrial remains is prominently higher than that in other areas of the city. In fact, the identification and designation of historical and cultural heritage sites along the Huangpu River, in the process of urban planning and development, is work in progress. Judging by the number of preservation and reuse projects so far completed, the actual number of industrial heritage buildings under preservation and adapted for reuse far exceeds the number in the published inventory. (Fig.1)

Fig.1
Map of Distribution of Industrial Remains along the Huangpu River

2.2 Characteristics of Riverfront Industrial Heritage

In Shanghai in the modern era, the colonial building styles of foreign concessions and traditional architecture in the old town, new building materials and technologies and traditional wood frame technology, modern Western architecture concepts and rigid traditional rules and closed thinking, created contrasts and were nonetheless unified and mutually accommodating. Such juxtaposition and convergence of contrasting elements gave birth to the diversity in architectural styles and forms in modern industrial buildings.

Traditional Residential Style

Early industrial buildings evolved from traditional residential buildings. Although new technologies

of the late 19th century were introduced with extensive use of different structural forms including brick and wood frame and bent structure, the external features continued to be dominated by traditional brick walls without plastering, wood windows and doors and pitched roofs. Buildings C and E at Huangpu Wharf in Yangpu District are examples of such style. (Fig.2)

Fig.2
Original exteriors and internal space of buildings C and E at Huangpu Wharf in Yangpu District.

Western Classical Style

Given diverse cultural influences, some industrial warehouse buildings demonstrate obvious characteristics of the Western architectural styles. The United Warehouse at No. 725 Wai Maloo, for example, was built in 1930 in the eclectic style with concrete frame structure and exterior brick walls. The building façade shows three sections, with the bottom section featuring huge columns, middle section a vertical division sequence with characteristics of modernism, and the top section the cornice. Decorative patterns in simple forms were added to spaces between windows. Three entrances (primary and secondary) of arch structure had elaborate, decorative patterns and solid columns with vertical hollow grooves (fluting) showing neo-classical features. (Fig.3)

Fig.3
Exterior and Façade of United Warehouse building

Modern Minimalist Style

Modern industrial buildings appeared in Shanghai in the 1920s, featuring box-shaped design, mostly using reinforced concrete structures or steel structural frames, with simple and clean building façade and dimensions conforming to standard building modules. The three-story buildings A and B at Huangpu Wharf in Yangpu District, for example, were built in 1911, which had beamless reinforced concrete floor and roof with a height of 14 meters and two reinforced concrete stairways leading to the second level. They had exterior stucco walls with concrete frames exposed and flat roofs. (Fig.4)

Fig.4
The original exteriors and façade of buildings A at Huangpu Wharf in Yangpu District.

3. Preservation and Reuse of Riverfront Industrial Heritage

The riverfront areas along the Huangpu River are symbolic of Shanghai's urban functions and form, and are key areas of the city's future development. In 2002, the Shanghai Municipal Government set up a "Leading Office for Development along the Banks of the Huangpu River" to provide overall guidance and coordination on urban renewal and development in areas along the River. The Master Plan for Riverfront Districts along the Huangpu River clearly defines the overall development objectives - adjustment of industrial structure and improvement of environmental quality of the waterfront areas, highlighting the need to create unique riverfront landscape and environment through preserving city's historic lineage and tapping into its cultural heritage.

Following the implementation of renewal and development plans for the South Bund, the North Bund and the 2012 World Expo area, comprehensive renewal and redevelopment have begun in riverfront areas in Yangpu, Xuhui and Pudong districts. Shanghai, through its urban development practice, has gradually established an evaluation system based on four sets of indicators for historical, scientific, artistic and reuse values, for evaluating the huge number of widely distributed industrial remains and sites with unique features along the river, attaching importance to the integrity of historic spaces and their accommodation in the environment.

3.1 The Guiding Principles for Preservation and Reuse of Industrial Heritage

The principle of sustainable development. The old industrial layout along the Huangpu River was inefficient in land use, liable for high costs in pollution cleanup and unsightly in the riverfront landscape, greatly hindering sustainable development of riverfront districts. Redevelopment planning requires, in the reuse of industrial heritage, proactive coordination with industrial restructuring, adoption of clean energy and green technology and sustainable development of areas along the Huangpu River.

The principle of holistic preservation of historical environment. Given high concentration of industrial remains in riverfront areas, redevelopment planning requires balanced considerations for the preservation of individual historic buildings and preservation of the historic district as a whole. Preservation measures integrating functional development and creation of open public spaces should be adopted to achieve distinct themes and functional enhancement of riverfront heritage.

The principle of adaptive re-use. Redevelopment planning requires maximum retention and preservation of industrial heritage buildings and their historic features as prerequisite for appropriate use of new spatial and functional elements to revitalize industrial heritage buildings and allow their integration into contemporary urban life.

The principle of holistic preservation of industrial culture. Industrial heritage in its broad sense includes factory production equipment, furniture and fixtures, other movable objects, historical archival materials as well as intangible assets such as industrial processes. Unlike immovable industrial heritage, such industrial remains are prone to loss and destruction in times of change. A survey has found that traditional production methods are still used in a number of factories in Pudong, which provides a living record of industrial evolution. As an important aspect of heritage preservation, necessary measures should be adopted to encourage these factories to preserve their traditional industrial processes, while participating in economic development.

3.2 Cases of Preservation and Reuse

This paper cites three cases most representative of renewal and reuse of historic wharfs. Common to these cases are the combination of comprehensive waterfront enhancement and transformation of industrial land functions, a typical redevelopment trend, and the unique “post-industrial landscape” created by integrating historic spaces and modern functions. Through careful study and appropriate reuse of industrial heritage sites and buildings, long abandoned and desolate old wharfs along the Huangpu River are gradually transformed into attractive public spaces.

South Bund (Redevelopment project near completion)

South Bund is an area of the earliest docks in Shanghai, which had served dock functions before Shanghai became a treaty port opening for international trade. Prior to the redevelopment project, the riverfront area had long been compartmentalized by fruit wholesale markets, a garbage dump and transport terminal and a host of factory buildings. It had been an area of rundown buildings and desolation with few public facilities and green spaces. The evaluation of South Bund’s heritage resources, conducted at the outset of the project, found that the area had unique historical and cultural features because of its maze of old streets and alleyways and legacies of some of the historic buildings. First, the 20 remaining streets, all at right angle to the riverfront in the project area, corresponded to street layout recorded in historical documents dating back a century. 11 of these retained original street names which were named after the wharfs, reflecting a distinct dockside legacy. The redevelopment plan requires preservation of all old streets and their original names, as well as their original dimensions, density and layout through zoning control, making possible the holistic preservation of historical texture and layout of the South Bund. Second, in addition to six historic buildings previously designated for preservation in government registry which include Dongjiadu Church, Old Customs Office, and Merchant Shipping Guild Building, 14 warehouse buildings were newly identified as worthy of preservation. These warehouses were

built in the early 19th century with solid structure, cavernous spaces, and unique architectural forms. They were eventually all retained and adapted, with necessary repair and renovation, to become spaces for public service, following experts’ evaluation and recommendation. (Fig.5/6)

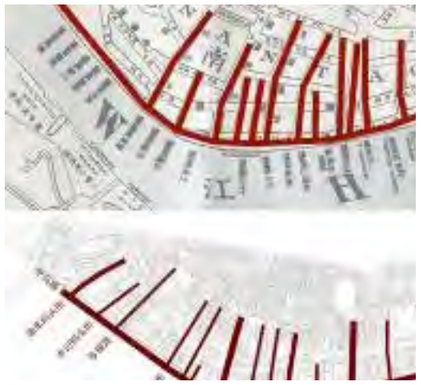

Fig.5
Historical street layout of the South Bund

Fig.6
Block scene of the South Bund after partial completion of redevelopment

East Wharf (Project completed)

East Wharf (formerly Huangpu Wharf) is located east of Qinhuangdao Road in Yangpu District and was originally built by the Japanese owned South Manchuria Railways Co. It served as a water-gate for the 2010 World Expo in Shanghai. The four 100-year-old warehouse buildings on the project site were originally built at the turn of the 20th century. Although once in serious disrepair, these buildings with unique architectural forms, traditional façade finish and the ancillary equipment and facilities have tremendous aesthetic and historical value worthy of preservation. The repair and renovation work proceeded according to the principle of preservation, remediation and appropriate reuse, achieving comprehensive remediation and restoration of the heritage warehouses and a perfect blend of authentic historic features with practical modern functionality. Following assessment by the Shanghai Cultural Relics Management Committee in 2010, two of the heritage warehouses which were more comprehensively restored (Buildings A and B) were added to the city government list of heritage buildings under preservation. (See Illustrations 3, 4, 7 and 8) (Fig.7/8)

Fig.7
Buildings A and B following protective restoration

Fig.8
Building A following protective restoration.

Minsheng Wharf (Project in design planning phase)

The wharf at the end of Minsheng Road, once the largest wharf in Asia, was originally built more than one hundred years ago with British investment and named Blue Funnel Line wharf. There

were 11 industrial buildings remaining on the project site, with a total floor space of 92,000 square meters. These 11 buildings, constructed over a period many decades from the early 20th century through the 1990s, were of significant value worthy of comprehensive preservation. Two of the buildings of more than 100 meters in length contain concrete grain silos of 50 meters high, with a total floor space of over 92,000 square meters. Such building type, with strong visual impact as a landmark, was rare among all industrial remains in Shanghai. The redevelopment plan requires transformation of Minsheng Wharf functions on the basis of preserving all remaining industrial buildings at the site, highlighting their voluminous space and building cluster, retaining and reusing original wharf facilities, so as to create spaces with unique cultural character and historical authenticity. (Fig.9/10)

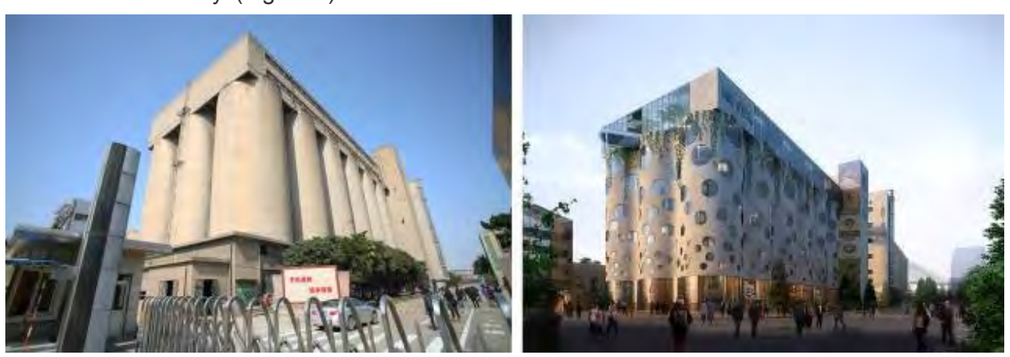

Fig.9
The current state of the 80,000-ton capacity grain silos and reuse plan

Fig.10
Master plan for comprehensive redevelopment of Minsheng Wharf site.

Conclusion

Industrial heritage sites with historical and cultural significance are important embodiment of the city's cultural identify and spatial character. The urban landscape along the Huangpu River in Shanghai is epitome of the city's historical, cultural continuity and enrichment, in both spiritual and physical legacies, constantly evolving as time moves on and society progresses over the past century.

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Industrial Heritage and Urban Regeneration in Italy: the Formation of New Urban Landscapes

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Abstract
Experiences of urban regeneration in Europe and in Italy have involved large-scale areas that have led to new urban landscapes.

In the beginning, regeneration plans were not interested in the reuse of former industrial structures, because of their negative image: public authorities and local communities did not pay any attention to the conservation of industrial remains. More recently, during the 1990s, a new perception of manufacturing buildings and mills emerged, as examples of the cultural heritage arose. Industrial sites ceased to be obstacles to be erased, and began to be seen as opportunities to be exploited, in order to increase the quality and value of projects.

While the industrial heritage has become a resource in the regeneration of towns and cities, there are several questions as regards the criteria for its protection: To what extent have certain values of the former manufacturing landscape been conserved? What have been the fragile elements whose destruction it has not been possible to prevent? Have the new architectural interventions been conceived in line with what remains of the image of the industrial town, or do they exist in visual and/or functional conflict with the former surviving structures?

To answer these questions, we will look at four Italian towns and cities where the rehabilitation of the manufacturing heritage has played a fundamental role in the creation of a new urban landscape: Sesto S. Giovanni, Rome-Ostiense, Carbonia and Ivrea represent exemplary case studies to compare the following:

- -the different combination between conservation and transformation which has been applied to reconversion projects which are to be the subject of our analysis;
- -the degree of consistency between the new functions assigned, and the kind of former manufacturing spaces that have taken them on;
- -the role of town planning in the development of the new urban landscapes which came into being from the reuse of former industrial territories.

Keywords: industrial heritage; industrial landscape; urban regeneration

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SESTO S. GIOVANNI

Sesto S. Giovanni, a 20th century industrial town, is interesting for several reasons.
First, because of its candidacy for inclusion in the Unesco list of World Heritage Sites, in the category of «developing cultural landscapes ».

The proposal for its inclusion on the Unesco List is based on the following criteria: criterion III (offering unique evidence of a cultural tradition) ; criterion IV (offering an eminent example of a type of construction or architectural, technological, or landscape assemblage); and criterion VI (being directly or physically associated with living events or traditions);The second reason of interest lies in the fact that evaluating this heritage in terms of an « evolving landscape » demands a new approach, able to combine conservation and transformation.

The sites that are the subject of the candidacy are mainly located in three major industrial zones which have marked the industrial history of Sesto: the Breda area, the Campari area, and the Falck area.

Museum of Industry and Labour (Breda Area)

Breda was a mechanical firm which developed a multi-sector production: railways, metallurgy, and aeronautics.

The site occupied by Breda is totally transformed today. The remains that hark back to its industrial past are the MIL (Museum of Industry and Labour) and its Park, with a bridge crane.

The Museum of Industry and Labour has been set up inside the former Stores building.

The conversion project, devised by the architect Luigi Cucinotta, transformed the former structure into a Museum documenting the town's evolution from a small market town to a modern centre of industry. Furthermore, the archive of Giovanni Sacchi, a great artisan who made the models of the most important products of industrial design in Italy, has been transferred to the MIL. Thanks to the intermediate step of his wooden models, most of Italy's architects and designers (Aldo Rossi, Marcello Nizzoli, Achille Castiglioni, Ettore Sottsass and Marco Zanuso) were able to develop and perfect their products.

Campari Gallery

Inside the building that was once used to make the Campari aperitif, an exhibition space was opened on March 18, 2010: the Campari Gallery. The space was arranged with interactive and multi-media displays, showing visitors the evolution in advertising for Campari's image by means of the expressions of modern and contemporary art.

Falck Area

Falck, which takes its name from its founder, Giovanni Falck, is a metallurgical firm founded in Milan in 1906. It used resmelted scrap metal in its electric arc furnace (EAF) as an alternative to single-cycle iron- and steel-making, or using blast furnaces. The EAF allowed the production of every kind of steel, from the most common to special steels.

The Falck company grew to a huge scale. The surface area of the steelworks exceeded 1,300,000 sq mt. Only a small part of the Falck heritage has been reworked so far.

The most important intervention is the reconversion of the "MAgazzini GEnerali" (General Stores) into a display space (MAGE). Very recently, MAGE developed a new project, called «TempoRiuso»

(Temporary Reuse), to make its space available for fashion designers, other designers, and craftsmen: following an open competition, 15 winners were selected and were granted contracts for the temporary (3-year) use of a workshop of their own, for start-ups, at no charge.

But Falck also means major industrial buildings for the production of steel. This is where the major challenge is played out over the conservation of the industrial heritage of Sesto S.Giovanni. What is to be done with such large spaces? And, above all, how is the Unesco candidacy of this heritage site to be harmonized with the project drawn up by Renzo Piano and named “Oltre il Muro della Falck” («Beyond the Walls of Falck»)?

Under the plan put forward by Piano, there would be a major North-South axis (Viale Italia), which is the backbone of a renovation plan; in place of the former factories, there would be hyper-technological skyscrapers to house universities, research centres, public administration offices etc. A large-scale park is envisioned, almost one million square metres in size.

The main industrial buildings will be conserved to protect the memory of a place which has forged Italy’s industrial and social history. In particular, the T3 and T5 steel-works will remain as «ruins» of industrial archaeology, and their monumental scale will be safeguarded by preventing their redesign for utilitarian functions. Moreover, there are plans for « excavations » in the grounds (Pompei) to reveal the foundations on which the machinery and equipment of the steel-works rested. The area will become a true industrial archaeological park.

On close inspection, one does not see in these plans any special attention for evidence of metallurgical activity. Apart from the spectacular setting, the ruins, and an archaeological park, behind the full respect for the structures there seems to be a certain lack of interest in the new role which these buildings and features could have. We are very far from the concept of adaptive reuse, which could represent a slightly less rigorous choice, but one which at least poses the question of how the built features could function in the present time.

In the landscape proposed by Piano, which in its own way is a new landscape of production, dominated by technology, ecology, and new sources of energy, the former factories are set to play a residual role as relics. They may have a charm of their own, but they remain alien to actual life.

ROMA OSTIENSE

Rome became the capital of the state of Italy in 1871, and began its efforts at modernization. The Testaccio-Ostiense zone, in the south of the city, became the destination of new facilities and infrastructure which are typical of cities in the industrial era :

- the Testaccio workers’ district (1883)
- the «Mattatoio», Livestock Market, and abattoirs (between 1888 and 1891).
- the Warehouses (1912),
- the Montemartini power station (1912),
- the Wholesale Markets (1921).

Today, Testaccio-Ostiense represents a full-scale town planning laboratory.

Under the new planning scheme, drawn up in 2000, the perimeter of the urban conservation area was expanded, and went beyond the perimeter of the «historic city centre» (the oldest part of the city, normally physically and morphologically delimited by the city walls) and encompasses

all of the «historic city ». Its extent even includes the districts that were built in the 19th and 20th centuries.

This led to the beginnings of interest in industrial zone of Testaccio-Ostiense as a «laboratory» to use «conservation» and «transformation» within a single project.

Mattatoio

The Mattatoio (1888-1890) consists in two zones: the Foro Boario (Cattle Market, the site where livestock were inspected prior to slaughter) and the Abattoir.
Three arcades mark the main entrance: inside, there are large blocks, with a roof made of Marseille tiles, supported by Polonceau-style metal rafters.
The Mattatoio ceased operating in 1975. After almost 30 years of abandonment, in the framework of the Marconi Ostiense Urban Project (2003-2005), there were plans for its conversion into a “City of The Arts”. This was a large-scale project as a public initiative (City Council, University of Rome 3, and MACRO: Rome’s Museum of Contemporary Art). The projects envisage the following:

- the new Academy of Fine Arts (project)
- the “Alternative Economy City”; organic agriculture and fair trade market, offices for ethical finance, free software, and responsible tourism. All these activities were located in the spaces which housed livestock;
- Macro Future (or Macro 2), a new exhibition space;
- a Centre of Cultural Production in the pig-skinning facility ;
- the new Faculty of Architecture (in the process of being built)

Montemartini Power Station

The first signs of the conversion of the Montemartini power station, which began operating in 1912, into a multi-functional centre were seen in the 1980s.

The complex was reopened in 1990, after a restoration which allowed the preservation of the two diesel turbines and the control equipment; it was also possible to restore the decor and mosaics on the ground floor.

In 1995, one initiative here, almost accidentally, determined the fate of the Montemartini power station for all time: the opening of a temporary exhibition of ancient sculpture from the Capitoline Museums, kept at the Palazzo dei Conservatori (which needed lengthy restoration work). The exhibition was supposed to end after three years, but it became permanent. The Montemartini power station thus became a permanent archaeological museum.

It has been argued that the arrangement of the works, in what was designed as a temporary display, is in some way inconsistent in terms of museum design. However, the novel effect has been extraordinary, and the Montemartini site is today the most famous example of renovation of an industrial heritage site in Italy.

One may debate whether the alliance between classical archaeology and industrial archaeology is a success. Yet, if one considers that the ancient statues are copies of even older Greek originals, and thus themselves the product of a « serial » process, the juxtaposition between these statues with machinery, and their moving parts, is less unusual: both are the consequence of serial

reproduction processes which are typical of the industrial system.

Mercati Generali

The wholesale markets (Mercati Generali), which were first built in 1910, are located near the river port and the Rome-Ostia rail station. In this new structure were grouped together the different markets which were previously located at various, separate sites in the city. It was divided into two sectors, one for fruit and vegetables, and the other for fish, separated by a connecting track. After the markets were moved elsewhere in 2002, the site of the former wholesale markets was the subject in 2007 of a preliminary project to turn them into a major poly-functional centre (plans by Rem Koolhaas).

The building will be restored in its current form, and part of it will be given over to new office space. But new buildings will be built, as well as a multi-storey car park, a 2,400-seater conference centre, and a multi-screen cinema (seating 1,300 people).

Koolhass' plans only exist in sketches, and these are insufficient for illustrating the plans in detail, but they are fully representative of his approach to disused industrial sites.

Instead of seeking patient solutions, in line with, and consistent with, the identity of the sites and the former buildings, Koolhaas envisages a sort of voluntary obliviousness of the spirit of places, a halt to the long historical processes which, layer by layer, ensure the evolution of the urban fabric by slow variations. According to Koolhaas, the new project is no longer a new layer that is added, but marks a jump away from any evolutionary connection with the past, although without wanting, for that reason, to claim a new beginning. The «generic city» which Koolhaas theorizes is a city that stands outside of time and history, a city which excludes all traces of memory.

CARBONIA

Carbonia is a « foundation town » created by fascism, as a result of the discovery of a coal field in the Serbariu area, around the end of 1936. The scale of the coal deposit is such that the government made plans for the creation of a workers' town at the mine. Thus, in 1937, work began on opening a mine workings at Serbariu, and to build a new town (Carbonia) along the lines of a company town.

In terms of the organization of pit, and the architectural quality of the buildings, the Serbariu mine can be compared with their best examples of mining sites in Europe :

- the headframes and their winching chambers are situated symmetrically around the lamp room, the large building where the miners got changed on their return from the underground workings ;
- the kind of metal headframes, 35 metres high, is the typical kind with external winch cable; conveyor belts took the mined coal to the separation tanks;
- the designer of the plans is not known, but the influence of 20th century rationalism, which can be fully seen in the town, is evident.

In the beginning, the town's layout, drawn up by Cesare Valle (engineer) and Ignazio Guidi (architect), was designed to house between 12,000-15,000 people, and aimed to establish a system of relations of proximity between the production sites, residential sites, and public services. The town, connected to the mine by a converging system of streets, was built in less than a year

and opened in December 1938.

Surrounding the new monumental square (Piazza Roma) stand the church, the town hall, the Theatre, the Casa del Fascio with the Littoria Tower, the post office etc.

There is a clear reference to the Howard model of garden cities :

- the concentric design is echoed in the « fan » arrangement of the three districts around the town centre ;
- instead of the single block, which was typical of the 19th century, the planning scheme is composed of isolated buildings: individual houses for managers, two-family homes for employees, and buildings housing four or more homes for the miners;
- the curved shape of local roads and streets (instead of a criss-crossing pattern) ;
- the creation of green areas and public gardens.

At the end of the war, coal mining was no longer economical. The mine was shut down in 1964, in line with the plans of the ECSC. There was a dual abandonment, of the mine and the town.

For a few decades, the ideological rejection of the totalitarian past made any plans to conserve the town difficult. Its image was an inevitable allusion to a heritage that had been roundly condemned by history, with a population that no longer had any connection to these places. This led to the following:

- the decay of the civil engineering buildings
- private occupation of parts of the garden city
- an alteration of the original architectural features of the built environment

Thus, the mine suffered demolition of machinery and headframes. Only the two headframes at Serbariu survived, while the major flotation tank, and the installations to treat the coal, were dismantled.

Only in the year 2000 was there a halt in this trend towards abandonment. The local council, elected in 2001, is the main player behind the town's revitalization and the improvements to the mining site. In partnership with the University of Cagliari, it is starting to draw up ambitious plans to restore the facilities and turn them into a museum.

The project has several goals at the same time: putting forward Carbonia both as a museum town of contemporary architecture, and as a town that is involved in a transformation plan destined to improve its urban quality, and promote new opportunities for economic development, without erasing its nature as an industrial town.

The details of the "Carbonia Project" are very complex, and we shall have to restrict ourselves to illustrating 4 basic constituent parts :

The Heritage Catalogue

Each building has been the subject of a detailed analysis concerning its architectural type, the materials used, its state of preservation, and the alterations it has been subjected to.

The Restoration Manual

This manual collates illustrations showing the traditional construction methods which were in use in the region. The detailed pictures of the particular characteristics of construction offer contemporary architects examples to follow in order to rebuild a floor, or a roof, or a vault, just as they were built traditionally. This enables the replacement of damaged features of a piece of architecture with new elements shaped identically, and made from the same material.

Carbonia Itinerari dell'Architettura Moderna (CIAM)

This is an open-air museum, as many others that have been tried out in different contexts in the last few years, whose purpose is to illustrate daily life, in real scale, and the urban heritage of Carbonia, by means of a detailed network of information which, here and there, throughout the streets and squares, illustrates the historical and architectural features of the foundation town.

Centro Italiano della Cultura del Carbone (CICC)

Created in the Serbariu Mine in 2006, the Centre is also a Museum, consisting in:

- the lamp room, which houses a permanent exhibition on the history of coal, and of the mine and town of Carbonia. It is thus a museum of technological history, a town history museum, and an anthropological museum on the history of the society which developed around mining.
- the underground tunnel, showing the evolution of coal-mining techniques and working conditions at Serbariu, from the1930s until the mine was closed down;
- the two winch rooms.

For all these reasons, Carbonia was awarded the Council of Europe's Landscape Prize in 2011 (2nd edition). The citation explains that the prize was awarded to Carbonia for all its actions, as a whole, undertaken to recover, restore, protect and convert the urban and architectural fabric of the 20th century industrial town. In this instance, the notion of landscape refers to a notion of urban and manufacturing landscape, of which Carbonia is a unique and incomparable example.

IVREA

Ivrea is associated with the name of Adriano Olivetti, who throughout his life strove for total, wide-ranging planning. In his philosophy, business, town, and local society were to become the areas of planning work that was not centrally-planned, as in Carbonia, but that was open to the participation of the best intellectual and professional elite. The most reputed architects, designers, sociologists, economists, and artists of the time worked at Olivetti on a programme where everything was combined together: industrial design, graphic arts, architecture, town planning, the economic and social sciences, regional planning etc.

This mobilization of intellectuals (at the height of fascism) led to the drafting of a General Planning Scheme for the Val d'Aosta region. "Regionalism" was the main idea behind this plan. However, there was nothing administrative about the notion of region; rather, this term was considered in terms of a historical, cultural, and economic region. The plan aimed to achieve close integration between industrial development, urban development, and regional development. However, Mussolini rejected this plan, and refused to visit the Olivetti factories during his visit to Ivrea in 1939.

Given the impossibility of making progress with his regional plan, Olivetti pursued the development of his business, and commissioned projects from his architects to extend the factory. From this decision sprang the greatest experience of architectural modernism in Italy. The European culture of rationalism found in Ivrea one of its most significant examples.

The original core of the Olivetti establishment is the red-brick Factory built in 1896; as production gradually increased, the need to expand became more urgent.

Thus, between 1896 and 1958, new manufacturing buildings sprang up, called the ICO Factories, from the name of their founder, Ing. Camillo Olivetti (Adriano's father, where the title « Ing » stands for « Engineer »), and these were ranged along Via Jervis.

In 1934, Adriano Olivetti was appointed chief executive. The development of the business demanded new spaces for production. The project for the "first expansion" (1934–36) was entrusted to two very young architects, Luigi Figini (1903-1984) and Gino Pollini (1903-1991), who were representative of a new generation of Italian architects, very open to the experiences of the international avant-garde.
For this expansion, designed on the basis of an assembly-line rationale, concrete structures were used allowing a large working space inside, illuminated by large windows along the length, in line with the models of industrial architecture already developed in the United States.

The third expansion (ICO Central) is the most significant (1939-1940). This was a new building, 130 mt long, lined with double continuous glass panelling covering the whole facade, and inspired by the rationalist architecture of the 1930s. The air chamber offers a certain resistance to heat, and to prevent the effects of over-heating small shutters were fitted which can be positioned inside to filter the sunlight.
With maximum illumination inside, and maximum flexibility of the use of the interior space (open space), the factory was designed as a hull, or shell, in which production can be organized totally independently of any constraint.

The long series of Olivetti Factories running the length of Via Jervis ended between 1956 and 1957 with a fourth expansion, known as the «New ICO». In this new building, the spatial model of the previous factories, the model of a vast, undifferentiated working space, was abandoned. In its place, the new factory allows two spaces expressly designed for two production lines: on one side the assembly of the machines, and on the other, the mechanical work to make the component parts.

The Olivetti factories ceased activity in 1997, with 7,000 job losses. They constitute an immense contribution to Italy's architectural heritage, representing the most significant result of 20th-century Italian architectural creation in the industrial sphere, and it is not easy to reuse them.

There are several dangers threatening the integrity of this heritage:

- ICO Central has been converted, by its new owner, Vodafone, to establish its call centre. The building had already suffered from certain inappropriate alterations when its open spaces were divided up to make individual offices; after Olivetti closed down, there were long years of abandonment and neglect. The plant's adaptation into a Call Centre had the advantage of allowing the restoration of the original open space layout.
- the new ICO has been reused as a university on the ground floor (although this is an unsatisfactory choice, because the building offers no possibility of being expanded), while the « H » Factory has been converted into a theatre, concert and exhibition space.
- unfortunately, there are also instances where interventions of reuse have radically disfigured

the former structure (the canteen, designed by Ignazio Gardella).
Faced with these risks, the municipal council created two instruments :

- a new planning scheme – « Ivrea 2000 » – which, for the first time in Italy, extends to the modern town the rules of conservation which are normally associated with historic town centres ;
- the opening of a new urban museum, in 2001: the “Museo A cielo aperto dell’Architettura Moderna di Ivrea” (MAAM).

MAAM is an open-air museum (the first example of its kind in Italy) which offers visitors an itinerary of visits uniting the most famous architectural of the Olivetti company town.

The itinerary is organized in stages, and has 7 installations illustrating the complexity of Adriano Olivetti’s original project, a project which was an industrial project, a social project and an urban planning project, at one and the same time.

MAAM is not only a «series of pictures in an exhibition», as Manfredo Tafuri, a great architectural historian, once said. On the contrary, its essential aim is rather to offer visitors a perspective of the town and over its transformation dynamics, and thus raise questions in the visitor’s mind regarding the margins of transformation and adaptation which the urban built heritage can tolerate.

CONCLUSIONS

The four projects of recovery of the industrial heritage examined here have led to the conversion of a former industrial landscape into a new urban landscape. The question that is raised thereby is as follows: How many of the founding values of the former manufacturing landscape have been conserved, how many have disappeared, and how many new values have been integrated into the new context?

The following industrial landscapes have been classified differently:

- the cultural landscape of Sesto S. Giovanni, where the enhancement of the manufacturing heritage is aimed both at adapting it for new uses (Breda and Campari zones), and at the adoption of criteria of archaeological conservation (Falck zone) ; Sesto S. Giovanni is also the place where plans for nomination to the Unesco List of World Heritage Sites is combined with a radical project (plans by Renzo Piano) which, while remaining within the theme of technology (eco-compatibility, energy savings etc), envisages an urban future that marks a break with the previous order; it is indeed a cultural landscape, but one that is discontinuous rather than a further evolution;
- the landscapes of the company towns at Carbonia and Ivrea: the former is the product of an authoritarian utopia, which continues to reflect the image of a past that is definitively perished, and the latter is the result of the dynamism of an enlightened businessman, Adriano Olivetti, which has continued on until recent times (when one thinks that its last addition – the office building by Cesare Valle – was built in 1988). Thus we have two different landscapes, but the prospects for their future are also different. Carbonia has set itself the challenge of reinterpreting its urban history which, while on the one hand bearing witness to an embarrassing past, on the other hand may continue to offer useful lessons for its future. Ivrea, thanks to its urban museum, and in order to deal with all the vagaries surrounding the difficult conversion of its factories, has organized an extraordinary collective think tank, to ask itself questions about its fate ;
- the historical landscape of the industrial district of Testaccio–Ostiense in Rome: a further layer in a process of urban stratification spanning several centuries which, starting from the ancient

city centre, has expanded to the city as a whole, imposing a unified project of reconversion incorporating the historic centre and the contemporary city.

In the case studies we have examined, the industrial heritage appears to play an essential role in the evolution of urban landscapes. Heritage conservation must be wedded with the transformation processes of these landscapes. Thus a balance needs to be found between conservation and transformation which demands a great effort of analysis and critical interpretation. For this task, one can find help in the reflection under way at Unesco on a new category of cultural landscape, the category of « historic urban landscapes ». The principles set out during the 2009 Symposium on «Historic Urban Landscapes» in Bordeaux seem to find fertile terrain for application in industrial territories:

- change and transformation are permanents aspects of urban history (and the industrial heritage and its adaptation is one of the fundamental movers behind this evolution) ;
- conservation of the urban landscape no longer reflects a principle of « static » conservation, crystallizing that which exists in the name of a principle of precaution; on the contrary, it reflects a « dynamic » conservation, favouring functional variations without prejudicing the essential historical architectural values.

The landscapes of the four Italian cities we have just looked at here are the results of very different projects. However, one finds a core set of common principles :

- first, detailed knowledge of the heritage is needed: Carbonia, Ivrea, and Sesto S. Giovanni were the subject of analytical studies on the founding elements of the heritage in question, on the historical, architectural, technical and social values which can be associated with them. The goal is not an academic understanding, but an operational knowledge, allowing one to establish what are the margins for transformation which each element can tolerate, without totally erasing its identity;
- conservation/renovation projects that envisage the adaptation of structures (adaptive reuse) must not only identify activities that are technically appropriate to the industrial buildings that are to be given a new use. While it is true that the original functions assigned to the structures which one wishes to reuse today were «the material expression of a social intention», it will be necessary for the new end uses to be, in turn, the expression of a new project of social inclusion and participation, if one wishes, in our societies that are set to become increasingly multicultural societies, this heritage to be able to continue to represent heritage for the whole world;
- the most effective criterion for claiming success for a new urban landscape that has emerged from a former industrial area is determined by the quality of the public space created by the new plan: an attractive public space that benefits the local community, and which is pleasurable to be in, is a space which has succeeded in integrating everything, the old and the new, that which conforms with that which conflicts. In its life and vitality, in its atmosphere, and in the pleasure which one feels in actually being there, one will also find a timely and effective answer to our initial question: how much to conserve, and how much to change?

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Rethinking the "Reuse" of Industrial Heritage in Shanghai with the Comparison of Industrial Heritage in Italy

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Abstract
With the deindustrialization since 1980's, the traditional industrial areas in China, especially in cities like Shanghai and Beijing, which had a profound effect by the economic conversion and industrial relocation, has been facing the many problems, similar as in the Europe since 1960's. Following in the footsteps of the industrial cities in Europe and American in encouraging the preservation and reuse of its industrial heritage · the practice of the reuse of industrial heritage is flourishing in China, but at the same time, the theory of industrial heritage is still at the initial stage.

Firstly, with the historical review of the industrial heritage in the context of Shanghai and Italy respectively, this paper analyzes the inborn deficiency of industrial heritage in Shanghai: Shanghai is an example, not only to be the first city to survey and constitute the regulations for its industrial heritage, but also because of its leading position in the practices of reuse and conservation of industrial heritage in China.
In the context of Europe, Italy also faced the transitional problems, such as the empty buildings and plants, the outdated machines and the dismissed industrial areas, in the last three decades of the 20th century. With the aims to preserve the knowledge and memory of the industrial era and to inspire others to preserve the essential evidence in a post-industrial context, "industrial archaeology" emerged with the fundamental task to bring together the materials and to develop many access to understand the "fact" of industry. Then the concept of Industrial heritage was introduced, so that the industrial heritage was classified under cultural heritage to deal with industrial buildings and artifacts.

On the contrast, the historical absence of industrial archaeology and the weak concept of "heritage" lead the concept of "Reuse" in Shanghai. It is different from the "Reuse" of industrial heritage in Italy, not only because of the historical reason, but also the different context they are facing, which both result the different methodology adopted in the practice.

Furthermore, this paper chooses some typical cases of the reuse of industrial buildings in Shanghai and Italy, to distinguish the own characters of methodology used in the context of very rapid urbanization in China. From the reuse of traditional industrial buildings carried out by some artists in 1990s, then the development of adaptive-reuse with Creative Industry which adopted an integrated "top-down" operation that governments play the leading role with private developers in Shanghai, we can find that the urban land itself is the scarce resource in the principles of development, so the nonfunctional production will soon be hold by the other owners or upgraded for contemporary commercial use. The reuse of industrial heritage gives rise to cultural innovations and economic development, but less in the authentic heritage conservation.

On the other side, In Italy, the industrial heritage has gone from a specific interest in the monument (the individual building or a single machine) to the industrial sites (including the machines, buildings and also its infrastructure), then the whole industrial area, and until now the industrial landscape. Industrial heritage are considered as an integral part of collective identity, and the reuse should be contextualized in the wider social-economic processes.

Keywords: re-use; industrial heritage; regeneration; industrial archaeology; comparison western and eastern cultures

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From spontaneous rehabilitation of abandoned industrial buildings to government impetus

As the largest industrial city in China[1] , Shanghai has been facing the deindustrialization since 1980's, similar as in the Europe since 1960's. The traditional industry areas in Shanghai had been profound effected by the economic conversion and industrial relocation.

Since the early 1990s, as in other Chinese cities, with the trend of land use conversion from industrial to commercial and residential uses, Shanghai started to remove polluting and labor-intensive manufacturing industries from the inner city, which left a large quantity of empty industrial buildings and warehouses[2] .

The story of Taiwanese artist Teng Kun-Yen is so famous in Shanghai, he is the first one discovered old warehouse on the south bank of Suzhou Creek and converted it to his studio in 1998. Then in some other places, like Tianzifang and M50, an increasing number of artists followed his step and moved into these old factories[3] .

Obviously, the characters of these industrial buildings, such like vast inner space, high ceiling and abundant daylight, meet the artists' need. But more than the cultural and artistic passions, the commercial purpose is another reason. The land market and housing reforms "lead to a rapid growth of a high-price real estate market and an expansion in the demand for space and a parallel rehabilitation of developed urban land[4] ", thus the individual artists and small or medium sized creative enterprises prefer these abandoned industrial buildings at affordable rents. The artists played an important role in initiating the reuse of industrial building not only in Shanghai. Beijing 798 is another famous case at that time that the abandoned factory was gradually transformed to a place with an agglomeration of artists.

Then this spontaneous rehabilitation of abandoned industrial buildings not only caught the attention of public by the media, but also the municipal government in Shanghai. These dismissed areas were no more seen as a burden for the government. Instead, they find the possibilities from

1 Because of its location, shanghai became a treaty port in 1843.By the 1930s, the number of factories in Shanghai had exceeded 50% of the total in China. In 1949, there were over 10,000 factories in Shanghai, making it the largest industrial city in China. From Song Zhang, ‗Conservation and Adaptive Reuse of Industrial Heritage in Shanghai', Frontiers of Architecture and Civil Engineering in China, 1 (2007), pp.481-490.
2 According to the Shanghai Statistical Yearbook, there were 1,835 industrial enterprises in central Shanghai in 2005, a decrease of 67% from 1995. From CBRE, ‗On the Waterfront: Recasting Shanghai's Industrial Heritage', 2007, p
3 Jun Wang, ‗Shaping Distinctiveness in Culture-led Urban Regeneration: Public-private Partnership in the Project of Red Town, Shanghai', Hkifm.org.hk, 1-16.See more in Teng, K.-Y., Spatial Revolution: Flame from Suzhou Creek to Huangpu River (in Chinese). 2006, Shanghai: China Eastern Normal University.
4 Jane Zheng and Desmond Hui, ‗Making Creative Industry Parks in Shanghai: The Urban Regime and The —Creative Classll', Development, pp.1-21. See more in Sassen, Saskia. 2001. The Global City, Princeton, N.J.: Princeton University Press.

the spontaneous activities by artists, especially the economic potential.

The Shanghai municipal government began to take the creative industries as a new driver for the urban development. The Shanghai Creative Industry Center[5] was established in 2004 to promote the creative industries at the city level. The Creative Industrial Agglomeration Area, a zone which restores and reuses industrial legacies, was proposed to accommodate creativity-based firms[6] .

Following, "within 4 years, around 80 dilapidated industrial sites have been converted to cultural infrastructures[7] ." The reuse of industrial building "suddenly" flourished in Shanghai, both in theoretical and practical discourse. Even more, because its leading position in the practices of reuse and conservation of industrial heritage in China, the "Shanghai model", as someone called, became a paragon that the other Chinese cities want to follow and imitate.

So it is necessary to observe this "model", from spontaneous rehabilitation of abandoned industrial buildings to government impetus, in Shanghai. What is the internal mechanism and what it would be result are deserved to analyze, especially in two perspectives: the conservation and the reuse of industrial heritage. Meanwhile, to compare with the industrial heritage in Italy will help us to find the differences in a wider perspective, what is more important, to distinguish the own way to conservation and develop in the procession of very rapid urbanization in China.

Reuse of industrial heritage under the culture-lead regeneration

Under the plan of cultural rehabilitation of industrial buildings, one of the main characters in the conservation and reuse in Shanghai is the operation with the strategies of the cultural lead regeneration. It is not a rare way in the transformation of industrial buildings in the postindustrial age.

In the international context, different from the way of many cities focused on developing relevant international cultural events and built cultural architecture and infrastructures during the 1980s and 1990s[8] ,the role of culture in urban regeneration has moved towards fostering cultural production and creativity.Lingotto is a typical case in Italy a FIAT. It is car factory in the company town Torino. Built in 1916-23 by Giacomo Mattè Trucco was celebrated in Le Corbusier's book, Vers une architecture, as an exemplar functional building, with its sharp constructive system in reinforced concrete and the test-drive circuit on the roof. The renewal of Lingotto as a shopping center, designed by Renzo Piano, contempled also the construction of a new part realized in "Lingotto style", reproducing the image of the past factory.There are also and many creative neighborhoods linked to culture and arts, such as Soho in New York,Montmartre and the Rive Gauche in Paris[9] .

Driven by global city making, Shanghai also sees culture as a key to bolster a new economy and to deal with decayed urban sites[10] .With the governmental promotion and public-private

5 A semi-governmental organization established under the municipal economic committee, one of its most influential measurements is designating the creative industry parks in Shanghai From Zheng and Hui, p.3.
6 SCIC (Shanghai Creative Industry Center). Profile. Shanghai Creative Industry Center 2008 [cited 2008 March 12]; Available from: http://www.shec.gov.cn/.
7 J Wang and S Li, ‗The Rhetoric and Reality of Culture-led Urban Regneration – A Comparison of Beijing and Shanghai , China', 2009, pp.875-888.
8 A. Smith and I. von Krogh Strand, ‗Oslo's New Opera House: Cultural Flagship, Regeneration Tool or Destination Icon?', European Urban and Regional Studies, 18 (2010), pp.93-110 .
9 Hans Mommaas, ‗Cultural Clusters and the Post-industrial City: Towards the Remapping of Urban Cultural Policy', Urban Studies, 41 (2004), pp.507-532.
10 Wang and Li, p.875.

cooperation[11] , the creative industry is developed with the support of reuse of industrial buildings. Some dismissed areas are taken for creative industry areas. “The physical feature of these zones is the regeneration of old factory buildings and the conversion of these buildings into the new studio, office or retail uses.… The other feature is the variant degrees of agglomeration of artists and creative enterprises in these zones and this generates rent profits, local taxes and stimulates cultural and creative industries[12] ”

The reuse means to take more consideration of the new use and the new life of the original industrial building. “Despite this image, art and industry do work well together by not only telling the industrial story or exhibiting paintings and sculpture, but also by giving new life to abandoned buildings and neighborhoods1[3] ”.

Some critics on what goes on in the reuse way in Shanghai is that it generally does not relate to the former use, but they were often treated as economic development projects rather than historic renovation ones.

Another outcome of this culture-led regeneration is the gentrification. The rise in value of the surrounding real estate by the process of urban transformation pushed out the artists. The basic reason of gentrification in China is similar to the others: “Although gentrification helps reserve physical forms on districts and extends historical landscape, yet it is bad for maintaining a social network on districts and passing down intangible heritage[14] ”.

Trying to develop a cohesive public policy to encourage artists to settle as well as not be driven out is a problem for many cities[15] . This phenomenon also shows the lack of specific of public policy to maintain stable artist communities in Shanghai.

Furthermore, on one side, “the underlying philosophy of regeneration is that cities have rich resources and values that can be nurtured and revived, and that the benefits of an improved environment and of new jobs will filter down to bring lasting or sustainable benefits to the whole community[16] ”, so in contrast to the emphasis on physical renewal, regeneration implies that the existing urban form is a starting point, to be upgraded within social, economic, cultural and, where appropriate, natural contexts. On the other side, regeneration should be based on broader principles, such as these of conservation, building incrementally on surviving resources in terms of buildings, landscape and people[17] .

11 There are four kind of public-private cooperation: First, the district government, with the Industrial Bureau affiliated corporation as the representative, functioned as an advisor, guiding and assisting guided state-owned enterprises to tackle their economic crisis by developing office quarters. Second, some district governments directly participate in some projects, usually having one or more affiliated corporation 15 as shareholders. The district Industrial Bureau or Economic Committee affiliated corporation(s) align with other private developers and state-owned enterprises to set up a new company. Third, the cooperation between the public actor and the business sector (i.e. developers or properties) has evolved. Fourth, the local authority also attempts to promote —creative industries‖ and cultural and art activities. From Zheng and Hui, pp.1-21.
12 Zheng and Hui, 1-21.
13 Carol Berens, Redeveloping Industrial Sites: A Guide for Architects, Planners, and Developers, 1 edition (Wiley, 2010), pp. 154-161.
14 Zhang Song and Zhao Ming, ‗On Gentrification in History Protection and its Countermeasure‘(in Chinese), China Ancient City,09(2010,),p.04.
15 Berens, p. 106.
16 Micheal Stratton, Industrial Buildings: Conservation and Regeneration, Tourism (London;New York: Taylor & Francis, 2000), p.232.
17 Ibid

Industrial archaeology as a key to understand of Industrial heritage

With the development of creative industry in Shanghai, the term “Industrial Heritage[18] ” is more and more quoted in media and public discourse, although what it means may be still ambiguous. Except for the economic value, the historic and cultural value of industrial heritage is more interested by the conservationists. The reuse practice is an opportunity to make the industrial heritage in the spotlight of public and government, but also a double-edged sword for the preservation.

In 1998, with the earliest attempts to survey and evaluate industrial facilities[19] , Shanghai municipal government announced the list of Excellent Heritage Buildings, which also included industrial sites. Industrial heritage was acknowledged in official documents such as the "Notice on Enhancing the Conservation of Historic Areas and Excellent Heritage Buildings in Shanghai in 2003[20] ". Shanghai also constitutes the earliest regulations on the conservation of heritage buildings in China[21] .

More than a rhetoric term, how to deal with these industrial plant and factory buildings under the concept of cultural heritage is a question and challenge in Shanghai. In reality, the conservation projects, such as Shanghai Sculpture Space, which is a typical project envisaged as a role model for heritage rehabilitation by the government, the selective history rather than the history of industrialization and the workers were represent. These selective histories also reflect the urban nostalgia of past, which “has been actively promoted by the city’s social and economic elites as well as government officials who assumed a pivotal role in the ongoing privatization, stratification and liberalization in many spheres of everyday urban life[22] ”. As some Critics point out, historical architectures are actively preserved not for their values as cultural heritage, but for their symbolic capital that can be used to project a global future[23] .”

When the preservation serves the economic development, there are some new questions emerge, such as how to make the protection and regeneration of industrial heritage together? How to deal with the conflict between economic and cultural goals?

It is not difficulty to understand that industrial buildings, as kind of culture heritage, are the important origin of the industrialization which witnesses the history of the modem industry development of China, including not only tangible evidences, but also other intangible evidences. However, there is a need for the greater awareness of the value of industrial heritage as catalyst for regeneration[24].

18 The basic definition of Industrial Heritage in China is the same as "Industrial heritage' of " definition of industrial heritage" in The Nimny Tagil Charter for the Industrial Heritage, But excepting " ..... also examining its earlier preindustrial and proton-industrial roots" and "it draws on the study of work and working techniques encompassed by the history of technology", the division of historical periods in the definition of IRC is partly deferent with the "historical period' in The Nimny Tagil Charter. From Que Weimin, ‗Industrial Heritage in China —It‘s Past, Present and the Future‘, English, 2006.p.2
19—To coordinate with the nomination of the third phase of heritage buildings, the Shanghai Urban Planning Bureau entrusted the College of Architecture and Urban Planning of Tongji University to start a general survey of the industrial heritage of the post-Opium War Era‖. see more in Zhang, p.484.
20 According to the document, "workshops, shopping premises, factories, and warehouses which were built over thirty years ago and representative of the historical episodes of Chinese industrial development shall be listed as heritage buildings and effective protection measure shall be applied to them. From Wang, pp.1-16.
21 In the —Regulations on the Conservation of Historic Areas and Excellent Heritage Buildings‖, which took effect on January 1, 2003, item 9 stipulates that, —Those which were built over thirty years ago, representative workshops, shopping premises, factories and warehouses in the history of Chinese industrial development shall be listed as heritage buildings and effective protection measures shall be applied to them.‖ From: Zhang, pp.481-490.
22 Tianshu Pan · Historical memory, community-building and place-making in neighborhood Shanghai, in L.J.C. Ma and Fulong Wu, Restructuring the Chinese City: Changing Society, Economy and Space, Geography (RoutledgeCurzon, 2005), p. 109.
23 Ren Xuefei, ‗Forward to the Past: Historical Preservation in Globalizing Shanghai‘, City and Community, 2008
24 Future Directions, Industrial Archaeology Future Direction, Industrial Archaeology.

The heritage have to preservation. In some point of view, preservation is conservation, conservation is restoration, furthermore, such as the restoration of Auditorium Paganini(Parma, Italy) by Architect Renzo Piano shows, restoration is a specific kind of design.

As Smith and Bender note: “Tradition, in varying degrees inherited and invented, plays a crucial role in the path to modernity outside of the zone of the metropolis[25] ”. Modernity is not a global and undifferentiated phenomenon, but is located often in harmony with a local expression of the past and heritage[26] . From this point of view, heritage was not only defined as important to the history, but also had important role in development, or at least a kind of resistance to the destruction.

In the aim to preserve the knowledge and memory of industrial era in China, the Industrial archaeology is necessary, but which is always ignored in the reuse of industrial heritage in China, or at least not enough.

“Industrial archaeology” emerged first in Britain as a discipline since the 1960s with the fundamental task to bring together the materials and to develop many access to understand the "fact" of industry. It plays an important aspect of conservation, as what it did in the second half of the twentieth century in the Western Europe. These days, because the desirability of maintaining old industrial installations within their traditional landscape, it shifted from the concern on survey in the early days to make a contribution to sustainable development[27] .

As the systematic study of structures and artifacts as a means of enlarging our understanding of the industrial past[28] , industrial archaeology is the fundamental way to reveal the irreplaceable history and collective memory in the certain period, to bridge the public and history, and eventually make the conservation of heritage.

Seeking for the balance between preservation and change of Industrial heritage in China

When Stratton summarized the Brian way in conservation and regeneration of industrial building[29] , he said the key challenge has been to find the right balance between preservation and change.

Following in the footsteps of the industrial cities in Europe and American in encouraging the preservation and reuse of its industrial heritage, numbers of successful practices were introduced into China. When we observe the process in Shanghai, from the reuse of industrial buildings carried out by some artists, then the development of reuse with Creative Industry in which governments play the leading role with private developers, we can find the relationship between preservation and change of Industrial heritage in China is still ambiguous. The historical absence of industrial archeology and the weak concept of “heritage” lead this practice of reuse hard to be contextualized in the wider social-economic processes.

In the Western Europe, public policies often argue industrial heritage could be an effective resource for economic and social development in dismissed areas, although the strategies adopted are vary with different national context. In a general view, there are two models: “One is the British model, originating in specific cities in British history as they emerged from the industrial revolution. This is a model deeply influenced by the neo-liberal Thatcher reforms, which encouraged private–public partnerships. The other is a continental model in which for a very long time relations between states and cities have been an important element of urban development[30] ”. Compared with the later model, like Italy and France, the operation in Shanghai is closer to the former.Italy, in the context of Europe, also faced the transitional problems, such as the empty buildings and plants, the outdated machines and the dismissed industrial areas, in the last three decades of 20th century. The industrial heritage has gone from a specific interest in the monument (the individual building or a single machine) to the industrial sites (including the machines, buildings and also its infrastructure), then the whole industrial area and industrial landscape.

Different from the evolution way from the industrial archaeology to the industrial heritage and now the reuse and industrial landscape, in Shanghai, the reuse of industrial building with the goals of economic development and urban regeneration, became an opportunity for the conservation of industrial heritage and propel the development of industrial archaeology. According to this distinctive situation, the comparison between China and other counties became more complicated and the methodology for reuse and preservation of industrial heritage also should be distinguished in the context of industrialization and deindustrialization in China.

CHAPTER TWO

25 Michael P. Smith and Thomas Bender, City and Nation: Rethinking Place and Identity, 2001, p. 244.
26 Ibid
27 Hillinger and Olaru, 607-630.
28 P. Neaverson, _Industrial Archaeology: Principles and Practice‘, 1998.
29 Stratton, p. 232.
30 Michel Rautenberg, _Industrial Heritage, Regeneration of Cities and Public Policies in the 1990s: Elements of a French/British Comparison‘, International Journal of Heritage Studies, 2011, pp.1-12.

SECTION III: INTERPRETATION AND APPLICATION

The Japanese Colonial Empire and its Industrial Legacy

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Abstract
When I first met Professor Hsiao-Wei Lin I asked her when industrialisation started in Taiwan and she said 'when the Japanese arrived'. Whilst this is not entirely true because there was some industrialisation in Taiwan whilst under Chinese control, the blossoming of industrialisation throughout what became the Japanese Empire really started in Taiwan when it was gifted to Japan in 1895 by the Chinese Government.

For over 200 years Japan had been a completely closed society until the 1850s when visits from Commodore Perry from the USA forced Japan to open its borders, create Treaty Ports and engage in a fantastic sixty-year period of industrialisation. Much of it was done with the importation of foreign experts, mainly from Europe, who developed Japan's coal, iron, shipbuilding and railway industries, together with silk and textile manufacture and communications. Subsequent disputes with China and Russia gave Japan territories in Taiwan, Manchuria and Korea, which were largely undeveloped. As the Japanese had no history of developing a colonial empire, they largely followed the British model and Japan was often referred to at the time as 'the England of the East'. Thus whilst they constructed the infrastructure of their new colonies, they also developed education, law and order, museums and commercial activity, as well as the transport infrastructure.

After several visits to Taiwan and Korea, and with many illustrations of sites in China, I hope to develop the theme that the Japanese colonial empire, modelled on British ideas, succeeded well until militarism overcame moderate thought in Japan.

Keywords: Britain; industrialization; Japan, Korea; Manchuria; Taiwan

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I have visited Taiwan on two occasions before this conference and have been amazed to see just how much of the original Japanese infrastructure has been preserved. I have also visited South Korea to see numerous civic buildings in the capital, Seoul, and buildings in Incheon, beautifully preserved. Although I have not visited mainland China, I have a very large number of images of civic buildings and industrial sites in Manchuria, built by the Japanese, and I would like to know one day how many of them survive.

Fig.1
Incheon Port Modern Architecure Museum former Incheon branch of Bank 18 of Japan Built 1890 Photo 2011 by author

In August 2011 I was privileged to attend on behalf of TICCIH the mAAN (modern Asian Architecture Network) Conference in Seoul, South Korea, and as part of that conference I visited the port of Incheon, known as Jinsen or Chemulpo when under Japanese control. I was escorted around by a very distinguished Professor of Architecture and his students from Seoul University, and we examined the conservation area known as '1883 streets', the date when Korea opened its first Treaty Ports. Korea became a Japanese protectorate in 1905, and in 1910 was annexed completely by Japan.

When we looked at the buildings closely, we saw that they were mainly brick built with slate roofs, sash windows, largely single storey, wooden staircases with newels and banisters and six panelled internal wooden doors. These buildings, devoted to banking, shipping and other commercial enterprises, were mainly built by the Japanese between 1883 and 1945, including the splendid post office largely built of granite, which survived the 1950s' United Nations invasion of Korea led by General McCarthy to repel the incursions by the North Koreans. This beautifully conserved area, with exciting museums and adequate interpretation, had been built by the Japanese during their nearly 60-year occupation of Korea, but they were not Japanese buildings. The Japanese were copying European buildings, mainly British, as they had no experience of how to run a colonial empire.

Until the Meiji Restoration[1] of 1868 Japan had been a totally closed country for nearly 250 years. In the 17th century it had encouraged some foreign contacts but their experience with the missionaries from Portugal in particular had underlined the fundamental threat to their society by the development of Christianity and therefore this religion was cruelly suppressed. However, they did allow a small community of Dutch nationals to settle in a small island off Nagasaki called the Dejima as they did not believe that the Dutch had any religion. This state of affairs existed for over 200 years with the only contact with outside nations being either through the Dutch or the Chinese in Nagasaki.

Forced in the 1850s to open their ports to foreign trade by visits by Commodore Perry from the USA, they quickly realised that their own attempts at self-industrialisation with the construction of iron furnaces copied entirely from Dutch textbooks were futile, especially as a result of naval encounters at Kagoshima and Shimonoseki where European navies quickly overcame the defences put up by the local Clans of Satsuma and Choshu. This led to a complete U-turn in the policy of the Clans who rather than try to expel the foreigner decided that it was only with the foreigners' assistance that they would be able to prevent the division of Japan by European and north American countries which had been observed in China.

Thus from the 1860s until the end of the Meiji period just before the First World War there were tremendous developments in coal mining, iron manufacture, ship building, railways, silk manufacture, textiles and communications, very often led by European engineers particularly from the UK (especially Scotland), Holland, France and Germany. Japan also introduced a national army to replace the feudal forces run by Clans and largely purchased a navy from British shipyards with British trained sailors.

With increasing settlement in Korea from 1883, the Japanese entered into a war with China in 1894 because of the brutal treatment of shipwrecked sailors who had landed in Formosa, which

1 W.G. Beasley, Meiji Restoration (Stanford University Press, 1973).

eventually led to the gift of Formosa, now Taiwan, by the Chinese government to Japan in 1895. Japan became increasingly concerned about the expansionist plans of Russia, who had recently built the trans-Siberian railway ending in Vladivostok but through negotiations with the Chinese government had extended the railway through Manchuria down to Port Arthur and Dalian. This gave the Russians an ice free port directly opposite Japan, which the Japanese felt was a threat. A naval engagement in 1904 by the Japanese and Russian navies decisively destroyed the Russian navy and led to an occupation of Manchuria by Japan from 1905 onwards.

Because of a treaty of alliance between the UK and Japan in 1902, Japan could feel confident that its now burgeoning empire was secure[2] and during the next 40 years set about constructing a model foreign empire. In the four major areas which they now occupied – Taiwan, Korea, Manchuria and Sakhalin – there was virtually no infrastructure apart from the railway through Manchuria built by the Russians and Chinese. Having had no experience of constructing colonial buildings they largely followed the British example with a very paternalistic attitude to their colonies, with liberalism in some areas and strong repression in others. There was deep resentment from Korea, for instance, for enforcing the Japanese language, although this was normal throughout the British Empire where English became the common language. For many of these countries the fifty-year period of Japanese colonialism created all the infrastructure – roads, railways, canals, ports and harbours – and also established education, law and order and industrial enterprises.

Fig.2
Map of the Japanese Empire 1912
pulished by George Phillip Son Ltd Author's collection

It is hard not to draw comparisons between the British and Japanese Empires, although Japanese rule lasted only 50 years whereas the British Empire dated back several hundred years. However, the appearance of large red blobs on maps was probably the most visual illustration of the two developments.

An extremely beautiful if controversial postage stamp (Fig 3) issued by Canada in 1898 shows Canada in the centre of a map of the British Empire, with Australia and New Zealand to the left and Africa and India to the right. This was the largest empire the world had ever seen and numerous maps produced both in and outside Japan from this time onwards show the Japanese empire featuring Japan, Korea, Taiwan, Manchuria and Sakhalin.

Fig.3
Canada postage 2c stamp for Christmas 1898 celebrating Imperial Penny Post Author's collection

2 Ramon H. Myers and Mark R. Peattie, Editors, The Japanese Colonial Empire 1895-1945, (Princeton University Press, NJ, 1984).

Fig..4
Postcard issued by Kagoshima in 1922 to commemorate the visit of Edward, Prince of Wales, later King Edward Vill. The picture is captioned 'The Beach Mansion of Prince Shimazu'. Author's collection

A postcard issued in Kagoshima in 1922 (Fig 4) to commemorate the visit of Edward, Prince of Wales, later King Edward VIII, shows the British and Japanese flags with Britain coloured in pink, as is the Japanese Empire. The caption reads 'The Beach Mansion of Prince Shimazu' whose ancestors in 1850 had converted part of the grounds of his beach mansion into the Shuzeikan, the first attempts to industrialise Japan entirely by copying foreign text books. Shimazu was head of the Satsuma clan, who together with the Choshu clan, was largely responsible for overthrowing the Tokugawa government and establishing Meiji rule in 1868. Many of these feudal clans had illegally sent their young men to Europe, secretly, in order to gain Western knowledge and they were the people who subsequently became leaders of the Meiji government. It is not surprising that they transferred their knowledge of the West to the development of their colonies.

Taiwan (ROC)

Formosa was called Taiwan by the Chinese and, following them, by the Japanese into whose possession it came after their war with China in 1895[3]. Taiwan is an island - roughly the same size as Kyushu in Japan – in the western Pacific Ocean between the southern and eastern China Sea. It is separated from the Chinese mainland by the Formosa Strait which has a width of about 90 miles in its narrowest part. There are few natural resources to encourage the development of heavy industry.

As a result of the British war with China in 1842 Hong Kong was taken by the British and soon a profitable opium trade with Taiwan was in operation. Both the British and the Americans considered establishing bases there but the British were more interested in China and the Americans became occupied with their own Civil War. From 1858 two Hong Kong firms, Jardine Matheson & Co and Dent & Co, first became involved in Taiwanese trade; their interests chiefly for obtaining camphor. In 1858 both the American and Russian Governments negotiated treaties to open Taiwan to foreign residents and trade, and subsequently other ports were opened by the British and French with treaties ratified in 1860, at the close of the war with China. Shipwrecked mariners – including British, American and Japanese – who sought refuge on Taiwan suffered brutal treatment from aboriginal Taiwanese. Japan mounted an expedition in 1874 which attempted to subdue the aborigines and a war with China was just averted through the assistance of the British Minister, Sir T.F. Wade. The Japanese retired with an indemnity.

Foreign trade continued to grow until 1884 when the French, towards the end of the Franco Chinese war, attempted to seize Taiwan as a guarantee for the payment of an indemnity which France had imposed upon the Chinese Government. Their first year's campaign was not a success as they failed to seize the island and the Chinese troops gained several victories. French battleships arrived in Keelung Harbour and destroyed the fortifications and the Chinese Governor ordered the destruction of the Keelung coal mines before the French occupation, which lasted for nine months before withdrawal.

3 James W .Davidson. FRGS, The Island of Formosa Past and Present – History, People, Resources and Commercial Prospects, (Southern Materials Center Inc, Taipei, 1903; reprinted Oxford University Press 1988).

There followed a period of modernisation 1886-1894 when Taiwan became the most progressive Province of the Chinese Empire. Strategic defences were strengthened, great improvements were made to the capital Taipei and a cable steamer was purchased in 1887. A year later Formosa became part of the world telegraphic system. When Taiwan was ceded to Japan in 1895 under the terms of the Treaty of Shimonoseki, the establishment of administrative mechanisms was the first priority. The nature of Taiwan's natural resources together with the policy of "an agricultural Taiwan and an industrial Japan" meant that industry was relatively slow to develop.

Taiwan's early industrial development mostly took place under the Japanese colonial government (1895- 1945) and followed the Japanese model, demonstrating onward technology transfer of an adapted European mode.[4]

From 1900, Kaohsiung, in the south of Taiwan, was transformed from an insignificant village named Takou into a major industrial centre and sea-port. In 1900, a railway was built between Kaohsiung and Tainan, which until then had been southern Taiwan's most important town. This was followed by the construction of harbour facilities for large ships in 1908. These developments provided the infrastructure for Taiwan's first iron and steel mill, the Takou Ironworks, which was constructed in 1919. Today the site is part of the China Steel Corporation's Kaohsiung plant.

Taiwan's shipbuilding industry essentially begins in 1937 when Mitsubishi Heavy Industry founded the Taiwan Dockyard Corporation. A merger between the later evolution of this corporation and the state-owned China Shipbuilding Corporation in 1978 created the CSBC Corporation, Taiwan, of today.

Bituminous coal occurs in most parts of the island and also in the Pescadores. The major outcrops are in the hills around Keelung and surface deposits have been worked from an early period. Most seams are between one and three feet in thickness and mechanisation is difficult. The Chinese opposed the mining of coal on superstitious grounds and in the eighteenth century the mining of coal was banned; even as late as 1835 the Governor of the island prohibited extraction. In 1849 the US Brig Dolphin visited Keelung and discovered that coal was available at an elevation of 230 feet and not more than three and a half miles from the harbour. In 1850 the British requested of the Chinese government that the Keelung coal deposits be worked and offered to cooperate in opening the mines; but the Chinese declined on 'cultural' grounds. Following the opening of the island to foreign trade in 1860 numerous foreign vessels called in to Keelung and the annual yield of illegally mined coal ranged from 6,000 to 18,000 tons. The abandonment of government prohibition was recommended by a Chinese commission but with the suggestion that foreigners be prevented from obtaining an interest in the industry; in 1864 a French Engineer, M. Dupont, employed by the Foochow arsenal, made a survey of the Keelung coal district but requests to the Chinese authorities to mine were declined. A Chinese expert made a survey in 1873 and reported that the inhabitants of Keelung were not in a position to establish modern mining technology on a large scale and therefore the Chinese government should undertake this task. Now that China had a modern Navy, together with the requirements of the Foochow arsenal, the government found that working the deposits in Taiwan would be desirable. Shen Paw Chan, who during the Japanese expedition to Formosa in 1874 had held the post of Imperial Commissioner to the island, sought and obtained permission from the Peking authorities to erect a modern mining

4 Yosaburo Takekoshi, Japanese Rule in Formosa, (Longmans, Green & Co, London, 1907). Translated by George Braithwaite with preface by Baron Shimpei Goto.

plant in the Keelung district. David Tyzack, a foreign mining expert, was engaged in 1874 and after making a careful survey of the coalfields in Keelung went to England the following year to purchase machinery and engage a party of mining experts. The machinery arrived in 1876, capable of handling several hundred tons of coal a day, and was erected at Pa Tou, three miles east of Keelung. A circular shaft, 12.5 feet in diameter, was sunk to 295 feet, intersecting the main seam at a depth of 270 feet. By the end of the year output was 30-40 tons per day. In 1878 a guibal fan was installed for ventilation and this required a further shaft 8 ft 6 in diameter and 88 ft deep. The mine was now producing 200 tons a day. The mine was one mile from the sea and a tramway connected the mine to a jetty and coal chutes in a bay known as Coal Harbour, a facility prone to poor weather. Staff and labour issues were problematical too as the mine was situated in dense jungle where heavy rains were frequently followed by intense heat which caused great sickness amongst the employees. This affected productivity and the shipment problems meant that enormous coal stocks built up at the mine.

Exports to Shanghai and other Chinese ports declined and the Taiwanese trade suffered badly. During the early 1880s improvements in the government-owned mine included coal handling.

In August 1884 difficulties between China and France reached a crisis and the French fleet arrived at Keelung and bombarded the forts. Liu Ming Chuang, Governor General of Taiwan, had no intention of presenting the French with a well equipped mine and a large stock of coal and gave orders that the mine machinery should be destroyed, the shafts flooded and the stock of coal – some 15,000 tons – set fire to. His orders were carried out immediately, ending modern mining in Taiwan for some time.

After the French intervention of 1884, mining continued on a very small scale with some new machinery being imported. However in 1891 the Chinese abandoned their mines and only private mines continued. In 1894 Taiwan's coal output was 24,000 tons.

Following the Sino-Japanese War (1894-95) the subsequent Treaty of Shimonoseki ceded Taiwan to Japan who issued mining regulations and licences for mining in 1896. Mining began to increase under Japanese investment and management though primitive techniques continued with no roof support, little pumping and no ventilation. Most of the coal was used on the railways and for brick making, coke manufacture and shipping whilst some was exported to Amoy and Foochow. Due to high labour costs in the unmechanised mines the coal could not compete in the Asian market.

Coal mines in Japan were highly mechanised and capitalised by the early years of the twentieth century and those nationals who could not afford to mine in Japan and who still wished to invest in mining moved their operations to Taiwan. Here the cycle of underinvestment continued until the First World War.

Gold Mining

Whilst under Chinese administration, a railway was developed between the harbour of Keelung and the capital city of Taipei which resulted in the discovery of gold along the line of the railway. By 1893 the Ching government of China established the Gold Bureau and from then on gold mining was under the management of the government. Further discoveries of gold took place in 1894 but the following year, after the secession of Taiwan to Japan, the Japanese government established its own gold administration. Massive developments in gold and copper mining took

place during the next 40 years of Japanese control, leading to the major gold field in Jinguashi, which is now preserved as an open air museum.

The most spectacular part of this site is the remains of the 13 levels by the coast, one of the largest ore processing works in the world. Of interest also is the gold mining village itself, which has residences for Japanese and Chinese separately, together with hospitals, schools and other social institutions, all completely separated. Of particular note is the Crown Prince Chalet, built in 1922 by the Tanaka Mining Corporation for the visit of Japanese Crown Prince, later Emperor, Hirohito. Unfortunately the Crown Prince never visited the gold mining site. The building is typical of a high class Japanese style building, but it also encloses a European style leisure room; on the north side of the house there is a beautiful Japanese garden, and on the south side there is a miniature golf course and an archery field. The mining company were providing every facility, both Japanese and European.

The opening up of Taiwan was constrained by two factors, the one being the very mountainous nature of the interior and the second being the fierce indigenous tribes which occupied this high ground. The small railway constructed by the Chinese was enlarged and expanded by the Japanese to run all down the west coast of Taiwan from Keelung harbour almost right down to the southern tip of Taiwan. Railway development led to a demand for bricks, railway workshops, engine sheds and numerous civil engineering structures, but the net result was to allow the development of the interior and the maritime economies. Such important industries as salt extraction, brewing including vinegar, and sugar manufacture all flourished, along with tea and agriculture. The growth of major towns led to the creation of public health facilities such as and sewage treatment, together with the generation of electricity and a hydropower station at the Sun Moon lake

Fig.5
The 1909 Pumping House, now the museum of Drinking Water in The Taipei Water Park. Old industrial sites are very popular for bridal photographs. Photographed 2008 by the author

Perhaps one of the most unusual industries, almost now forgotten, is the camphor industry[5] which flourished in Formosa for many years. Although camphor trees grow in Japan and in east China, Formosa provided the best trees which grew to enormous sizes. The aborigine tribes had been abstracting camphor for generations by cutting down the trees, converting the wood into chips, and then boiling the mixture in water and condensing the spirit given off, which could then be condensed into camphor oil. Camphor is well known as an insect repellent and has numerous medical uses, but by the end of the 19th century it was in enormous demand because of its use as a plasticiser when used in conjunction with nitro cellulose as part of the production of celluloid, one of the first true plastics. The process was patented by American John Hyatt in 1870 as part of a search to replace natural materials such as ivory or tortoiseshell which were becoming increasingly rare and expensive, and in particular the need for cheap billiard balls. Originally wooden cores were encapsulated in an outer layer of almost pure gun cotton (cellulose nitrate). This led to some spectacular billiard games with many flashes and bangs and something

5 James W .Davidson. FRGS, The Island of Formosa Past and Present – History, People, Resources and Commercial Prospects, (Southern Materials Center Inc, Taipei, 1903; reprinted Oxford University Press 1988).

was required to make the cellulose nitrate more stable. Camphor was the answer and the new celluloid manufactured with camphor was an outstanding success and allowed the manufacture of a whole range of plastic goods for the first time. Celluloid could be formed into a very thin film and was the basis of film stock used from the end of the 19th century until well into the 20th century. The Japanese had a monopoly of the supply of camphor for many years and it was only with the introduction of synthetic forms of camphor in the 1920s and 1930s that the industry declined.

The Japanese put a great deal of effort into increasing the number of camphor stills throughout Taiwan and improving their design, and I wonder whether any modern research has been done into the industry or any archaeology carried out on the thousands of camphor stills which used to exist.

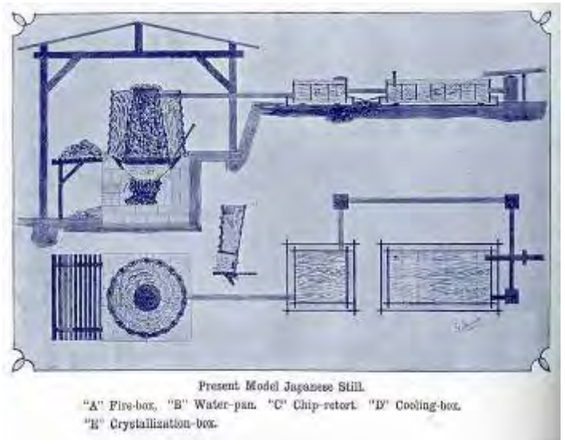

Fig.6
Japanese designed camphor still, from James W Devidson The Island of Fomosa Past & Present op cit

In a booklet entitled The Charm of the East[6] , the capital of Taiwan, known by the Japanese as Taihoku (Taipei) (the capital of the island and the seat of government), is described as 'a city of 100,000 people and is well built after the European model with fine streets, public and private institutions including museums and laboratories, the Taiwan railway hotel, owned and operated by the Formosan Railway, affords excellent accommodation for foreign visitors'. Tourism was therefore an important aspect of the development of the Japanese empire from an early stage.

Korea

During much of the nineteenth century Korea kept loose cultural and political ties with China and attempts by Western powers to trade were rebuffed[7]. By 1860 Russia reached Korea's borders and by 1876 Korea started to establish relationships with other powers and treaty rights were obtained by Japan, America, Britain and others. The Korean government, however, was feeble and corrupt and China, Russia and Japan struggled for supremacy. Eventually a bitter rivalry over Korea developed between China and the Japan. This led to the Sino-Japanese War (1894-1895) and Japanese victory. The threat of Russian expansion into Korea, where ice-free ports fronting the Sea of Japan were coveted, ended in 1905 when Japan defeated Russia in the Russo-Japanese War. Having occupied Korea to fight the Russians, Japan left her troops there and Korea became a Japanese Protectorate in 1905. Japan took an increasing involvement in Korean affairs until, in 1910, Japan formally annexed Korea making it an integral part of the Japanese Empire.

Coal mining in Korea was primitive until well after Japanese annexation, after which the first large-scale coal mining operations began under a Japanese government corporation. Iron and steel, and shipbuilding, did not begin to industrialise until the second half of the twentieth century. Iron

6 The Charm of The East – Guide to Japan & China for the use of passengers by the N.Y.K. Steamers, (Nippon Yusen Kaisha (NYK) the Japan Mail Steamship Company, Tokyo, 1919)
7 Angus Hamilton, Korea (William Heinemann, London 1904).

and steel: Iron is abundant, especially in Phyöng an Do, but mining was very limited until well into the twentieth century. Korea's integrated iron and steel industry dates from the 1960s and today has become one of the world's most successful and efficient.

South Korea made shipbuilding a strategic industry in the 1970s.
As most Korean gold mines were in foreign ownership, the Japanese turned their attention principally to iron and coal extraction. By 1910, extensive coalfields in Hwang hai Do and elsewhere were as yet undeveloped, though the privilege of owning mines was extended to aliens under the Mining Regulations of 1906. Virtually all the indigenous coal in South Korea consisted of low-quality anthracite.

Almost the entire infrastructure of Korea before 1945 was built by the Japanese – this includes road, railways, ports, communications including post offices, telegraphs, etc. In Seoul there are many public buildings which still survive from this era, although the insensitive construction of the Japanese governor's residence inside the grounds of the royal palace has not surprisingly been cleared away. Virtually all of these colonial period buildings appear to be designated as national treasures and carefully maintained. One surprising aspect of the Japanese occupation was the fact that they encouraged missionaries, who not only built numerous churches of all denominations, but also founded hospitals, educational establishments including universities, which still survive today. Korea has a very large percentage of its population as Christians.

Manchuria and Port Arthur

Port Arthur was named by the British during the second Opium War in 1856. At the conclusion of the Sino-Japanese war of 1894-95 Japan claimed Manchuria at the Treaty of Shimonoseki. This was endorsed but, after representations from Germany, Russia and France, Japan agreed to withdraw. Manchuria was claimed by Russia in 1896 when China granted a concession to the Russo-Chinese Bank to build the Chinese eastern railway. Subsequently Russian troops occupied many parts of the country and in particular developed Port Arthur as an ice free port, unlike the other terminus of the Trans Siberian railway at Vladivostok. After the Russo Japanese war of 1904-05 the Portsmouth Peace Conference (USA, 1905) resulted in the Russian lease of Port Arthur and Talienwan (known as Dalny by the Russians and Dairen by the Japanese) being transferred to Japan along with the Liaotung peninsula and the south Manchuria railway.

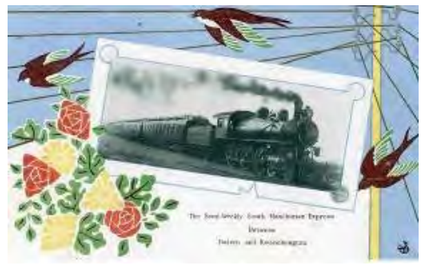

Fig.7
Postcard of the Semi-Weekly South Manchurian Express Between Dairen and Kwanchengtzu. Published between 1907 and 1918 by the South Manchuria Railway Company Dairen Author's collection

Technically, therefore, Manchuria was not part of the Japanese Empire originally as it was only held on leasehold from the Chinese government with the right to protect the south Manchuria railway which ran up to Harbin where it joined the trans-Siberian railway which ran from Vladivostok to Moscow. This route from Japan, through Korea, Manchuria and Russia, was and still is incredibly important and much mail can still be found stamped 'via Siberia'.

Gradually the protection of the railway extended to a full scale occupation of Manchuria and its

dramatic growth as an industrial centre and an exporter of raw materials, particularly iron ore, coal and agricultural goods, to Japan. The expansion of Manchuria by the Japanese during the 1920s and 1930s saw some of the worst excesses of Japanese imperialism led by the army, and by 1932 all pretence that this was still Chinese territory was abandoned when the puppet state of Manchukuo, was established.

Industrial development in Manchuria successively took place under British, Russian and Japanese intervention[8].

Fig.8
Postcard of Ironworks at Anshan and Penhsihu, Manchuria Author's collection

Fig.9
Postcard showing the Yalu River bridge Amtung, which divdes Korea from China Built by the Japanese Author's collection

Iron smelting began in the 1898-1904 Russian phase of industrial expansion. From 1904 Japan occupied Dalian and followed Russia's lead in augmenting industrial capacity.

Before, and during, the Sino-Japanese War, Dalian was host to a growing shipbuilding activity. In 1898 Russia started construction of a shipyard in their new leased territory and in 1905, when Japan replaced Russia to lease Dalian Port, the shipyard was expanded.

Fig.10
Japan British Exhibition 1910 Formosa hamlet Rotary photographic series Author's collection

Coal was unworked in Manchuria until the Japanese opened the modern and typically colonial Fushun colliery in Kirin, Fengtien. It became the second most productive coal mine in China.

By 1910 Japan was being referred to as the 'England of the East' and this was celebrated in a magnificent exhibition in London, the Japan/Britain Exhibition, which attracted eight million visitors in three months and gave Japan the opportunity to show off its national treasures and also exhibits from its colonies. This followed a long tradition of exhibitions in Britain where its colonies had their own pavilions.

During the First World War Japan was aligned to the Allies, with Britain and the USA, and provided useful service in the Mediterranean and also occupied German colonies in Asia. However, after the end of the war militarism in Japan became increasingly prominent and dominated government thinking. Whilst prisoners of war, for instance, in the Japanese/Russian war had been treated with extreme sensitivity, this did not apply during the war with China in the 1920s and 1930s, or with hostilities within Asia during the Pacific War.

This therefore leaves us with the dichotomy that for almost 50 years Japan built the infrastructure of its colonies in Taiwan, Korea, Manchuria and Sakhalin, but was eventually expelled from all these areas in 1945.[9] Thus we have large areas of built environment, infrastructure and industrial sites which were built by a foreign, colonising country which is often held in distrust by the modern powers that operate these countries. I am pleased to see that many of these countries now accept that these buildings are part of their history and should be preserved and interpreted. The peoples of eastern Asia should appreciate that the Japanese colonial empire transformed these countries from rural backwaters into some of the most highly industrialised societies in the world, but it will be many years before the ill feeling disappears altogether.

Whilst I am certain that a huge amount of research has been done with the universities in Japan and its former colonies on the industrialisation of this area, little seems to have appeared in print outside academic monographs. Surely more needs to be done to explain and interpret Japan's colonial legacy, such as the short booklet on Seoul's Historic Walks[10] , which puts into perspective the development of Seoul during the 20th century. Knowledge about the colonisation and industrialisation of east Asia is little appreciated in the West and is probably least known in Japan itself. I hope the next generation of industrial archaeologists in Asia will take up this challenge.

I am indebted to my colleague Barry Gamble in contributing heavily to this article.

8 Yoshihisa Tak Matsusaka, The Making of Japanese Manchuria 1904-1932. (Harvard University Press, 2001).

9 Alfred Stead, Great Japan – A Study in National Efficiency, (John Lane, The Bodley Head, 1905.)

10 Cho In-souk and Robert Koehler, Seoul's Historic Walks – Walking Tour of Seoul. (Foundation for Arts and Culture, Korea, 2008)

“La Dificultad” Mine. A Site Museum and Interpretation Center in the Mining District of Real del Monte and Pachuca

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Abstract
“La Dificultad” mine is located in Real del Monte, Mexico, and is the most emblematic mine for its architecture and history. By the end of the 19th century a Wolf steam pump from Saxony was installed, being the most powerful pump -580hp- in Mexico at the time. A few years later electricity was introduced to the mine, and both systems (steam and electricity) were used. At the beginning of the 20th century an electric plant that still works was installed in the mine.

The site comprises almost 11,000 square meters and its 15 buildings and structures are in good state of conservation (80%). Among them, the chimney and the machine house are outstanding, due to their architecture and proportion.

There has been a minimal intervention: Substitution of roof panels, wall plaster and doors and windows fixtures, demolition of modern structures, consolidation of structures already in ruins, cleaning of open spaces and the conditioning of spaces and circulations according to the museographic guide.

A steam winch, the only one in the zone and an electric winch from the beginning of the 20th century still survive almost complete in the mine. They have been cleaned and repaired.

The project comprised an archaeological registry of each working area in order to understand its function inside the mine. The first step was the elaboration of a three-dimensional topographic plan. Then archaeological exploration has been conducted in the boiler and machine rooms and some artifacts and tools have been recovered. With this, we can know the historic and technological context of the mine.

The purpose of the Site Museum and Interpretation Center is to spread the knowledge of the historical, technological and cultural heritage originated with the development of mining in the region from colonial times till now. The use of images, models and interactive panels help the visitor to acquire a background about the origin and importance of this district and its mines.

Keywords: mining heritage; museums; cultural tourism; restoration

History of the mine.
La Dificultad mine is located in Mineral del Monte (Real del Monte), in the old Camacho neighborhood, next to the “Mexicans” cemetery (San Felipe). In the 19th century this mine was adjacent to Jesús María, Carretera, Ahuichote, El Tejocote and Vargas mines, all belonging to the Pachuca and Real del Monte Company.

The mine was claimed on June 5, 1865 by Mr. Martiaena who received possession of it after overcoming several obstacles, with his partner Mr. Chester, on August, 1866[1] . After six years, Martiarena and Chester had to resort to the working capital loan system, signing a contract with Esquipulas La Nueva Company; such company was absorbed by Real del Monte and Pachuca Company (CRDMyP, from now on) four years later, on June 23, 1880.

The working capital loan contract with this company established that if the mines receiving a loan were using CRDMyP machinery, they had to pay 10% of the metal extracted. In case they needed steam machinery or hoists local drainage systems, they had to be charged to the loan account, that’s the reason why 10 years later when a Rittinger system machine was installed to drain La Dificultad, the owners were the ones who absorbed the expenses.. These type of contracts also established that:
“…mines leadership, administration, and management, including work style and metal processing, were exclusively authorized by the Real del Monte Company”[2] .

Working capital loan contracts with small miners of the region allowed CRDMyP to expand its properties and have regional mining full control. However, after the silver prices dropped in the international market, the company faced several economic problems, worsened by Pachuca’s mines low production and floods in several Real del Monte work places. (Fig. 1)

Fig.1
General view of La Dificultad mine, ca. 1890
Source: AHMM,AC

The best perspective to continue the district’s productive life was to exploit the San Ignacio ore deposit, located 280 meters from La Dificultad shaft, on top of Santa Inés vein, this vein had a width between 10 and 14 rods[3] , producing 25 000 pesos per week in 1866. The only problem was that the drainage processes were insufficient to continue exploiting it; that’s why the decision to acquire a higher power machine to continue production was made.

At first they wanted to buy a used machine in Cornwall, but they desisted after Mr. Mateo Bauden sent a letter to Mr. Guillermo Rabling describing “East Wheal Rose” used machines history and condition, concluding the following:
“…when a used machine is purchased you don’t know repair costs and the cost to transport it is the same as transporting a new machine. I will tell you to end this letter, if the Board of Directors

1 Statement related to La Dificultad Mine in Mineral del Monte, 1865 – 1928, p. 10 AHCRDMyP. Esparza Collection
2 Working capital loan system negotiation document, Esquipulas y Anexas, favoring Compañía Real del Monte y Pachuca, 1880, p.3 AHCRDMyP. Esparza Collection.
3 A rod is equivalent to 83.5 centimeters.

decides to buy one of these used machines, they will be making a big mistake from my point of view"[4]

After several studies conducted by engineers Andrés Aldasoro and Manuel Contreras and Mr. José de Landero y Cos and Mr.Rodolfo Múñoz, it was decided to open a shaft next to the "Mexicans cemetery" in La Dificultad property.

In 1885, the Real del Monte and Pachuca Mining Company (CRDMyP) started to look for new steam machines in other countries, instead of buying them in Cornwall. That year, the company sent an envoy to buy a machine for "Morán" mine; the purchase was commissioned to Mr. Paschker and Mr. Kaestner, from Freiberg. In 1889 Mr. Paschker & Mr. Kaestner continued being CRDMyP suppliers of material, including coils, wire and cable.

In 1887, the Real del Monte and Pachuca Company decided to acquire new Rley type machinery in order to drain the mines in Real del Monte; such machinery had been developed in Bon by a civil engineer that basically perfected the Woolk (UK) pumps; adding to them two cylinders in order to make the most of steam tension in the smaller one, and expansion in the bigger one, an independent condenser with wheels and intermittent knock, and a hydraulic counterbalance. Boilers were tubular and a fixed Rittinger double-effect pumps column, 25 ¾" diameter and almost three rods stroke, ensured fuel savings[5] .

Real del Monte's Engineer Mr. Contreras guaranteed that the machines perfected by Rley saved more fuel than Cornwall machines because they had more expansion, some motors worked very well at a speed from ½ knock to 18 knocks per minute and the company shouldn't fear any important inconveniences because company's machinists were good and that type of machines were being used in many mining districts. Also, the cost of the machine, a little bit higher than Cornwall's offer, was justified due to fuel consumption economy[6] .

In the Board of Directors' minutes of January, 1877, it was agreed to request through Oëtling Brothers from Hamburg to the Machine Factory of Saxony a machine with approximately 600 horses power adding another cylinder and an independent condenser to save more fuel.

In the same meeting, the president of the Board of Directors, José de Landero y Cos, mentioned that it would be convenient to hire some machinists in order to avoid practice difficulties.

Oëtling Brothers, representing CRDMyP, signed the contract with the factory on May 2, 1887 to build a set of machines able to pump water and sink a shaft at the same time, consisting of:
A Rittinger system pump with 900 steam horses
A drilling pump to sink the shaft to 485 meters depth
A complete Eschwingel device to take the pump up and down in order to sink the shaft under water
Parts for two pumps, as well as the necessary piping, screws, rubber couplings, and screw wrenches.
Two hydraulic neutralizers to counterbalance the transmission chains that weighted 85 tons

4 AHCRDMyP Siglo XIX, Engineers Department, Box 2, File 13, October 27, 1886
5 Board of Directors Minutes, January 8, 1887, pp.17-21, AHCRDMyP Fondo Siglo XIX
6 AHCRDMyP Fondo Siglo XIX Engineers Department File 14 January 8, 1877 p. 9-10

The equipment would weigh 310 tons and would have a cost of 130,950 German marks.
The purchase was made in the Machine Factory of Saxony in Chemnitz, Germany, through Oëtling Brothers from Hamburg[7] , but instead of a 900 steam horses pump, a 580 steam horses pump was acquired as well as an 80 horses fixed hoist. The machine total cost, its transportation and installation in La Dificultad shaft was 423 036.42 pesos[8] , the amount was charged to the mine's working capital loan account and consequently it was discounted from its owner's profits for a period of three years[9] .

During the second half of 1889 the work to install the machinery in La Dificultad was conducted including the mine's shaft adjustment, the company hired specialized personnel from the same factory where the machine was purchased; however, technical differences between both countries, land conditions, and Real del Monte's weather, made this task difficult. In April, 1889, the Machine Factory of Saxony wrote to Oetling Brothers:

"our assembler worker Mertzenfeld has informed us in a letter dated on March 21 that he had started the drain machine assembly work to the point of setting the rise sheet erecting the big cylinder, but due to transporting difficulties, especially caused by land unevenness (around 7 meters between the street and engine room) and because there are not enough helpers, they will need probably around four months to finish the work. We are very disappointed because we will lack the services of such assembler worker for such a long time, we need him urgently and we would appreciate if you talk in our behalf with your friends in Pachuca, requesting them to hurry the work, increasing workers, cranes, and other necessary things…"[10]

The work done by this machine contributed to increase CRDMyP profits from 153 319.17 pesos in 1889 to 529 018.53 in 1891, such amount was also favored by the silver price increase in the same year[11] .

By the end of 1890 the machine main installation purpose was achieved: to drain San Ignacio ore deposit and Real del Monte district's productive continuity, as a consequence, the town's life was also able to continue. (fig. 2)

Fig.2
Workers outside the main engine house of La Dificultad mine, ca. 1890.
Source, AHMM, AC

This was reflected in the big party organized by Real del Monte's population to celebrate the steam engine room inauguration in La Dificultad, on January 12, 1890.

Besides the machinery, CRDMyP established a staff contract with the Machine Factory of Saxony; that way between September, 1888 and February, 1890 the company worked with German assemblers, carpenters, engineers, pump operators, construction workers, workers responsible for the braces, and machinists. Assemblers had an insurance policy covering accident expenses,

7 Board of Directors Minutes. January 8, 1887 p.21. Drainage report submitted by Management to Negotiation Board, regarding convenience, location, power, and type of draining machine in Real del Monte district mines at San Ignacio shaft ore depth, September 14, 1886, AHCRDMyP, Fondo Siglo XIX.
8 Accounting No.1, Account copier from Dec. 28, 1889 to Feb. 2, 1892, AHCRDMyP, Fondo Siglo XIX. 17-19 pages. February 4, 1890
9 Draining steam machine installed in La Dificultad shaft in Real del Monte value and cost, 1890, AHCRDMyP, Fondo Siglo XIX.
10 Siglo XIX, Rels. Eterna. Commercial Relations/ Oetling Vol. 63 exp 2. 4 Jan.. 1889 – Dec. 29,1893
11 Board of Directors Report, 1889 – 1891, AHCDRMyP, Fondo Siglo XIX.

including death, as long as it was caused by a work accident and not because natural causes. However, from the correspondence kept by the mining company we can assume that the work relation wasn't easy, to a great extent because the working conditions differences between Mexico and Germany, and Real del Monte's weather.

On March 20, 1889, Heno Arnoldo writes to the Machine Factory of Saxony in Chemnitz:
"Dear Sirs. I'm glad to inform you that a few days ago I finished all the masonry work assigned to me, except the big machine "balancier" column. Working as an Assembler, von Mertenfeld says that before starting this work he has to bring inside the building all the machinery major parts, and according to his opinion this can last from one month to one month and a half; I have begged the Company's management to excuse me from this last work considering that I have to spend so much time without doing anything, and lacking from any other occupation. Mines administrator, Mr. Muñoz, has promised to admit my petition, because the rest of my work can be done by construction workers here, they are more oriented in this kind of work, and he is only going to request Mr. Landero authorization. For that reason I hope to finish my services with the Company at the beginning of April, those services, as you maybe have heard in your assemblers' letters are not precisely very pleasant" [12]

In August of the same year, the assembler Mertzenfeld requested to the Machine Factory of Saxony in Chemnitz, authorization to go back to Germany because he had already finish the work assigned to him and because
"I'm not happy here, I would like to leave this place as soon as possible, and the machine, in the most favorable case, won't be able to start working before six months. Please let me know if you consider my presence indispensable here"[13]

In September, 1889 CRDMyP informs to the Machine Factory of Saxony in Chemntiz about some problems with German assemblers, who were complaining –among other things- working schedules and the shaft's humidity. Through Oëtling Brothers, the factory of Saxony answered:
"We have been unpleasantly surprised with the content of such letter, especially, because according to Mr. von Mertzenfeld last news we supposed that everything was working fine over there. We will reprimand them and we will write them letting them know we don't approve the way they are acting. We are sorry to experience in every case the very pretentiously behavior of these people outside their country, producing the least possible. We are begging you to tell your friends in Mexico to treat assemblers with energy, they need a strict treatment, eventually with a rigorous discipline because they are used to it. Furthermore, do reports from Mexico lie? Daily working hours are 10 instead of 8? We advice you not to start promising bonuses…"

In March of the following year, the Machine Factory of Saxony, finally accepted its workers reasons because they sent letters explaining they were not requesting a raise but an overtime payment, they had been working more than the 8 usual hours in Pachuca and under difficult conditions due to Real del Monte's weather and specially because shaft's excessive humidity. In Germany workers worked 10 hours but always in the surface outside the mine.The working day was reduced to 8 hours if it was performed inside the mine. They requested to Mr. Landero y Cos, CRDMyP Director to pay overtime and to respect schedules in order to keep workers happy, but they also requested to fire immediately assembler Fischer Sr. because he was considered the

12 Siglo XIX, Rels. Eterna. Commercial relations/ Oetling Vol. 63 file 2. Jan.4 1889 - Dec. 29,1893
13 Siglo XIX, Rels. Eterna. Commercial relations/ Oetling Vol. 63 file 2. Jan.4 1889 - Dec. 29,1893

person who initiated several problems between German workers and the mining company.

The restoration of the site.
Three general criteria to elaborate this site's restoration project were considered because buildings and open areas have diverse characteristics, and variable conservation conditions.

1. **– Authenticity and integrity.** Save the originality and integrity of the spaces, architectonic elements, tools and machinery. Restore only damaged parts, trying to integrate new finishes with existing parts and their normal wear and tear. Eliminate all bad quality additions either in exteriors placed on top of the facades. The objective is to show the site in its most authentic and original expression.

2. **- Safety.** Modify property's condition and site topography only if the original state represents any danger to visitors. We also installed hand rails, banisters, and security grills to prevent access to dangerous areas, as well as ramps for the disabled. The design is integrated to the site, trying not to visually compete with the rest of the elements.

3. **–Care of the collections and conservation policies.** Structures, mezzanines, halls, covers, and protections added to buildings, not only serve to protect visitors, but also to shelter appropriately collections and assets that bring the site museum to life.

The mine has an extension of 10,710 sq. meters, from which 3000 sq. meters are buildings.
Most of them were built in two stages, using materials such as: stone, brick, and stone quarry extracted from a nearby bank in the community known as Tezoantla. The architectonic complex is integrated by a formidable engine room which also has a shaft, this place has a surface of 312 square meters and it is 20 meters high. It has a boiler room, two buildings that housed a steam hoist and a hydraulic hoist, and a building for the air compressor, all of them built with the same type of materials (stone, brick and quarry); a stone and steel sheet construction where the electric hoist, which still operating for the mining company, is kept. The chimney, a unique piece due to its manufacturing and design, a water storage tank, a room housing the transformers of the power plant, offices of the company now empty, and a dwelling house. (Fig. 3)


Fig.3
Rear view of the Engine House before restoration.
Photo: Miguel Iwadare, 2006

The size of its buildings and the cost of its maintenance delayed its conservation during decades; even roofs were in bad condition. However, in 2008, this mine still had in operation condition a good part of a mine's basic infrastructure: the electric hoist, headframe and main shaft. It also had an interesting collection of diamond drilling engines (powered by steam, electricity and diesel) and the repair workshop, complemented with a huge drill cores storage (cores were taken from the veins), a steam hoist (imported from Birmingham), in relatively good conservation condition.

The need to have good illumination in the engine room, and good ventilation in the boiler room, determined to include in the architectural design a good number of widows at the moment of its construction; without the proper maintenance, those windows deteriorated. Years later, when

Fig.4
Interior of the Engine House before restoration.
Photo: Miguel Iwadare, 2006.

natural illumination wasn't so indispensable, and steam technology wasn't being used anymore, windows openings were bricked up to avoid that rain continued affecting the buildings. (Fig. 4)

As we mentioned above, its location, extension, and buildings make it a landmark in Real del Monte mining cultural landscape.

Restoration works were aimed to recover the integrity of its architectonic style, trying to conserve it. Its reutilization as museum has allow us to know and value its history as well as the importance of this site and finally, to add this new infrastructure to the effort that the AHMM, A.C. has done during 24 years to concretize the old mining district recuperation project, within a management plan designed to prepare and educate the population concerning the importance of this material and immaterial cultural heritage.

It was a difficult task to elaborate a general diagnosis of the conservation condition of each one of the buildings and their content. For this reason we divided the site in areas since the preliminary stage of surveying and diagnosing the place. The project was developed in chronological stages according to the characteristics, needs and importance of each one of them. In June of 2008, archeological research, architectonic surveys, and conservation diagnosis works were started. Documents scattered around the place were rescued, most of them were in bad conservation condition: 80% of them were dirty, wet or moist; they were taken to the Historical Archive of the association in Pachuca, in order to be restored. We also started mine's machinery and tools inventory.

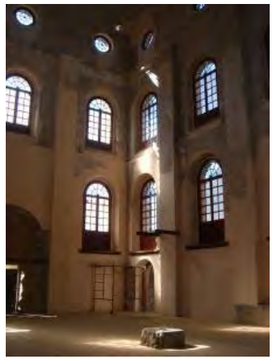

Fig.5
Restored walls and windows of the Engine House before the adaptaion of the space for exhibitions.
Photo: Miguel Iwadare, 2008

The restoration work plan started by fixing, maintaining, and cleaning the mine, among other activities, the structures of the main building received maintenance and roof's steel sheets which were in bad condition, were substituted by panels as a solution against humidity and as noise insulation, missing plaster was replaced and 30 wooden windows with frames were installed (3.20 meters high by 1.60 meters wide, each one of them), as well as circular windows and doors. It was necessary to place a tempered glass system at the entrance door; this was designed to allow internal ventilation and to release the steam coming out from the main shaft. Floors were replaced. A mezzanine was adapted in order to have a better view of the museum's content, of the component of the mine (structure and headframe) and especially to provide maintenance to the windows. (Fig.5)

The roof and structures of the boilers area were restored and painted; this space has a surface of 360 meters and it is 11 meters high, as well as a ventilation section. It was not necessary to replace steel sheets. The main affectations were caused by rain.

All buildings were electrified and illuminated, including façades, exposed structures and chimney. The furnace room roofing was not entirely replaced, but it was restored and painted, as well as

its structure (360 sq. meters at 11 meters height, with a ventilation section throughout the ridge).

When the company stopped its operation in the mine, they took almost all machinery with them, along with plumbing material, carts, tools and other artifacts, except a series of diamond drills in regular conservation state that were found in site, the oldest is a pneumatic drill from the late 1800's. From the steam era, the mine still has an old hoist, the only machine almost complete in the whole mining district; there is also an electric hoist (one of the early 1900's best machines still working). (Fig. 6)

Fig.6
Restored Birmingham steam winch (hoist).
Photo: Marco H. Badillo, 2008

The mine as a museum and interpretation center

Pachuca and Real del Monte mining districts face nowadays a strong decrease in their productive activity, such decrease has caused important repercussions in the economic life of the population that basically depends on this industry. In 1987 the number of workers in Real del Monte and Pachuca was approximately 3,000 laborers and 800 employees; nowadays it hardly reaches 300 laborers and 60 employees. The unemployment rate caused by this situation made young people migrate to other countries. In this case the creation of infrastructure for cultural purposes, promoting tourism, is a viable option.

The conversion of La Dificultad mine into a site museum and interpretation center has the advantage to be self-sufficient at a short term and to create important benefits in its surrounding areas because the economic and cultural activity will increase. A recent phenomenon in Real del Monte is that former miners have started to produce crafts with mining motifs; this is in response to the region tourists' demand. (According to some surveys, the town hosted more than 55,000 visitors in 2010).

Due to its history, regional symbolism, geographical location, and singular architecture, La Dificultad Site Museum and Interpretation Center has become a lighthouse illuminating the culture forged throughout centuries but hidden until a few years ago –just as metal veins- under earth.

The main purpose of this project was to rescue, preserve, spread, and protect Real del Monte and Pachuca mining district industrial heritage (archives, buildings, machinery, tools, and equipment). It also supports formal education in the region, providing students a space where they can enrich their mining history knowledge acquired in the classroom through a meaningful and recreational knowledge. Industrial heritage enormous richness gives us a possibility not yet used in order to obtain those purposes.

Fig.7
Interior of the Engine House with the permanent exhibition: Models, maps, plans and photos.
Photo: Miguel Iwadare, 2010

At the same time, it provides visitors the historical, technological, and cultural heritage knowledge generated with the region's mining development, from the colonial period until now, and to contribute to promote respect and interest for the industrial culture and its

different expressions: archives, buildings, machinery, tools, legends, traditions and gastronomy. The mine is a good starting point to recreate these aspects, because it is in itself an icon of this development. (Fig. 7)

The interpretation center contains blueprints and maps of the area where the visitors can identify different mining towns conforming the mining district, there are also informative cards and a big scale model showing the steam era with its big engine houses and chimneys, and the electricity era with its big metal head frames and mining cable railways; in addition, it is possible to see the change from one technology to another one, creating awareness regarding the mining and natural landscape transformation, depending on the application of new technologies. An “open” part in the scale model shows the different levels inside the mine and the work done in each one of them.

A chronicle of the mining work is illustrated with an exhibition of selected blueprints, dated from the late 1800’s to the early 1900’s detailing the extension and depth reached by mining. In this case, there are only reproduction of such blueprints and maps because the weather conditions in Real del Monte don’t allow the museum to exhibit the original documents.

Other topics include: mine history, steam era, application of electricity to mining work, geological exploration with the support of diamond drilling in engine room, steam boiler room, electric hoist area, and drill repair workshop, respectively.

The mine still has an old steam hoist, the only complete machine in the mining district which has been repaired to show how it worked. There is also a hoist operated with electricity from the same period (this machine is one of the best from the early 1900’s and is still operating. The electric hoist is in good condition and is one of the tour attractions, because it is still working for the mine. The main shaft is the access to the 560 meters depth work areas. It has communication with the “Acosta” Mine; in the future that communication can be a dynamic element to establish a circuit between both mines (Acosta is another site museum of the AHMM).

This district is one of the most visited by scholars of different disciplines, but especially by geologists and mines engineers, who have accumulated profound knowledge about the geology of the region and the importance of its mineral deposits. Mining engineering and work have a special place; they are illustrated with a specially selected collection of blueprints, from the end of the 19th century to the beginning of the 20th century detailing the extension and depth reached by silver veins exploration and exploitation.

Fig.8
View of the mine‘s workshop. All tools and equipment are original.
Photo: Miguel Iwadare, 2010.

This unit is complemented with an interesting collection of diamond drilling machines; the oldest one is a pneumatic drill from the end of the 19th century. This collection supports the explanation of diamond drilling work and its importance in geological exploration. It is used as an example of the change of power sources and the possibilities that each period offered to exploration. A collection of tools and drilling pieces located at the workshop is also exhibited. All of this has allowed us to preserve the original environment of these workshops and to integrate them to the general itinerary.(Fig.8)

And finally the drilling cores storage, composed of thousands of cores samples boxes; this site is the most unusual place of the mine, visiting it and listening to the explanation of the importance of the geological exploration works, can provide the illustrative knowledge of the mineralogical work performed by mining companies. This area has become a mineral sample exhibition room, the first one of this kind in the country.

Industrial archeology work will be done permanently at the engine house in the future, integrating young students of this discipline to the field work. Visitors will be able to understand and learn about this activity from professionals in situ.

Final notes.

The historical importance reached by Real del Monte and Pachuca Mining District reflects to a considerable extent in the growth of the towns integrating it and the singularity and importance of its historical, monumental, architectonic and industrial heritage.

CHAPTER TWO

Even though Mineral del Chico, Huasca and Omitlán (three other mining towns that are part of the mining district) have maintained their mining towns’ characteristics, the impact of tourism in the region demands to establish conservation programs and operation guidebooks appropriate for these historical sites, as well as a master plan regulating their future development. Pachuca and Mineral de la Reforma face different problems: the accelerated urban growth stimulated by new inhabitants who arrive mainly from Mexico City, is causing the problems of any big city, plus the gradual loss of identity and the erratic reutilization of historical sites, especially those with a history related to mining activity.

Real del Monte has unique characteristics, both because of its urban design as well as the typology of its constructions.

The urban design is due to the uneven geography of the place and the irregular trace gives an intimate atmosphere to its streets. This geography has prevented, to some extent, big transformations and the excessive growth of the urban sprawl.

There is an important number of civil facilities and buildings in the town, they are a sample of the historic stages covered by its main economic activity: mining work and its bonanzas with the substantial metal (gold and silver) extraction. These heritage sites, now mingled with the urban fabric and its adjoining parcels are generally in good condition; however, losing their importance as productive centers originated the lack of maintenance, this fact together with the passing of time and weather affectations, damaged their conservation and preservation. The gradual incorporation of this heritage to a new economic activity in the town (industrial before, services today), gives us new hope regarding the preservation of these places as historical sites.

In addition, opening new cultural spaces such as the Acosta Mine Site Museum, Nicolás Zavala Cultural Center/Occupational Medicine Museum, located at the mining company old hospital, in Real del Monte, and the Mining Museum in the city of Pachuca, have attracted cultural tourism visiting mining towns, these towns have accumulated their own identity and customs during centuries of mining activity.

The important increase of cultural tourism interested in the mining topic, touring now the region's fanciful orography (with gullies and crests reaching 3000 meters above sea level), enjoying its special and attractive pine forest and foggy landscapes, are an important motivation to accomplish AHMM,A.C.'s management project for the most emblematic industrial heritage sites in the Real del Monte and Pachuca mining district, this will allow us to help to preserve them and to give them the historical place they deserve. (Fig. 9)

La Dificultad Mine recuperation and reutilization work is a very important step towards accomplishing the management general project for the whole mining district, since this site is for sure the most emblematic one in the region's mining history. Located on top of the mountain range, it has been an important reference point in the mining district geography; we took advantage of this aspect in order to create an interpretation center facilitating a reading of this district's history, origin, and mining heritage sites importance, its towns and the cultural and natural environment aspects, becoming a reference and a model for other restoration projects in mining towns of Mexico. (Fig.10)

Fig.9
View of the boiler room and chimney after restoration.
Photo: Miguel Iwadare, 2011.

Fig.10
General view of the restored mine.
Photo; Marco H. Badillo, 2011.

Tracing the Invisible- Electropolis Berlin

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Abstract
The "Berlin Center for Industrial Heritage" (BZI) is a project jointly developed by the University of Applied Sciences Berlin (HTW) and the Foundation of the German Museum for Technology in Berlin (SDTB). Since autumn 2011, the initial budget is provided by a programme to promote the innovative potential of culture in Berlin which is financed by the European Regional Development Fund. The HTW has been engaged in the broad topic of industrial culture for more than 20 years and has developed its own Competence Centre for Regional Industrial Heritage (KRIK) three years ago to arouse public awareness in relation to industrial culture. It was also the KRIK where the idea to found the BZI was born.

One of the many missions of the BZI is to develop an intelligent and visionary tourism concept for Berlin's industrial heritage. Instead of collecting all data and references of all industrial sites in Berlin and then do a selection based on worn-out criteria from existing touristic concepts, we first of all started thinking: What's special about Berlin's industrial heritage when compared to other places? What's the story it stands for in human history? Why should people – and especially younger generations – be at all interested in listening to this story? Which message could be drawn from Berlin's industrial experience that is useful for the global society of tomorrow? These are the questions that will be answered in the following chapters.

Keywords: technological infrastructures; intangible heritage; universal cultural values; scale-jumping in landscape interpretation; regional messages; participative approach

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The traditional key regions of industrial heritage in Germany are the Ruhr area and the Saarland in the west and Lusatia and Saxony in the east of the country. The industrial heritage movements in all these regions resulted from socially desperate situations: the structural changes – triggered by the coal and steel crisis in Western Germany in the 1960s and the implosion of the German Democratic Republic in Eastern Germany in 1990 – led to the collapse of the whole social system in these regions. The increasing decay and impending demolition of the last witnesses of the long gone economic heydays were conceived by the regional population as an existential affront against their own identity. Hence, their fight for preservation has always been a political project and a fight for social recognition. The German term 'Industriekultur'[1] became internationally known in the wake of such events as the IBA Emscher Park (Ruhr area 1989-1999) or the IBA See (Lusatia 2000-2010). With this term, a new concept emerged in the 1970s, facilitating a global perspective on the phenomena of the industrial age. Until today, the term stands for a comprehensive study of the diverse impacts industrialization has had on human culture, also including a critical

Fig.1
The power plant Oberspree was built outside the city centre in 1896/97. It had its own harbour to improve the supply with coal. It is one of the oldest three-phase power plants in Europe and still preserved.
(Source: Vattenfall Europe, Historical Archives, Berlin)

interpretation of present-day processes.[2]

Next to Saxony, Lusatia, the Ruhr and the Saar, Berlin is currently becoming a new regional focus for industrial heritage in Germany. However, the social context is fundamentally different. Even though there are numerous initiatives in Berlin committed to preserve the industrial heritage, the situation is not as socially desperate as in the traditional industrial regions. Furthermore, it is the first time that the German research activities on industrial heritage do not focus on an industrialized region but an industrially defined metropolitan area. Undoubtedly, Berlin can compete with the traditional industrial regions in terms of unemployment rates, and – almost like samples under a magnifying glass – the social upheavals following 1990 intensify in Berlin. However, Berlin's economic structure is much more diversified than in traditional, mono-structured mining regions, and being a capital and international metropolis, Berlin offers a large variety of opportunities that help to establish a positive urban identity.

This becomes particularly clear when we consider the spontaneous connotations that come to our minds when we think of Berlin: city of subculture, a good place to live even without making much money, or the city where you can make a living out of your creative work... Klaus Wowereit, mayor of Berlin, phrased this as "Berlin is poor but sexy."[3] What is completely missing in the city's public perception is the topic of industrial heritage. Even if you have a beer in Kulturbrauerei[4] you rather think about the future of the creative workers than about the past of the brewers.

The Electropolis Berlin

From a historic perspective, however, Berlin only developed as an industrial city. Following the unification of the Deutsche Reich under the supremacy of Prussia in 1871 and the Electric Revolution that began in 1880, the hitherto provincial Berlin evolved into a rapidly growing city. It became the focus for administration, lobbyists and banks. Also, the Technical University and the outstanding public education system contributed to the development of the unique electricity cluster in Berlin. The stakeholders knew each other well and had excellent international contacts that proved to be a fertile ground for technological and social innovations.

The city itself became a laboratory to test and apply the new technologies. Within just two decades, Berlin advanced to be temporarily the biggest metropolis on the European continent. The booming industries in the electronics, railway and engineering sectors as well as the new radio and communication technologies made industrial and architectural history around the world. Both the industrial production and the organisation of urban life had an enormous hunger for energy. The public power and water supply infrastructure as well as the modern transport systems inspired the whole world. Towards the end of the 19th century "Electropolis Berlin" became a synonym for the modern, networked city.

It is no wonder that Berlin's industrial history is present everywhere in the city – you just do not see it. However, "there is no second place on earth today featuring such a high number of outstanding monuments related to the electro-technical industry and the supply of electricity" says Jörg Haspel, Curator for the Preservation of Historical Monuments in Berlin.[5] Due to the special political situation of the two World Wars and then the divided city, which prevented a fundamental modernisation during the Cold War, an extraordinarily large number of the 120-year-old buildings still exist today. Many kept their original use and remain in operation – a fact that promises particular authenticity and integrity. The new World Heritage initiative, currently being pushed forward by Berlin's Senate Department for Monuments, would be the first in Berlin to explicitly focus on the city's industrial history.

Fig.2
Berlin's forgotten past as an industrial metropolis is what the current World Heritage initiative wants to bring back to people's minds. This aerial view from 1928 shows the AEG Cable Works in Schöneweide. (Source: SDTB, AEG archives)

Among the sites considered for nomination are (in chronological order of their construction): transformer station Buchhändlerhof in Mauerstrasse in Mitte (built from 1885-86 as second municipal block power station in Berlin; today reused[6]); power station Oberspree in Schöneweide (built from 1895-97, Fig. 1); the former AEG Cable Works Oberspree and AEG transformer factory in Schöneweide (built between 1895 and 1929, Fig. 2 and 3); power station Charlottenburg (built in 1899/1900; operating); AEG factories in Brunnenstrasse in Wedding (built between 1906 and 1913; reused after closedown in the 1980s); dynamo hall in Siemensstadt (built in 1906 and expanded until 1942; operating); AEG turbine hall in Huttenstrasse in Moabit (built in 1909; operating, Fig. 4); Siemensforum with Siemens headquarter (built from 1910-13, expanded in 1922 and from 1929-30); switchgear skyscraper and switchgear halls in Siemensstadt (built from 1926-28, 1916, 1921/22 and 1927/28; operating); power station Klingenberg in Lichtenberg (built from 1925-26; operating). In order to emphasise the grid character of the Electropolis as an industrial cityscape, it is planned to include also the electrification of the metropolitan transport systems.[7]

The importance of the architectural and technical sites of the Electropolis Berlin was already recognized on both sides of the wall in the post-WWII time. After the

Fig.3
Some parts of the former AEG premises in Schöneweide reopened as the HTW's second university campus when restoration finished in October 2009. The core area of the cable factory is still operating; the reuse of the remaining areas is currently under discussion. (Source: HTW Berlin)

Fig.4
The AEG turbine hall in Huttenstrasse in Moabit was erected in 1909 and was listed as a monument as early as in 1956. It is still operating today. (Copyright: Deutsche Bundespost Berlin, stamp from 1987)

fall of the Berlin Wall, the city's conservation authorities cooperated with the industry to create concepts for the development and preservation of the Electropolis' buildings. One example is the "Preservation Conception for Siemensstadt"[8]; similar concepts were developed in co-operation with the energy supplier Vattenfall Europe, the former BEWAG.[9] Today, some 20 years after the fall of the wall, the economic situation in Berlin seems to have normalised and the city is striving for re-industrialisation. This new pressure to develop economically is increased by Germany's extreme dependency on exports and its commitment to compete on the global markets. Regulations regarding the conservation of monuments and hitherto existing agreements are increasingly called into question. In addition, all activities regarding the protection of monuments suffer from the disastrous financial situation of the public sector and the extreme downsizing of state agencies in recent years. The companies, on the other hand, lament the shortage of junior employees and a lacking public interest in a vivid industry in Berlin.

Fig.5
The transformer station in Wilhemshavener Strasse, built in 1900/01, was one of the first of its type in Berlin. The technical purpose of the building is difficult to recognise for the layman. (Source: Vattenfall Europe, Historical Archives, Berlin)

Fig.6
Franz Skarbina's painting, View across the Railway in the North of Berlin, dating from 1895, shows how industry settled outside the commuter train ring of Berlin. (Source: Stadtmuseum Berlin)

The "invisible" Electropolis

So far, analysis in the context of the World Heritage initiative has focussed on the morphology, the visible, the "physical landscape". The "mental landscape" and the intangible heritage of the Electropolis Berlin were only partially considered.[10] This subject seems indeed to be as elusive as electricity itself: it is around us, but it remains invisible. We cannot smell it, and we cannot touch it. Electricity is not a material, but a medium; no resource, but a technological infrastructure. It eludes our senses – nevertheless it is the "fifth" element and of substantial importance for our everyday lives.

In a certain way electricity can also be seen as a metaphor for Berlin: the city is fascinating and inspiring and has the power to attract people. Berlin is electrifying – and the electric shock might stimulate us or might result in overkill, a nervous breakdown.

The presence of technological infrastructure is generally hard to trace in the cityscape; this applies in particular to the supply infrastructure for electricity. All cables in Berlin were laid underground right from the beginning. How electricity is produced and distributed, how it arrives in our sockets at home is something that most inhabitants are unaware of. Also, most buildings that are connected to this infrastructure remain invisible in the cityscape. The Berlin transformer stations dating from around 1900 are a good example: they were integrated into the street fronts, their façades were designed as normal office or residential buildings so that their technological functions remain concealed until today (Fig. 5). However, there is still another "invisibility" that makes it difficult to reflect about the

intangible heritage of the Electropolis Berlin: the decentralised layout of the city. With the rapid growth that began in the 1880s the factories abandoned the city centre. New industrial towns, such as Siemensstadt and Schöneweide, or new industrial areas, as in Moabit and Wedding, were built outside the city gates, each of them offering thousands of jobs (Fig. 6). Since the foundation of Great Berlin in 1920, these key areas of the Electropolis are a part of the Berlin municipality. In the collective perception, however, this periphery of the city was widely ignored and still is ignored today. And also the city's living industries – even though they still exist today – are left unnoticed and do not raise the awareness of most Berliners.

Fig.7
Public energy supply in Germany can be traced back to Emil Rathenau's presentation of electric lighting in a luxury Berlin restaurant in 1882. Despite some technical problems backstage (the picture shows him cooling the dynamo) he succeeded in convincing the city's most important stakeholders about the advantages of electricity. (Source: Vattenfall Europe, Historical Archives, Berlin)

This assumed invisibility is in stark contrast to the intensity by which electrification radically and globally changed the way how people lived together in the last 120 years. The wide-spread availability of electricity has produced a new quality of life over the years, which today – at least in Western Europe – is so much taken for granted that we only notice this fact when we have to face occasional power cuts. Being an integral part of the services of public interest, the nation-wide power supply is considered an essential, social and cultural value in Germany, while other parts of the world are striving to reach this goal in their development. Whereas the civilisation's achievements of electrification are generally welcomed today, there is harsh criticism against the technological-cultural system of regulation which evolved from the provision of conventional electricity: waste of electric power, electro smog, "loss of the night", monopoly economy, non-transparent pricing, the unfair way how labour is divided internationally etc. One issue raised during the current structural conflict between conventional and renewable energies is how the system of conventional power supply once developed, how it could be implemented worldwide and how it is affecting our lives. Analysing and reviewing the Electric Revolution 120 years ago may also be helpful in finding reasonable solutions to meet the challenges of the global structural changes taking place at the moment – and when to be alert.

Landscapes of Power

Technology itself has no intrinsic logic. The construction of technological systems is governed by the interests and intentions of certain stakeholders. In order to be accepted by society, technological inventions require important political decisions and a cultural context to promote such ideas. Technological systems use space; they create characteristic structures and hierarchies. The contemporary perspective during the Electric Revolution held the view that large technological systems could solve many social problems. This position was already reflected in the euphoria enthusing about the use of steam engines and railways during the first industrial revolution and gained more and more momentum during the electrification and the second industrial revolution. Today, we are aware of the environmental, social, and cultural "side effects" in the use of large-scale technologies. The current zeitgeist tends to favour decentralised solutions as they seem more human and feasible – and their possible impacts seem to be better manageable.

The history of the Electropolis Berlin shows that the construction of systems to supply electricity in large areas was always accompanied by the conflict between private companies and society at large, which could not be solved until today. Despite this fact, it was the idea to create something for the benefit of all that motivated the municipal protagonists who negotiated the development of electricity grids with private enterprises. The bosses of these companies, which later became large energy corporations, were fully aware of the accumulation opportunities and actively promoted the creation of new markets (Fig. 7). The generation of power developed from “small scale, isolated operations consisting of only a few participants to a phenomenon covering wide areas.”[11] The central power plants for Berlin were built outside the city centre near the water and had their own harbours to improve the supply with huge amounts of coal. The power station Oberspree (Fig. 1) is the first example of this development in Berlin. Once the street lights and the first trams were electrified, it only took a few decades to connect almost all households to the electricity grid.[12] More and more electric appliances were invented and their marketing was massively promoted in public places (Fig. 8). But electricity also empowered completely new applications for entertainment and e.g. paved the way for the film and music industries.

Fig.8
Electric appliances quickly became a status symbol of modern times. New application technologies, in particular for domestic use, were promoted by massive marketing campaigns in the public space. Photography taken in 1931.
(Source: Vattenfall Europe, Historical Archives, Berlin)

Since the beginning, the electrical power industries were dominated by powerful monopolies. The Berlin giants Siemens and AEG (Fig. 9) prevailed on the German market; in “coopetition” with the US corporations General Electric and Westinghouse, they dominated the global market around 1900, concluded agreements to protect their home markets and to divide up the rest of the world. The Berlin banks were involved in these activities right from the start as they were needed to pre-finance the capital intensive building of the facilities. Power plant technology and tram systems were exported to the whole world. Within a few decades, Berlin became a metropolis and Germany an export nation. Even in times when the state intended to exercise more control, it was unable to find a compromise between the economic interests of industry and the overall interests of society. This deadlock remains unsolved until today.[13]

Almost “in the shadow of light”, an energy system emerged that made the consumers unilaterally dependent on a centralised and monopolistically organised electric power industry operating globally. Consumer resistance to this regulation system began with the activities of only a few persons who withdrew from the conventional energy supply by producing their own electricity. Co-operatives set up the first wind wheels, solar panels were installed on the roofs, people tried to save energy – what had started with single actions turned into a broadening social movement and promoted the development of alternative technologies. The structural conflict became obvious. Today, renewable energies leverage a social vision that is seeking forms of global energy supply which are more ecological and more democratic. Maybe this time – with the second attempt – we succeed in making our electricity supply more sustainable. However, we should not only focus on environmental aspects, but should particularly consider how existing international power

structures and the global division of labour can be regulated with greater justice.[14]

Tracing the Invisible

The BZI sees the Electropolis Berlin as a historically grown functional arrangement and a cultural system. The key question is that of the universal cultural value: Which lessons can be learned from Berlin’s industrial past as Electropolis that are useful for our time? Our interpretation comprises a critical discussion of current questions and includes a socio-political and a post-colonial message. Our aim is to encourage public reflection on how a global perspective of human development can help to rethink the energy supply of the future and to make its distribution more just, and we think this would in fact be an extremely worthwhile contribution of Berlin’s industrial heritage on our way to the global society.

Fig.9
Company brand of the Allgemeine Elektricitäts-Gesellschaft (AEG) dating from 1888. (Source: SDTB, AEG archives)

The BZI develops a grid of prototypical theme routes leading across the city that give testimony to the past and present of the industrial metropolis of Berlin. Existing tours will be aligned and integrated into a consistent concept. Our aim is to obtain a connotative overall impression of the industrial metropolis, so that the Electropolis Berlin can be interpreted across time, space and generations as a system that goes far beyond the city’s limits. We want to pull Berlin out of today’s dominating connotations as a cultural metropolis, demonstrate how its powerful electricity industries contributed in a specific way to the development of today’s global “networks of power” and make the particular spatial-functional interconnectedness of the Electropolis Berlin visible and understandable.

For this purpose, it seems appropriate to simultaneously think in two directions: from the city centre to the outside - and then back again from the periphery to the inside. Inside the Electropolis innovations were created, and the young capital and emerging metropolis Berlin outshined the rest of the nation. The province turned into a resource for material and people – and the world became the market. The Electropolis Berlin, as an economic, political, cultural and functional unit, cannot be reduced to its centre, but must encompass the supposedly “invisible” periphery and all international relations. A new conception of the Electropolis should widen our understanding of culture to cross today’s regional and national boundaries. This approach opens new potentials of interpretation aiming at Silesia, Saxony or the Ruhr area – and overseas. And it would reveal the division of labour between the regions which still exists today. In addition, the global understanding of these interregional and transnational relations could serve as good basis for developing specific content profiles and messages for each industrial region in the world.

Fig.10
Ludwig Sütterlin, picture of the "Goddess of Light" with idealised landscape in the background. Issued 1897 in the anniversary publication "The Berlin Electricity Works Until the End of 1896. Planned and Built by the Allgemeine Elektricitäts-Gesellschaft."
(Source: Vattenfall Europe, Historical Archives, Berlin)

The BZI proposes ten thematic routes to approach the particular profile of the Electropolis Berlin, its “spirit of place”, from a global perspective. Each route addresses social questions that shape a time loop engulfing past, presence and future. The current situation can be the starting or end point and invites participants to talk from generation to generation or from region to region. Competing points of view are confronted with each other.

1. The Networked City (Myth of Electropolis): Water, gas, electricity, transport and radio networks as urban root systems. The role of electricity for traffic and communication. The internet. Access points, nodes and control points in the network. Urban quality of life and consumer autonomy.
2. Beyond the Socket: The whole chain of conventional electricity supply: source, delivery of raw materials, power plants, transformer stations, cable networks, different types of consumers. New energy sources (biomass, wind, solar, domestic waste etc.) and their exploration.
3. Landscapes of Power: From early isolated operations to the network system. The electric isolation of West Berlin after 1952, the network system in Western Europe and the former Eastern Bloc, energy reunification after 1994. Outlook on new energy landscapes: new sources, new networks. (Fig. 10)
4. Urban Hygiene: Water supply and waste water, sewage treatment plants, drain fields, public baths, delousing and disinfection facilities, emigration of manufacturing industries, hospitals for epidemics and graveyards outside the city, living in the green outskirts (Berlin Modern Housing Estates).
5. Industrious Berlin: Manufacturing and creative industries. Old factories still operating, creative reuses and new industries (fashion, design, music etc.). Creative clusters in the past and today. Marketing slogans praising Berlin as industrial hub today and 120 years ago.
6. Everyday Life and Dying: Mansions, tenements, applied electric technology, household appliances, department stores, market halls, food industry, breweries, leisure facilities, social housing. Typical diseases, large-sized hospitals, insane asylums, madhouses, graveyards, graves.
7. Urban Mining: Use of resources, origin of reusable waste, waste as a resource, mining in the city, waste collection and management. Green tech. Life cycle of products and criticism of the throwaway society. Dumpsites, mountains of rubble, incineration plants.
8. The Music Industry: Hand-made music, electrification of music. Instruments, compositions, recordings, the juke box. Today's music industry, Technopolis Berlin, independent scene, working conditions and funding, controversy over copyrights in the internet.
9. Made in Germany: Export nation, trade and banks (Deutsche Bank etc.), international financial market, imported and exported products, German companies on the global market, international relations, development aid, German export model.
10. Operation and Administration: Cycles and processes, logistics and organisation. Transit periods and temporary residence. Computerisation of industrial production, just in time management, central server rooms, emergency services. Forced labour and mass extermination.

These ten theme routes will be developed in co-operation with professional tourism providers who know Berlin’s industrial heritage and are experienced in using new, interactive ways to present information. It is planned to co-operate with additional social actors for each route. The BZI routes will be available as virtual routes displayed on a virtual map on the internet and will be marketed as a package. However, the BZI will not act as a tourism provider. Our aim is to help existing providers to increase visibility and their economic potentials by providing an intelligent

and consistent conception and overall marketing – we consider ourselves as their partners and not as their competitors.

The BZI deliberately breaks with traditional tourism expectations. We concentrate on "insider tips" for those who lived in Berlin for a long time and those who just have arrived, and who wish to see the city through different eyes. For us, it is most important to find places where you can strike up a conversation with other people about urban and social developments and the "spirit of place" of the Electropolis Berlin. The BZI will develop new criteria, and to be considered for one of the main routes, a site needs to fulfil at least one of the following requirements: 1) Representativeness and Density: these places are very representative for a theme route and/or showcase a high density of various topics; 2) Explorer potential: there are unexpected things to discover at these places. Hidden treasures; urban exploration; 3) Complexity of meanings of place: the simultaneity of the non-simultaneous is very high at this place. The lost, the never-built and the newly emerging; 4) Meeting places: you can meet contemporary witnesses, activists and/or visionaries here who tell stories about the place’s historic and/or future development; 5) Living the change: locals continuously inform about their progressing work on the internet or by e-mail; interested persons can participate in some of the work.

Network strategy: Organising public interest

The BZI sees itself as an open platform for social communication about the old and the newly emerging industrial heritage of Berlin. Our aim is to organise a joint interpretation process of the Electropolis Berlin and to raise public interest in the city's industrial past and present. It is the BZI's intention to stimulate the exchange and to increase and create new networks between stakeholders, institutions and initiatives who are engaged in Berlin's industrial heritage. Diversity plays a major role in what we do. We co-operate with partners coming from various social and public areas such as monument protection, urban development, industrial and economic policy, museums and archives, non-profit associations, real estate agents, owners and investors, universities and marketing agencies.

In addition, there are various creative communities who use public spaces, the internet or new media (e.g. games[15] or geocaching) to communicate about industrial heritage and the close links between technology and culture. Undoubtedly, they are also story tellers and as such they are important stakeholders in the process to interpret the Electropolis Berlin. The involvement of these creative communities, however, is a novelty in Germany’s discourse about industrial heritage and it requires new ways of thinking. Classic participation models do not seem to fit in this case because they often are drafted as unilateral models by public administration, are too inflexible and do not offer much artistic freedom. For this reason, the BZI prefers the term "Interaction" to "Participation" because we hold the view that meaningful analytical content can only be found jointly, and we are looking for ways to design this public interpretation process openly and with pleasure.

The BZI brings together the various and sometimes contradictory views of different stakeholders by creating global and integrative topics for the theme routes. It is a major concern of the BZI to comply with everybody's right to interpret things differently, even though this can be a complex challenge. The fact that the BZI was founded by academic institutions is a great advantage because it allows us to work independently and in depth. And even though the stakeholders currently do not share the same values, there is at least one bridging interest: they all are seeking

for their cultural roots in Berlin's industrial story (for different reasons of course) and hope to obtain some added value for their own work by actively participating in the network.

Furthermore, tourism is a worthy topic when it comes to building a heterogeneous network, as tourism today is generally understood as a marketing strategy, and marketing is something all groups of stakeholders are somehow interested in. The BZI, however, appreciates tourism in particular as an interactive tool for landscape interpretation – as a collaborative analysis that helps to communicate and implement values. The theoretical reflection on what tourism is and can do for society has not yet been developed further by academics, but to us it looks fundamental when it comes to develop and implement a touristic concept. In this sense, we see the BZI also as an academic experiment put to practice. We work on content, and we play with contents, with different and sometimes opposing contents, looking for messages that are useful on our way to the global society.

Open Roads

One great advantage of not having focussed on industrial heritage in Berlin before is that there is still an array of possible interpretations. Being aware of previous models and traditions but acting independently, we have the great opportunity to develop new contents and messages and new types of storytelling, and to interact with new groups in our society. Due to the particular cultural milieu in Berlin, this might also be the first opportunity to highlight the reasons that contribute to the fascination we have with industrial heritage: it is the reflection about unsolved complex questions we have as persons and which are inherently human. In this new and enlightening sense, we could understand the unfulfilled promise of paradise on earth not as an imposition but as a mental-cultural liberation from worn-out patterns of thought.

And just as some artists did in the 1920s and 1930s when they created the term "Electropolis"[16], we can give birth today to new utopian narratives about the electric city and the global society of the future. However, this requires a high degree of curiosity and open-mindedness including the willingness to give up certainties believed to be true as well as the ability to come to terms with ambivalences and to uphold fairness. The BZI wants to motivate everybody to join this journey into the unknown – as we are convinced it will be really worth it.

Endnotes

1 The term Industriearchäologie could not prevail in German, partially due to a language problem. Facilitating a much broader understanding of the industrialized society, the concept of Industriekultur proved to be more useful in the German context. For details see Helmuth Albrecht, "Zum Verhältnis von Industriearchäologie, Industriekultur und Industriedenkmalpflege in Deutschland", Schriftenreihe der Georg-Agricola-Gesellschaft No. 34 (2011): 22-23.

2 Interestingly, the theoretical debates in the Federal Republic of Germany from which the new concept Industriekultur the emerged, have also been inspired by ideas from the German Democratic Republic. For details on how industrial heritage developed as a new discipline in both German states see Marion Steiner, "Industrial Heritage in Germany" (in English), Patrimonio Industriale: Rivista Semestrale dell'Associazione Italiana per il Patrimonio Archeologico Industriale No. 8 (2011); and Helmuth Albrecht, "Zum Verhältnis von…" (full details see endnote No. 1): 15-30.

3 The mayor of Berlin, Klaus Wowereit, used this slogan for the first time in 2003 and continued using it as some sort of personal motto during subsequent election campaigns. Nowadays, the slogan can be found on various merchandising products such as bags and pouches for Berlin tourists.

4 A former brewery that was renovated and now houses clubs, pubs, a cinema and a theatre.

5 Jörg Haspel and Hubert Staroste, "Das Erbe der Elektropolis Berlin", ICOMOS Journals of the German National Committee No. LI (51) (2011): 74 (original quotation in German).

6 Between 1993 and 1997 this former source of power for the Electropolis became a new source of innovations: the "E-Werk" was one of Berlin's hippest techno clubs and had global influence on the emerging techno scene. Today, it is an event centre and office building.

7 For more detailed information on the World Heritage initiative see Jörg Haspel and Hubert Staroste, "Elektropolis Berlin – Erbe von Weltrang", industrie-kultur No. 03 (2011): 28-30; and Jörg Haspel and Hubert Staroste, "Das Erbe der Elektropolis Berlin", ICOMOS Journals of the German National Committee No. LI (51) (2011): 74-78.

8 See Wolfgang Schäche (ed.), Denkmalschutzkonzeption Siemensstadt, Vol. 1: Industriegebäude, Vol. 2: Wohnsiedlungen (Berlin: Konopka, 1994 and 1995).

9 See Jörg Haspel and Hubert Staroste, "Elektropolis Berlin – Erbe von Weltrang", industrie-kultur No. 03 (2011): 30; and Jörg Haspel and Hubert Staroste, "Das Erbe der Elektropolis Berlin", ICOMOS Journals of the German National Committee No. LI (51) (2011): 78.

10 A first expansion was made by Thorsten Dame in Elektropolis Berlin. Die Energie der Großstadt (Berlin, Gebr. Mann Verlag, 2011). Dame explains e.g. how the term "Elektropolis" originates in utopian narratives from the 1920s and 1930s and describes the network of stakeholders that was essential for Berlin's way to become a metropolis.

11 Axel Föhl, "Bauten der Industrie und Technik", Schriftenreihe des Deutschen Nationalkomitees für Denkmalschutz No. 47 (1995): 105 (original quotation in German). In the beginning, electricity was generated in block power stations, later in power stations and finally in central power plants. The various steps in this technological development can be seen in Berlin at various original sites.

12 In 1914 5% were connected, 25% in 1925, and by 1938 this number had increased to 92%. See Jörg Haspel, "Elektropolis – das Erbe der elektrotechnischen Industrie und der Stromversorgung," in Denkmalpflege und Gesellschaft, Detlef Karg zum 65. Geburtstag, ed. Thomas Drachenberg (Rostock: Hinstorff, 2010): 114.

13 Günter Karweina described the situation in Germany in Der Stromstaat. Stern-Buch-Report (Hamburg: Gruner und Jahr, 1984); for the situation in Europe, see Peter Becker, Aufstieg und Krise der deutschen Stromkonzerne: Zugleich ein Beitrag zur Entwicklung des Energierechts (Bochum: Ponte Press Verlags GmbH, 2011).

14 In his latest book, published before his death, the German economist and social scientist, Hermann Scheer, winner of the alternative Nobel prize in 1999, proved how the complete switch to renewable energies can be realised in a decentralised and cost-effective way and how even the periphery and developing countries can be supplied with electricity; Hermann Scheer, Der energethische Imperativ: 100% jetzt. Wie der vollständige Wechsel zu erneuerbaren Energien zu realisieren ist (München: Kunstmann, 2010).

15 See for example http://amanita-design.net/samorost-1.

16 Examples are given by Thorsten Dame, Elektropolis Berlin. Die Energie der Großstadt (Berlin, Gebr. Mann Verlag, 2011): 24-30. One is Erich Kästner's novel The 35th of May, or Conrad's Ride to the South Seas, first published in 1931 (original language: German).

The Industrial Heritage of Aluminium Industry in Post-colonialism

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Abstract
The topic of the TICCIH congress offers the rare opportunity to examine the question of the Industrial Heritage from the point of view of the colonial world. The challenge is to understand the expansion of the aluminium industry after World War 2, in the decolonization context. These also gives the opportunity to (i) develop a global approach to industrial heritage, and (ii) consider the incorporation of aluminium in Africa's heritage (heritagization), and in particular, highlight the objects of this heritage.

Keywords: industrial heritage; aluminium; post-colonialism

The topic of the TICCIH congress offers the rare opportunity to examine the question of the Industrial Heritage from the point of view of the colonial world. The challenge is to understand the expansion of the aluminium industry after World War 2, in the decolonisation context. These also gives the opportunity to (i) develop a global approach to industrial heritage, and (ii) consider the incorporation of aluminium in Africa's heritage (heritagization), and in particular, highlight the objects of this heritage[1] .

Industrial context
Aluminium industry was born in the middle of the Nineteenth Century. The first process, established by Henri Sainte-Claire Deville, was used essentially in France from 1854 to 1890, and for a short time, in the United Kingdom and in the United States. In 1886, at the same time as in France and in the United States, Paul Héroult and Charles-Martin Hall discovered a second and large-scale process. That was the beginning of mass production and the birth of new markets with new artefacts for consumers. In the beginning of the Twentieth Century, only five companies in four countries were mastering the aluminium technology: France, United States, United Kingdom and Switzerland. They were keeping their technology secret and created a cartel in 1901. When the patent fell into the public domain in 1907, and because of the World War One and the metallic airplanes' growth, other countries contributed to develop this industrial sector, for instance Norway and Russia. From the beginning of the Twentieth Century until after World War Two, smelters (i.e., aluminium reduction plants) were only owned by Western companies, with the exception of Japan.

The real expansion of the market for aluminium began in the 1950's. The world aluminium's consumption grew more than 10% per year until the oil crisis in the mid-1970's. The production

1 This research was undertaken in ANR Créalu Research Program, financed by the Agence Nationale de la Recherche, France.

grew from 1.5 million in 1950 to 10.2 millions tonnes in 1970, and 18 millions by 1990. Nevertheless, until the 1990's, there were comparatively few smelters in the world, and particularly few in colonial regions. For example, the French Pechiney Company only had one aluminium plant in Africa, in Cameroon, and it was the first one built in Africa. The other plants of Pechiney were in Europe (Greece and the Netherlands), in the United States and Australia[2] . The Cameroon smelter received the alumina from Guinea, where Pechiney had bauxite mines and an alumina refinery.

From everyday objects…to artefacts in museum collections
The introduction of aluminium goods in Africa did not wait for the construction of the first aluminium factory in Africa, in the 1950's, in Cameroon. The military expeditions of the nineteenth century, e.g., the French military expedition to Madagascar in 1895, already included aluminium coins, kitchen utensils and boats. Many aluminium objects used by expeditions or missionaries were for instance exhibited at the 1931 Colonial Exhibition in Paris.

World War Two was a turning point in the expansion of usages of the metal, both for the amounts used and for the multiplication of applications. The U.S. military was one of the drivers of innovation in this domain, by soliciting industry for new products tailored to military requirements in combat zones with extreme climate such as in Asia: for example, aluminium beverage cans and aluminium foil for packaging.

The ethnologist Michel Morainville dates from this period the appearance of aluminium foundry technology in West Africa, and links it to the presence of American soldiers in Senegal. A consequence of this technology's transfer is that traditional blacksmiths started to use aluminium as they previously did iron. The technology then spread across Africa to Madagascar, thanks to the waste recycling of aluminium. This is shown by the handcrafting of many kinds of pans and saucepans. Morainville succeeded in tracing the "road of aluminium" of this technique.

We could cite many more examples of use, reuse and recycling of aluminium in the former colonial regions. A study is still needed to analyse their nature, the technologies used, and their social importance. But we also want to understand whether aluminium causes a patrimonial interest in the former colonial regions.

The notion of collections is familiar to Africa, as Steven Nelson has rightly described in the issue of Museum International devoted to "Issues of the collection in the twenty-first century". Traditional objects as well as technical ones have been collected and stored in the inter-war period in situ, as was the case in Bamum kingdom, Cameroon, in 1931, and the National Museum of Lubumbashi, since 1937[3] . Rapid research in the collections of the Musée du Quai Branly in Paris shows the presence of more than 500 different objects, all-aluminium or having aluminium components. The earliest date from the 1930s, e.g., a Tunisian coffee pot[4] (1934), or a kettle of Mauritania (1938)[5] . Records indicate that this kettle, produced in copper and aluminium, had been manufactured by a nomadic blacksmith. A third object, a Labret, all-aluminium and from Cameroon, dates from the same period. They highlight the diversity of techniques mastered there: rolling, casting, carving.

2 For comparison, the American producer Alcoa, the largest world aluminium producer, did the same in Surinam at the end of the Fifties, and in Brazil in the Seventies. (Smith, 1988)
3 (Guy de Plaen, 1989).
4 N° inventaire : 71.1934.37.3 bis.
5 N° inventaire 71.1938.108.3

The Musée d'ethnographie de Genève offers other pieces of evidence with even older objects dating from the nineteenth century: ceremonial weapons from Congo and a bracelet of Ethiopia.

New materials, from the successive industrial revolutions, were introduced into jewelry, ornaments and objects of worship belonging to populations from geographical areas with little or no industry. Besides aluminium, plastics also provide an interesting framework for studying the relationships to modernity and technical progress. Modes of appropriation of these new materials by users in Europe and Africa, with very different time scales, is an essential element for studying world economic and social history.

Industrial sites and colonial buildings

To produce aluminium, bauxite ore is necessary. The most important mines are located in sub-tropical areas, in Africa (Guinea), Central and South-America (Guyana), Jamaïca and Australia. The mining began after World War Two, and the industrial landscapes were deeply altered. For the bauxite mines, as well as for the alumina and aluminium sites, a common point is their very large size, which we describe as 'gigantism'.

Gigantic and tricky: the heritage of bauxite mining

The issue of industrial landscape in the case of bauxite mines is a very sensitive subject. The original landscape, after open-cast bauxite mining, is often considerably altered. Under a very strong social pressure, in many countries most of the producers decided to rehabilitate the sites. "Landscaping is the first step in the rehabilitation process. Landscaping reshapes the mined out pit, removes pit faces and pit floors, buries large rocks and creates a final surface that blends in with the surrounding forest topography." That is the case in Australia or in Jamaica. This topic has to be studied in more depth because the industrial heritage[6] is never discussed when such mines closes. The aim is always to protect the natural environment, without taking into account the social and economic dimension.

Are there any bauxite mining museums into the world? This ore is the second most prolific in the earth crust. We know of one museum in Southern France called the "Musée des gueules rouges" (the Red Faces Museum), another one in Arkansas[7] , United States, and a third at Sopron, in Hungary … But these three museums do not seem to be on mining sites. The fourth, located in Greece, is called the Fokis Mining Park[9] , and offers the possibility to the visitor to enter an original mine, but we failed to find any in Jamaïca or Guinea…

Aluminium smelter: an homogeneous industrial architecture around the world

The aluminium industry is characterised by the similarity of the factories architecture all around the world. The architecture of potrooms[10] is almost frozen at the beginning of the Twentieth century. It responds to process constraints, including the series connection of the electrolytic cells, where a current goes through each, one after the other. The potrooms are large and high, and the roof has openings to let out fumes and heat while preventing rain from entering. The structure is light: metal and bricks.

6 See for example John Gardner and Geoff Stoneman, « Bauxite Mining and Conservation of the Jarrah Forest in South- West Australia ».
7 Bauxite Museum, 6706 Benton Road - Bauxite, Saline County, Arkansas 72011/. http://www.arkansasties.com/Saline/BauxiteMuseum.htm. Web link accessed January 29, 2013.
8 The Balas Eugene Gant Exposition Bauxitmining. http://www.kbm.hu/hu/node/59. Web link accessed January 29, 2013.
9 Fokis Mining Park, http://www.vagonetto.gr/en/fokis-mining-park/history/ Web link accessed January 29, 2013.
10 Potroom means a building unit which houses a group of electrolytic cells in which aluminium is produced.

Production sites are typically designed along the same lines:
- An electrical substation to supply the plant with energy,
- Alumina silos,
- A workshop anode manufacture,
- Potrooms, the heart of the process,
- A foundry, to transform metal into semi-finished products (plates, billets, ingots...), and
- Administrative and welfare buildings, such as offices and a canteen etc.

The surface area is even more important if the site is combined with an alumina refinery and a power generation site: hydroelectric dam, thermal or nuclear power plant. That is partially the case of the first aluminium smelter in Africa, in Cameroon[11] with the Sanaga power plant. The alumina is imported from Guinea. The construction began in 1954 and the production started in 1957. The plant operated until early 1970 exclusively for Pechiney, with all of the metal sent to France. The plant was then turned into a company with Cameroon State participation. In 1979, the company took the name of Alucam, Compagnie camerounaise de l'aluminium, and continued to develop downstream, especially with the rolling company Socatral, who produced corrugated sheets, and the manufacture of kitchen utensils, Alubassa. Alucam had become truly integrated into the economy of Cameroon: an important part of the metal was processed and consumed locally. That deeply modified the population's consumer habits.

Built by a French company, the architecture is similar to that of French aluminium factories. It is also quite difficult to see differences on the construction site through the aerial photographs. On the ground, the Potrooms are very similar, and so are the interior views. French technical culture, acquired over half a century, is visible and legible. The main differences come from the workers who are mostly Cameroonians, and from the office buildings of colonial architecture.

Colonial constructions: aluminium to build "light houses"

Indeed, to accommodate the employees, the company built houses and other specific buildings as medical centre, swimming pool, etc. In this industrial setting, most prominent are the homes for expatriates. To make them as comfortable as possible for its employees, Pechiney resorted to an engineer recognized as a pioneer in the use of aluminium in architecture, Jean Prouvé. Some unusual "colonial houses" were imported into Africa and are now considered as collector's items. Three houses have been bought in Niamey and Brazzaville and repatriated in France[12] , thus depriving Niger and Congo of this famous heritage. A major problem is now to defend the preservation of industrial heritage on site, while large sums are offered to homeowners to dismantle, and sell them on the American or European art market. The awareness of national authorities to the issue of industrial heritage is necessary to preserve these buildings in site.

The "aluminium landscape" in Africa is now around fifty years old. Alucam Company published a very interesting book to commemorate this jubilee. Is it perhaps the first step towered heritage awareness?

Conclusion

In this article, it has been argued that Africa has an interesting potential in terms of Industrial Heritage that is insufficiently appreciated by the African and Western governments. Cameroon

11 M. Laparra et I. Grinberg, Alucam, un destin africain. 50 ans d'aluminium au Cameroun, Mirabeau, Ref.2C éditions, 2007.
12 See the pictures taken by the buyer:
http://www.galerie54.com/web/Expositions_details.php?ID=MTIAOTY4MzEwNDRiOWEzNTdkY2NlN2ViZGQ1ODBlMThjYjU= Web link accessed January 29, 2013.

is an excellent example. Its technological, economical, architectural and social history has been studied and is well known. The relationships between the Cameroonians and technology are fascinating, and could be the topic of promotional projects based on their industrial heritage. Through the prism of a single element, aluminium, the history of usages, consumers and users can be written, explained and transmitted. The ethnographic collections are precious sources of information for the history of technology in Africa, where very few archives exist. Objects have even more importance than in other regions, and the intangible heritage, human memory, as shown by M. Morainville, is also precious and fragile. But tangible heritage is threatened as well, as is illustrated by the example of the Prouvé architecture, demonstrating that the looting of Africa continues.

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Transnational Heritage in Europe

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Abstract
The industrial colonial heritage is a Transnational Heritage. Transnational Industrial Heritage is the one built by a foreign company or person according to aesthetic designs and shapes that are used in other countries, either by a company or by a person. Transnational heritage has not always been built with a colonial mentality, at least in Europe. In this continent, there are many examples of Transnational Heritage due to different causes. A very quite common one is the change of borders in certain periods of the history. Therefore, the industrial constructions made during this time become part of the new nation. Sometimes the new nation conceals the national origin of the construction. In others, they despise it and tend to destroy it.
That kind of heritage has not been widely studied. Even so, knowing part of the relationships among industrialised countries is very relevant.

The most common cause that produces Transnational Heritage occurs when a company or person decides to work in a foreign country to enlarge its market. This can be done by simply moving the production centre to the other country or by creating a new company in the new place to be able to take advantage of the opportunities that exist there. A third type of Transnational Heritage in Europe is the colonial one. That happened most often in non-industrialized regions. In that case, the goal of the company was to create an industrial site to extract raw material, to produce or store goods, or to create communication lines for the sole purpose of making a business. In Spain, the most emblematic case is the exploitation of Riotinto cooper mines in Andalusia from the British company Rio Tinto Company Limited in 1873. In this case, the technical body of the metropolis was completely separated from the nation's workers in addition to the company not being involved in the economic development of the area.

In Catalonia, there are several examples of transnational architecture due to the second cause, which occurred when certain people or companies decided to create an industry in Catalonia to take advantage of the business opportunities.

In the presentation, several Catalan sites will be discussed:

- The industrial colony in Sant Vicens de Torelló and the textile factory in Barcelona built by the Scottish company Coats.
- The textile Colony Salou in "Masies de Voltregà" (1862) and the Baurier factory in Barcelona created by the French Baurier family in 1910.
- The Electrochemistry of Flix created by the German company Chemische Fabrik Elektron i Elektrizitäts AG in 1897
- The Hispano Olivetti company created by the Italian company Olivetti in 1942
- The AEG factory in Terrassa created in 1941 by this German company.

- The Siemens factory in Cornellà created by Siemens Schuckert Industria Eléctrica S.A. in 1910.

The fate of the industrial heritage in those companies has been varied. Even though in some cases it has disappeared, most of it still exists. Part of it is still operational and another part has been rescued for other uses.

Keywords: transnational heritage; post-colonial heritage; industrial heritage; Europe

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When I proposed presenting a paper regarding the post-colonial heritage, I didn't think I could give any examples or reflections related directly to the subject. The Spanish Empire was not characterized by its industrial spirit and most of the American Spanish Colonies were lost at the beginning of the nineteenth century when their most important economic production was related to agriculture.

However, I related the post-colonial heritage to particular sites of European industrial heritage that were created by individuals or by companies from countries outside Europe itself. In some cases this situation was similar to that of the post-colonial heritage, while in other cases there were parallels: these were industrial buildings built by foreigners often with the aesthetics of their own country. Its generic name is "transnational heritage" because physically this heritage belongs to one country while the initiative and design concept comes from a different national culture. The post-colonial heritage could therefore also qualify as a kind of transnational heritage.

I have discussed this issue at a conference in Brussels and spoken of it in meetings of Europa Nostra. The transnational heritage has caused some debate in Europe in the discussion of the role of cultural heritage in building continental identity. For example, The "European Heritage Label" was officially created to promote the transnational dimension of certain cultural assets which have had a key role in the construction and consolidation of Europe. The purpose of this brand is " to increase the knowledge, the awareness and the support of citizens for their heritage whilst strengthening the support of Europeans for a sense of common identity".

Various scholars have written directly or indirectly on the subject, among them Steiner and Edgar Morin, since the common European heritage has to have some different characteristics to those of other existing types of territorially-based heritage. The parameters that define the "common heritage of Europe" which the "Label" aims to reflect must be different from the national heritages which value artistic or historical distinctiveness at a territorial level. Nor should it be a sort of mini-World Heritage which is based on the universal value of a site at a global level. European heritage has to reflect European values or those phenomena that have influenced the history of the continent rather than specific places that stand out for their own intrinsic interest.

The industrial heritage has a double interest for Europe. Partly it is a material witness to the process of industrialization which was born on the continent and which changed the social and economic life of its society. This industrial culture which changed habits of work and ways of life spread to rest of the world. On the other hand, industrialization began to found a common European culture. There was a transfer of capital, of knowledge, of raw materials, of finished products and of people which together homogenized society. Within the industrial heritage, the

sites that testify most to this phenomenon of transfers are the transnational heritage found in different parts of Europe.

Companies trying to enlarge their markets developed the strategy of establishing businesses to exploit raw materials and also to produce their products “in situ” in order to sell to particular groups in Europe. These companies brought wealth and in many areas developed the industrial mentality where it did hitherto not exist. But we must not forget the negative side. The competition for new markets, both in Europe and elsewhere, has also been one of the factors that have provoked the great wars.

Before starting the article, it should be made clear that internationally, and specifically in the case of UNESCO, transnational heritage refers to groups of buildings that have been built in various countries according to three circumstances that are different to the way in which it is treated here:

1. There is a heritage created by some other peoples or cultures that have disappeared and whose territory is occupied today by various countries. This heritage is very widespread in Europe and other parts of the world. Celtic, Roman or Inca heritage is transnational.

2. The international organizations also consider the transnational heritage to be that created by human movements such as that created by the Silk Road or Route of Santiago de Compostela which pass through several countries.

3. The third case applies to that heritage created by various nations for a common purpose. The best known is the Struve Geodetic Arc (World Heritage). This comprises a number of Triangulation points which together show that the earth is not spherical but flatter at the poles. This World Heritage site is located in ten countries.

So transnational heritage is testimony to diverse human events such as a vanished culture, human movements, a scientific work, etcetera. Similarly, the cases described in this article also together testify to a reality: the phenomenon of industrial expansion and colonialism. The testimonial and documentary value go beyond the intrinsic value of each one of the heritage sites, and it is the ensemble that testifies to a historic fact.

The concept of European heritage

The concept of the nation state was created In Europe, as was the concept of cultural heritage linked to the Nation State. It was during the French Revolution that this concept of cultural heritage was formalized for the first time. The cultural heritage was taken to be all those productions of the human spirit, music, painting, sculpture and architecture as well as technical inventions. The cultural heritage had the value of being formed by works transmitted throughout the history of the nation and belonged to the people considered as a large family.

One of those responsible was the Abbé Gregoire, a French revolutionary leadernwho was the founder of the School and the Musée d’Arts et Métiers in Paris where technical innovations were conserved. Faced with the destruction of the historic property of the church such as the monastery of Cluny and of the noble palaces, he asserted that these now no longer belonged to the social classes that had formerly held power. They were owned by the people and constituted a national wealth that had to be preserved for the benefit of the people. As the Convention (similar to deputy

chamber) declared “All monuments of the sciences and the arts are under the care of all good citizens” and “Barbarians and slaves detest the sciences and destroy monuments of the arts, while free men love and conserve them”. This declaration meant that some physical goods which had an identity value for the country were the property of the people and therefore of the Nation.

During the nineteenth and twentieth centuries, the national heritage has served to reinforce the idea of the Nation, transmitting the antiquity of the national community and the historical unity of the inhabitants of its territory. A large part of the declarations of national heritage imply, or even say, that the territory the nation occupies is its natural territory. In some cases they state that the neighbouring country has taken part of its territory but they almost never question that part of their historic territory, which belonged to another country.

The conclusion of different discussions about European Heritage is everyone agrees there is no national heritage of Europe, the dominant characteristic of the continent’s heritage is its diversity. The sum of its heritage expresses the different values and cultures that have shaped Europe and have constituted the cradle of Western civilization.

Material goods have an interest at a European level when they form part of a group that has represented an event which has been important in the history of Europe and has produced some values. For example, the great importance of the churches and monasteries of the route to Santiago, a religious pilgrimage trail whose final destination is Santiago de Compostela (Spain), is that they are a testimony to an itinerary that served for the transmission of knowledge among people from different parts of the continent. Its impact was so great than the German writer Goethe affirmed, Europe was formed with the pilgrimages to Santiago de Compostela.

Industrialization was one of the great events in European history that definitively promoted the cultural union of its people. It created a common culture of production and behaviour at the same time as it created strong ties between countries. This model of production and way of life was exported to the rest of the world.

In the process, industrialization broke down isolation and began to dilute territorial specialisms. Industrialization in Europe marked the beginning of a change of era but also marked the beginning of a real process of continental unification. This process had clear antecedents going back to the Middle Ages when another cultural and productive change took place. On the one hand the arrival of knowledge from the classical world, via Arabic texts, encouraged the creation of a philosophical mentality and on the oher the development of different technologies such as milling, mining, mechanics, textiles or the use of iron on a large scale, along with the emergence of an intense trade, began a process of cultural and productive change.

The technical development of Europe is unique. According to Eric Hobsbawm “Europe became European when its technology started to surpass in some respects the technology and knowledge of the Chinese” and we might add that this allowed the countries of the European continent to conquer the rest of the world.

Exchanges multiplied in the seventeenth century and eighteenth centuries, and not only through production and trade. Contacts between scientists and scholars from various countries created a high culture common to all countries. To quote Eric Hobsbawm again, “there was a small selection

of cultivated people that related across borders thanks to a common language which in the eighteenth century was already French and which replaced the Latin of the Middle Ages. These people, known as the Republic of Letters, were united by their faith in reason and education, progress and the possibility of improving, through action, the human condition." And he adds " In my opinion this constitutes the most specific and enduring expression of the European legacy."

The forms of capitalist production and the method of production according to the "factory system" of industrialization swept across Europe, creating centres of production that were everywhere alike. This is the reason why some say that the true common European heritage is the industrial heritage. Moreover, everyday objects and working tools were increasingly standardized and identical all over Europe. For example the forges of the Pyrenees, whose main products were nails made with hand tools, had to close when the new French foundries invaded the nail market. The new nails were much cheaper, had the same size according to predetermined typologies and were standardized throughout Europe.

This unification of working methods and of the goods they produced though industrial processes, used in the manufacturing and in everyday life, generated a similar material culture in all the countries of the continent. As Gràcia Dorel explained in a conference: "What is the difference between a metallurgical workshop or a coal mine in Poland, Scandinavia or Italy? Are the interiors of working and middle class houses very different in the various European countries between 1880 and 1930? Despite regional variations, among which eating habits are the most resistant to homogenization, and the climate enforcing different habits of dress, everything is the same from the Atlantic to the Urals - the same brand of sewing machine, the corset and "Paris fashion" magazines.

Entrepreneurs and technicians travelled from the more to less industrialized countries, creating a common work culture. As an example, in the Barcelona of the mid-nineteenth century with a population of some 340,000 there were about 5,000 French-speakers, which prompted the French consul Ferdinand Lesseps (who would later build the Suez Canal) to establish a French school, which still exists. Probably most were technicians who had come to work and their families in Catalan industry.

The consequence of the transfers of capital, people and knowledge was the creation of manufacturing centers in different parts of Europe by people and companies from other nations. These relationships were often primarily and only capitalist. But in other cases, buildings were built with the aesthetics and the mentality of the foreign country and have left behind a heritage that can be classified transnational. It is a heritage that is in one nation but which belongs conceptually to the culture of another, as occurs with post-colonial heritage.

The European industrial heritage considered as transnational is not everywhere of the same origin, nor it can be classified in the same way. Three different circumstances can be identified: a) heritage produced by a process similar to colonialism, b) heritage resulting from a change of borders and c) that created by foreign companies and individuals.

The first category, the colonial industrial heritage in Europe, is similar to the so-called post-colonial heritage in other continents. It is a heritage belonging to companies that exploited raw materials in underdeveloped regions of Europe. In Spain, the best known example is that of the Rio Tinto

copper mines. These mines, operated since the Copper Age, had a first major expansion in the Roman period. The greatest testimony to this period is the over-thirty Roman waterwheels found in later operations. The mines were again exploited in the eighteenth century, first by the Swede L Wolters and then by the State, but the principal development occurred in 1873 when the British consortium the Rio Tinto Company Limited obtained the concession. The entire Rio Tinto mine is one of the most important industrial heritage sites in Spain. In this paper I want to highlight how the heritage related to the housing displays the colonial character of the site.

There are several aspects which bear out this colonial relationship. First there is the British attitude towards the local inhabitants. For example, the old Riotinto village was demolished because it interfered with the company's plans for exploiting the copper. They built another, called "The Valley", was constructed using British building codes but with the techniques and aesthetics of the host country. Moreover there was a major conflict, expressive of this colonial character, in which the political disposition of the country was also involved. The ore-roasting furnaces produced a great plume of toxic smoke which in 1888 led to protests by the village. The governor sent in the army who shot at the protesters, causing a hundred deaths.

Meanwhile the English built for themselves a residential district called "the English village of Bella Vista" (1883) of Victorian-style houses with gardens, an Anglican Church and of course a club. The whole "Bella Vista village" was isolated from the township of Rio Tinto, surrounded by a fence, and the Spanish were not allowed in right up until the end of commercial life in the 1950s. Despite this, in real life there was a certain relationship between the two populations. An example is the formation of the first football team in Spain and the first Boy Scout group in the country.

The difference between this type of exploitation and other non-colonial operations also in Spain is that it engendered no industrial mentality as, for example, that inculcated in the Basque country where there was another strong British investment and influence related to iron works . Here there was transfer of technology and the Basc Country was an is the most important iron region in Spain.

The second type of transnational capital results from changes of borders, which is why it can also be referred to as cross-border heritage. This is the most important transnational heritage in Europe. Wars and peace treaties have moved the lines that separate the nations of Europe, integrating territories formerly of one nation into the territory of another. This phenomenon has been common throughout European history but has particularly affected much of central Europe in recent centuries. There are numerous industrial buildings created by individuals or companies in one country which now find themselves in another.

This heritage is often absorbed as part of the local heritage and its foreign origin is hidden, while at other times it is undervalued because it is not accepted as part of the indigenous culture. There have been cases of an industrial site in which the buildings erected by the companies of the country are appreciated as heritage while those built by another whilst occupying that territory are not.

The third type of transnational industrial heritage is that created by foreigners and foreign companies with a constructive style from their own country. The two main reasons why a company decides to invest in a different country are to increase their markets or to exploit raw materials. In

the first case, proximity of production to the centres of consumption and saving import taxes make the locally-produced product cheaper and more competitive. On a personal level there are other reasons such as someone spotting a business opportunity in another country where there could be market demand. In this case the entrepreneur moves with his family to the foreign country.

Examples of transnational industrial heritage in Catalonia

In this paper we will look at this third type of transnational heritage, that is to say the heritage of industries created through the initiative of foreign individuals or companies using the constructive style of their original country. Catalonia is a clear example of a country that started its industrialization at the beginning of the nineteenth century and throughout the century it was local capital that founded the industry. But with the turn of the century foreign companies took an interest in establishing factories to sell their products. These are six examples:

- The industrial settlement “Colònia Borgonyà” in Sant Vicens de Torelló and the textile factory built in Barcelona by the Scottish company Coats.
- The textile Colony Salou in “Masies de Voltregà” (1862) and the Baurier factory in Barcelona created by the French Baurier family in 1910.
- Electrochemistry of Flix founded by the German company Chemische Fabrik Elektron and Elektrizitäts AG in 1897.
- The Siemens factory established in Cornellà by Siemens Industria Electrica SA Schuckert in 1910.
- The AEG factory built in Terrassa in 1941 by this German company.
- The Hispano Olivetti company formed by the Italian Olivetti in 1942.

1.- Fabra i Coats: Colònia Borgonyà en Sant Vicens de Torelló i Fabrica de Hilados en Sant Andreu (Barcelona

The Scottish company J & P Coats, thread manufacturers, created a spanish company called “Nuevas Hilaturas Ter in Catalonia.” His manager John Flechsig, bought in 1893 a grant of water t. The factory went into operation in 1895 and beside it a worker colony was created. Ten years later the company joined the catalan company Fabra and the new one was called “Fabra i Coats” and the industrial colony “Colònia Borgonyà”.When compared with the other Catalan industrial colonies, the houses are not apartments in blocks of flats. Houses are unifamilares on the back they have a yard similar to English houses. Fabra and Coats gave a series of services that were exemplary among the colonies of the Ter: church schools for both sexes, cooperative, theater, casino, football field that was the first of Catalonia, post office, cemetery, a kindergarten and permanent services of a physician and a pharmacy .La colony Borgonyà factory closed its doors in 1995

The company Fabra i Coats built another industrial complex in the district of Sant Andreu de Barcelona. The factory buildings were built between 1910 and 1920. The architectural structure is fomada by brick walls and pillars and beams of steel manufactured in the UK. Currently the factory is becoming a cultural center. The architectural structure is formed by brick walls and pillars with steeel pilars manufactured in the UK. Currently the factory is becoming a cultural center.

2- The Electrochemistry of Flix created by the German company Chemische Fabrik Elektron i Elektrizitäts AG in 1897.

This company was established in 1897 by two German companies, and an electric chemistry,

involving Swiss banks and some spanish inversors. In Flix yhere were given conditions of proximity to raw materials (quarries and salt), water (river Ebro), coal and a possibility of building a hydroelectric dam on river Ebro.) and optimal media for the transport of goods and coal by train to Barcelona and Madrid.

The Flix plant was the first in Spain and the third in Europe to make the major technological transition experienced by the traditional chemical industry, using electricity in the chlorine manufacturing process. The technological change was driven by higher demand from the textile sector which the chemical industry supplied with the chlorine and soda used in the finishing, dyeing, painting and bleaching of the textiles.

The plant was inaugurate in 1899 and in 1904, it granted exclusive rights to sell its products to the Catalan fertiliser company Cros S.A.

During its first fifty years of operation, the Flix plant was affected by wars both in Europe and Spain. During World War I, the allied blockade made it difficult to manufacture the existing products meaning that it had to add new products.

During the 50s, 60s and 70s Electroquímica de Flix underwent a major expansion and, after becoming a limited liability company with Cros S.A. as its majority shareholder, would be taken over by the latter in 1974.

The plant’s production activities are currently focussed on the manufacture of chlorine and soda, chlorine derivatives, chlorinated solvents and dicalcium phosphate. Its business activities cover two Ercros divisions: Basic Chemicals and Animal Feed.

The manufacture had a workers village called “el Barrio” (neighbourhood), known for its origins as the “international district” (for the significant presence of German workers and other European nationalities) is characterized represents a model for urban and central Europe being one of the few examples of colony industrial remains active. Significantly, it contains a number of buildings and places of great historical, architectural and sentimental to the town of Flix. Currently the colony, despite being a historic and unique heritage of Catalonia, is in a situation of strong architectural and urban degradation, product of the progressive abandonment of the buildings and the lack of maintenance periods of economic crisis linked to the factory.
In the Barrio there was a cooperative for selling goods, sport fields, medical kindergarten centre, a church, children’s park. Some of these buildings have been restored.

3.- The Siemens factory in Cornellà created by Siemens Schuckert Industria Eléctrica S.A. in 1910.

In 1897 the engineer Louis Muntadas founded the company “Electric Industry” in Barcelona. In 1910 the company joined the company “Siemens Schckert Industria Electrica SA” Thanks to the neutrality of Spain in the IWW the manufacture had a huge industrial development. In 1925 the the dimention of the manufacture was 50,000 m2 The demand for electrical products was growing steadily and in 1929 Siemens built a new factory in Cornella del Llobregat in the style of the German company.

After the Civil War during the 40’s the factory continued to expand at the end of fifties and

sixties reached its maximum expansion. For example in 1958 the factory produced one million electric meters and in in 1969 it had already produced one million electric motors. From the eighties the factory began to specialize in certain products in anticipation of the entry of Spain into the European Union. Currently the factory produces for the international market for rail traction motors, converters and railway signalling. Last years Siemens has expanded in Cornellá

4.- The AEG factory in Terrassa created in 1941 by this German company.

Al 1910 uns industrials de terrassa van fundar “l’electra industrial” i al 1939, el grup alemany AEG comprà la majoria de les accions de La Electra Industrial. Al 1942 compra un terreny on edificarà una primera nau de 3000m2. El més característic de la fàbrica és l’edifici de recepció on hi havien els serveis i les oficines. Aquest edifici de la fàbrica és d’estil alemany dels anys quaranta cinquanta perquè és completament diferent al que existeix en altres edificis industrials de terrassa. Al costat de companyia es crea un barri obrer. L’empresa fabricava elements elèctrics i a partir de 1980 s’especialitzà en la fabricació de motors elèctrics i absorbí la producció de motors de de Esslingen i de la berlinesa KF Motors (1982). Al 1998 la fàbrica va ser comprada pel grup Lafert d’Itàlia i es va traslladar a un altre local. Hi han uns projectes de construir un grup de vivendes nou on eren situat els tallers i preservar –ne una part. A l’edifici principal hi ha el proyecte de convertir-lo en un centre comercial i un segon en una escola.

In 1910 some Terrassa industrialist founded the company “Industrial Electra” and in 1939, the German group AEG bought its majority of the shareholding. In 1942 AEG o purchased land to build the first industrial premises of 3000m2. Today the most characteristic building of the factory is the entrance hall building where there were services and offices. This factory building was built in German style from beginning of the fifties and it is completely different to the others existing in the town. Along with the manufacture a working neighbourhood was created The company manufactured electrical devices and from 1980 it was specialized in manufacturing electric motors and absorbed the production of Esslingen engines and motors Berlin KF (1982). In 1998 the factory was bought by the group Lafert Italy and moved to another place.

There is a project for building new blocks of houses in one part of the manufacture and they want preserve the buildings that have more value.. One of them will be used as school, the entrance hall has been proposed to turn it into a commercial store.

5.- The Hispano Olivetti company created by the Italian company Olivetti in 1942

La Compañía Olivetti fue fundada en Ivrea en 1895 i des de 1908 se especializó en la producción de máquinas de escribir. Camilo Olivetti era una persona muy humanista y quería que los productos y los edificios de su compañía fueran estéticamente bellos. En 1929 Olivetti crea una sociedad “Hispano Olivetti” en Barcelona i después de la guerra Civil en 1939 absorbe la empresa “La Rápida” que fabricaba máquinas de coser y de escribir En 1942 inaugura una nueva fábrica de 2.200 m2 cuyos arquitectos fueron el arquitecto municipal Josep Soteras y el ingeniero italiano Italo Lauro apoyados por una firma de arquitectura de Milán. El diseño estaba influido por la estética moderna italiana que estaba muy alejada de las la arquitectura que se realizaba durante el franquismo.

La fábrica disponía de servicios para los trabajadores como comedores, kindergarden campo de deportes y piscina, utilizados durante los fines de semana, algo inusual en la postguerra española.

A partir de los años ochenta debido al desarrollo de la informática, la planta de Barcelona especializada en la producción de máquinas de escribir empezó a reducir trabajadores. En 1992 vendió los terrenos de la fábrica que estaban muy cerca de la remodelada zona olímpica (juegos olímpicos de Barcelona de 1992).

Se preservó el edificio principal i algunos más que se han reutilizado como un centro comercial y en oficinas.

The Olivetti Company was founded in Ivrea (Italy)in 1895. In 1908 it was specialized in the production of typewriters. Camillo Olivetti, the owner, was a very humanistic and he wanted the product and the company’s buildings were aesthetically beautiful. In 1929 Olivetti company creates a “Hispano Olivetti” in Barcelona and after the Civil War in 1939 absorbed the company “La Rápida” a manufacture of sewing machines and writing machines. In 1942 “Hispano Olivetti” opened a new factory of 2,200 m2 built by the municipal architect Josep Soteras and the Italian engineer Italo Lauro supported by an architecture firm in Milan. The design was influenced by modern Italian aesthetic that was completely different from the architecture that took place during the Franco regime.

The factory built social services available to workers as dining rooms, kindergarten sports field and swimming pool, used during the weekends, something unusual in postwar Spanish.

From the eighties due to the development of the Barcelona manufacture specialized in the production of typewriters began to reduce workers because of the news personal computers. In 1992 the barcelona factory was sold and they moved to another catalan town outside Bacelona. The factory was close to the Olimpic area (Barcdelona 1992) that was been remodeled and the land value increased.

The Hispano Olivetti complex was bought by a private company and the main building and others parts was preserved and reused as commercial center and offices.

In this article, examples of industrial heritage are described in which the cultures of the companies and people who built the factories are reflected in their architecture. But there are many more examples of industries where the capital, technicians or designers were foreigners but this is not apparent because they used local construction technologies. Industrialists also sometimes ordered plant or machinery from a company which in addition sent plans for the building because local knowledge was inadequate.

This phenomenon was especially common at the beginning of industrialization. In the case of the “Igualadina Algodonera” (1841) in Igualada, for example, the design of the building and the machinery was French (Alsatian), while the “Vapor Vell de Sants” in Barcelona (1844-46) was the same but of English origin.

There were many other companies which imported foreign capital, technology or technicians. At other times the industrialists themselves emigrated to Catalonia to build their businesses. The two most emblematic examples are the Damm and Moritz breweries, the largest in Barcelona, which introduced an almost unknown drink into this country. Both were established by Alsatians. The

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first was founded in 1851 by Louis Moritz of Pfaffenhoffen. Initially he was associated with another Frenchman already in Barcelona, Ernest Ganivet, and they purchased a factory from another foreigner, John Murer. In 1862 Moritz bought a new piece of land on which to build his definitive brewery but this time with Catalan design and technology.

The Barcelona factory closed in 1972 and the family continued to produce another beer in Zaragoza. In 2004 it decided to relaunch the Moritz brand and the old factory is now a brewery restored by Jean Nouvel.

August K. Damm arrived in 1871, exiled to Barcelona after the Franco-Prussian War. The following year he joined the Catalan Camps to brew beer in a location called Gambrinus and four years later he created his own company. In 1910 Damm was associated with two other Barcelona brewers, Bohèmia and F Campmany. The company set up in Bohèmia's premises, later it expanded but continued with the same style of Catalan architecture. Production is today outside the city and the building is a Damm museum and a cultural centre.

I have cited examples of different factories in which foreign participation is clearly known. In the first examples the factories are defined as transnational because their style and organization belong to a culture different to that of the host country. In the second cases, foreign participation has been through the capital, technology or initiative of someone from another European country. Although the Catalan example can not be extrapolated to the entire Continent, a number of cases could be found of heritage that is partly or fully transnational, especially if we add the cross-border heritage for all the European countries. These examples exemplify the transfer of technology, capital, labour and products that took place during industrialization.

In heritage interpretation and industrial museums, the European relationships are either not discussed at all or are explained as something extraordinary and specific to a particular production site. Each site of industrial heritage ought to be treated from a European perspective. We should recognise the many examples where there has been a transfer of capital, know-how, people, raw materials and products from other European countries. The industrial heritage can be seen as evidence of common cultural traits. We should accept that the history of production in Europe during that the last two hundred years is far more interconnected than we think.

Those of us in the world of industrial heritage should make the relationships with Europe evident and explain them to visitors and draw attention to the intangible elements that have been presented.

The study of industrialization and access to its heritage can help to increase mutual understanding and not just in the area of production. Industrialization in Europe was a prologue to globalization and it is essential to be aware of it so as to understand today's world: relocation, business concentration, the international division of labour, labour mobility were all born with industrialization and what is happening today is their continuation. This is why we can say that industrial heritage is the only European heritage and that industrialization meant the beginning of European union.

The Memory of Soviet-type Industrialisation and Industrial Heritage Conservation in Hungary

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Abstract
Relating to the main theme of the conference, Post-colonialism and re-interpretation of industrial heritage, this paper aims to investigate what memory has been preserved locally related to past industrial activity if industry was developed according to interests outside the country's boundaries. However, instead of post-colonialist states, the European countries of the former Soviet Bloc, especially Hungary will be put in the focus facing a similar dilemma.

Through the analysis of various sources, the presentation intends to drive attention to the difficulties of the evaluation of the recent past including its industrial features for the national community. The feelings of uneasiness, rejection, as well as the lack of interest and identity problems create an ambivalent attitude to the industrial heritage of the era resulting in its neglect. Preservation, on the contrary, could facilitate the proper understanding of the past.

Keywords: Hungary, Soviet-type industrialisation, industrial heritage preservation, historiography

Motto
"Through its cultural heritage a society becomes visible to itself and to others. Which past becomes evident in that heritage and which values emerge in its identificatory appropriation tells us much about the constitution and tendencies of a society." [1]
Jan Assmann

Introduction
Industrial landscapes, sites, buildings and machinery have been preserved to remind the community of its highly appreciated and warmly cherished industrial past. As is widely known, industrial archaeology, recognising the significance of values inherent in the material evidence of industrialisation for the society, appeared first in Britain. Indeed, the increasing successes in industrial heritage conservation have substantially transformed national consciousness since the 1960s, generating pride by clearly demonstrating the country's primary role in the worldwide history of industrialisation.[2] Accordingly, the world's first cast-iron bridge, erected in 1779 and restored in the 1970s from imminent collapse at a locality renamed as Ironbridge, became the symbol of the Industrial Revolution for the British people.[3] This national attitude has been formulated shortly by Laura Clayton in a recent issue of the Conservation Bulletin dedicated to industrial heritage: [4]

Industrial heritage is part of the fabric of our communities. New research shows that just under half of the English population (43%) state they live in an area well known for a particular type of historic industry. It is valued by us all – for its role in shaping our national identity, for its

educational potential, and even for its beauty.

A similar phenomenon has been observed in those west European and north American countries where the British example of industrial heritage conservation was rapidly followed.[5] In Germany, for example, the three large-scale industrial complexes designated on the World Heritage List, the Rammelsberg ore mine, the Völklingen iron works and the Zollverein coal mine, have been esteemed particularly high, representing for the national community German achievements of global significance in twentieth-century heavy industry and industrial architecture.[6]

But what should be the attitude to the material evidence of past industrial activity in the post-colonialist and post-Soviet states where industry in an extensive time period was not developed to achieve national goals but to serve the various interests of a foreign power? In search of a relevant answer to the above question, this paper will present a case study investigating the current stage of conservation regarding the heritage of industrialisation implemented on Soviet directives in Hungary, in relation to the memory preserved about it in contemporary academic historical works.

The key role of industrialisation between 1947 and 1989

Industrialisation was assigned a fundamental role in the centrally planned economic system devised in the Soviet Union and initiated in Hungary following the communist takeover in 1947. In compliance with the foreign directives, the three- and five-year development plans gave priority to industrial growth to the disadvantage of other economic sectors, mostly, agriculture. Despite the shortage and low quality of essential raw materials available in the country, the development of heavy industries, in particular, coal mining as well as iron and steel making was enforced. Quoting the frequently cited words of a prominent communist leader, Hungary should have been transformed into a “country of iron and steel”. In addition to the irrational advancement of coal mining and iron industries, considerable investments were also made in bauxite mining and aluminium metallurgy as well as chemical industry. Compensated abundantly with Hungarian natural resources, payment and products, technology as well as large quantities of raw material were transferred from the Soviet Union, aimed to facilitate the accomplishment of the basically unfeasible objectives of the economic plans. Publicly, though, the accelerated development of heavy industries was declared essential for the enhancement of the economic and political strength of the country as well as the whole Eastern Bloc, in fact, it was primarily necessitated by the Soviet military throughout the Cold War era. Still, there can be no doubt that the country became fairly modernised in several fields as a result of large-scale industrialisation even if the economic system dictated by the Soviet Union finally proved unsustainable. [7]

Owing to the high workforce demand of the rapidly developing heavy industrial plants, modern workers' settlements, named socialist cities, were erected in the neighbourhood of the production facilities. They attracted a multitude of people from various social layers and geographical regions because of the numerous job opportunities, the higher-than-average wages and the availability of satisfactory accommodation. However, the construction of these settlements was due to not only economic but also ideological reasons. Designed on the pattern of Magnitogorsk in the USSR, socialist cities were to function as communist melting pots providing inspiring spaces for the evolution of the new socialist-type of man and its model community deprived of all previous social and national features. From the approximately one thousand socialist cities established in the Soviet Bloc, there were eleven constructed in Hungary. Eventually, these planned settlements, furnished with newly-built apartments as well as public buildings frequently created by prominent architects, offered particularly high living standards for their working-class citizens, although occasionally they were left unfinished lacking even a proper city centre in consequence. [8]

Parallel to the rapid dissolution of the Soviet Bloc, the abrupt change of the political system in 1989 was accompanied by the inevitable collapse of planned economy. Therefore, instead of the primacy of industrial activities, deindustrialisation became prevalent in the country marked by an increasing number of abandoned industrial buildings and obsolete machinery, succeeding the closure of plenty inefficient extraction and manufacturing facilities. [9]

Conservation of communist era industrial heritage between 1990 and 2011

The investigation related to the conservation of communist era industrial heritage in Hungary over the two decades following the disintegration of the Soviet Empire has brought disturbing results. From 1990 until 2011, when the latest list of newly-protected monuments and sites was published in Magyar Közlöny,[10] the official journal of the Hungarian Republic, merely five properties were given statutory protection of the numerous remains bearing evidence to Soviet-type technology and industrialisation,[11] despite their specific historical significance and extraordinary architectural values (Table 1).

CHAPTER TWO

【Table 1】 Industrial and technical monuments and sites protected between 1990 and 2011[12]

	Types of monuments and sites	Erected between 1947 and 1989	Protected between 1990 and 1999	Protected between 2000 and 2011	Total number protected
1	Industrial	1	6	56	62
a	agricultural and food industries		(4)	(36)	(40)
b	heavy industries	(1)	(1)	(5)	(6)
c	other industries		(1)	(15)	(16)
2	Transport facilities	2	4	17	21
3	Water infrastructure			9	9
4	Technical	2		2	2
		5	10	84	94

Considering that the total number of industrial and technical monuments protected in the period was ninety-four, the proportion of communist era heritage slightly surpassing five per cent is definitely low.

Besides, typological analysis of the five properties clearly indicates the almost complete absence of heavy industrial sites representing the main focus of Soviet-type industrial development. In fact, two of the protected sites, the rocket-launching station in Zsámbék (Fig. 1), as well as the terrestrial transmitter station for space communication at Taliándörögd (Fig. 2), hardly provide any physical evidence to communist industrialisation, locating technical

Fig.1
Rocket launching station, Zsámbék (Source: Azso, CC BY-NC-ND 3.0, www.creativecommons.org/licenses/by-nc-nd/3.0, via Wikimedia Commons).

Fig.2
Terrestrial transmitter station for space communication,Taliándörögd (Source: Nyugdíjba vonult a hazai űrtávközlési állomás, www.origo.hu/techbazis/20061005nyugdijba.html

Fig.3
Pithead frame in the former uranium mine, Kővágószőlős (Source: hvg.hu)

Fig.4
Port building and cranes in Sztálinváros, currently named Dunaújváros. (Source: egykor.hu: Dunaújváros, www.egykor.hu/dunaujvaros/585)

Fig.5
Railway station, Székesfehérvár (Source: renault25, CC BY-ND 3.0, www.creativecommons.org/licenses/by-nd/3.0/, via Wikimedia Commons).

establishments designed for specific purposes.

The only technical monument protected to preserve the memory of Soviet-type heavy industry on a production site is a pithead frame erected in a former uranium mine at Kővágószőlős (Fig. 3).

The port building in Dunaújváros (Fig. 4), though reminding the local and national community of the bulks of coal and iron ore shipped from the Soviet Union for the supply of the city's newly-founded iron and steel works, is indeed a transport facility, protected along with the railway station building in Székesfehérvár (Fig. 5).

There is no substantial improvement regarding the conservation of communist-era industrial heritage if monuments protected within socialist cities are also included in the analysis. Adding the three sites given statutory protection in two of the eleven cities, namely, the movie building and the medical centre in Dunaújváros,[13] as well as the museum building in Salgótarján,[14] the final number of sites preserving the memory of Soviet-type technology and industrialisation will rise to not more than eight.

Still, examining the statutory protection of the eight properties in a chronological framework, the past years of the twenty-first century definitely witnessed the emergence of interest in the industrial heritage of the communist period. The first remains related to Soviet-type industrialisation, the public buildings in Dunaújváros, became protected in 2004,[15] while the latest protections were provided in 2011 for the port building of the same settlement and the Székesfehérvár railway station.[16] This increasing interest, however, was mainly due to the fundamental change in attitude between 2000 and 2011 to industrial heritage in general. While from 1990 to 1999, there were altogether ten new inscriptions on the list of protected industrial monuments, in the following years eighty-four industrial properties were given protection. Moreover, agricultural and food industry sites such as mills and granaries, mostly from the pre-industrial period, evoked considerably greater interest compared to heavy industrial heritage from the communist era as there were thirty-six of them protected between 2000 and 2011. Even water infrastructure had been ranked higher with nine new properties inscribed on the list in the same time period.[17]

Fig.6
View of Millenáris, the regenerated site of the former Ganz Electric Works, Budapest (Source: Györgyi Németh)

In addition to its minor representation among protected monuments, Soviet-type industrial heritage was also disregarded in the flagship regeneration project implemented in 2001 in Hungary giving preference to industrial remains from historical periods prior to the communist era. The Millenáris, the Millennium Exhibition and Programme Centre was created in Budapest on the site of the former Ganz Electric Works to accommodate a magnificent exhibition on science and technology celebrating the thousandth anniversary of the foundation of the Hungarian state in the Carpathian basin. Currently, having every edifice from the second half of the twentieth century destroyed after closure, the revitalised site makes the impression of an industrial plant from the turn of the nineteenth and twentieth century, the very period of its establishment (Fig. 6).[18]

The next regeneration project of national significance, aimed to provide impressive public spaces for the 2010 programmes of the city of Pécs designated as European Capital of Culture in conjunction with Essen and Istanbul for that year, was also not associated with the heritage of communist industrialisation. The Zsolnay Cultural Quarter has embraced the site of the renowned ceramics factory established in the second half of the nineteenth century by Vilmos Zsolnay, the inventor of porcelain faience and multi-coloured eosin technique, as well as that of pyrogranite, the unique building material of Hungarian art nouveau (Fig. 7).[19]

Fig.7
Mansion, Zsolnay Cultural Quarter, Pécs (Source: Galacs, CC BY-NC-ND 3.0, www.creativecommons.org/licenses/by-nc-nd/3.0, via Wikimedia Commons).

Seemingly in contradiction to the unfavourable conservation developments regarding the heritage of Soviet-type industrialisation, a colliery site from the communist era has been rather successfully preserved by transferring a mining museum in its buildings in 2001 in the surroundings of Oroszlány (Fig. 8). In operation, though, due to its newly-received cultural function, albeit partially demolished and lacking statutory protection, the site's ambitious regeneration has been repeatedly postponed, leaving substantial financial means from European funds completely unexploited.[20]

F.8
View of the colliery site in Oroszlány (Source: Györgyi Németh)

History of communist era industrialisation between 1990 and 2012

Studying what memory has been preserved in the historical works published between 1990 and

2012 on communist era industrialisation will certainly facilitate a better understanding of the obvious deficiencies in conservation. There were four journals selected for investigation representing the highest level of scholarship as well as the various approaches of Hungarian academic historical writing. Published since 1867 by the Hungarian Historical Society, one of the oldest scientific associations in Hungary,[21] Századok [Centuries][22] enjoys undoubtedly the greatest reputation, disseminating scholarly knowledge on diverse topics of Hungarian history for a wide audience of historians, history teachers and other professionals. Emerging next to Századok in significance, Történelmi Szemle [Historical Review][23] has been published by the Institute of History, established in 1949 within the framework of the Hungarian Academy of Sciences to perform basic research on Hungarian history in a regional, European and global context.[24] Aetas, defining itself as a journal of history and related disciplines, founded in 1985 by young historians not in Budapest but in Szeged, has gained considerable popularity as well as high academic reputation nationwide and across the borders for offering, with the words of an eminent professor, “an alternative and refreshing view particularly on matters Hungarian and European".[25] Similarly to Aetas, since the publication of its first issue in 2000, Korall has also aimed to develop novel approaches providing a most appreciated platform as an independent medium not affiliated with any public, scientific or academic institution and university for young researchers of history, sociology and anthropology to undertake interdisciplinary social study of historical processes. [26]

Starting up with a statistical survey of articles and book reviews published in the four journals on varied topics related to communist era industrialisation, the results are desperately low thus being in complete harmony with poor conservation data. In the course of more than two decades, there were merely twenty-four articles and fourteen book reviews published in the leading historical journals of Hungary (Table 2).

【Table 2】Articles and book reviews published on topics related to communist era industrialisation between 1990 and 2012[27]

Title of journal	Article			Book reviews		
	from between 1990 and 1999	from between 2000 and 2012	total	from between 1990 and 1999	from between 2000 and 2012	total
Századok	0	3 (6)	3 (6)	(1)	(2)	(3)
Történelmi Szemle	(1)	2 (5)	2 (6)	-	-	-
Aetas	0	1	1	0	1	1
Korall	-	18	18	-	12 (13)	12 (13)
	(1)	24 (30)	24 (31)	(1)	13 (16)	13 (17)

Including in the analyses articles as well as book reviews not primarily focusing on industrialisation-related issues but taking them also into consideration in discussion, the number will be rising slightly, to thirty-one and seventeen respectively.[28] Remarkably, almost all these articles and book reviews appeared in the twenty-first century, just one article and one book review having been published between 1990 and 1999, both touching partially upon the theme of communist era industrialisation.

The distribution of articles and book reviews among the four historical journals has not been balanced either. In Századok and Történelmi Szemle, the principal publication authorities in the communist system prioritising the history of labour and industrial development, there were six

articles published each on matters related in toto or in part to Soviet-type industry. In contrast, in Korall, over the merely thirteen years since its establishment, there were eighteen articles printed driving direct attention to different aspects of communist industrialisation. Surprisingly, despite its innovative character, Aetas has been represented with a singular article and book review released in the whole period. Thirteen book reviews having been published in Korall from a total number of seventeen definitely makes publication imbalances even more obvious.

For the thematic investigation of the wide variety of articles and book reviews produced in relation to Soviet-type industrialisation, the writings were organised into four categories, those of industrial, social, urban and economic history. In consequence to the publication of the great majority of the works in Korall, seventeen of the thirty-one articles, and ten of the seventeen book reviews have been listed into the category of social history, the main focus of the journal, embracing related disciplines like everyday history, women's and gender studies, microhistory, the history of mentalities, cultural history and anthropology (Table 3).

【Table 3 】Main types of articles and book reviews published on communist era industrialisation between 1990 and 2012[29]

Types	Articles	Book reviews
industrial history	6	3
social history	17	10
urban history	4	3
economic history	4	1
	31	17

As a result, articles and book reviews, listed in the three other categories, including industrial history, have got a considerably lower representation. There were only four articles and three book reviews published in urban history, four articles and one book review in economic history, while the number of articles and book reviews produced on the fundamental issues of communist era industrialisation was mounting to not more than six and three respectively.

The strikingly low level of interest in the proper history of Soviet-type industrial development has been also demonstrated by the further analysis of the publications. In fact, four of the six articles created within the scope of industrial history have been written by one and the same author, Pál Germuska, whose focus is on military industry. Relating to this, he has investigated the evolution of communist industrial policy,[30] as well as the production of communist military enterprises for the civilian population[31] , their technology transfer from the Soviet Union to Hungary,[32] and between 1965 and 1985, from Hungary to Libya.[33] The two remaining industrial history articles, discussing both the removal of a Hungarian-owned heavy industrial complex in Romania to the Soviet Union in compensation for war damages,[34] and the role of Soviet military advisors at various Hungarian establishments[35] only partially dwell upon the theme of communist industrialisation. Similarly, Soviet-type industrial development is definitely not the main concern of the three industrial history books reviewed in the journals. The first concentrates on the thousand-year-old history of Hungarian mining,[36] the second presents primary sources related to the 1948 nationalisation of industrial and commercial small enterprises,[37] while the third relates the infrastructure developments in the 1950s in Budapest.[38]

Obviously, the memory of communist era industrialisation has been very badly preserved in the leading journals of Hungarian academic history. Between 1990 and 1999, this research area was completely unnoticed, attracting only immensely limited attention in the first decade of the twenty-first century. Remarkably, rising interest in diverse issues related to Soviet-type industrial development was primarily due to the emergence of a younger generation of researchers who aim to follow the latest trends in global history writing. However, industrial production providing goods and employment for the members of the society over a forty-year period, though under the control of a foreign power, still remains to be analysed and understood. Consequently, the scarcely cultivated memory of Soviet-type industrialisation is in complete concordance with the insufficient conservation of communist era industrial heritage.

Conclusions

Besides various other reasons, limited interest in the history and low appreciation for the heritage of communist industrialisation is fundamentally due to the ambivalence prevailing in the country which originates from the difficulties regarding the evaluation of the recent past. There can be no doubt that this is still a political issue. In addition, focusing research on industrial history and the industrial heritage confers little professional prestige at present, these areas having been in the previous system prioritised. In consequence, communist era industrial heritage is not a matter of national pride, and Soviet-type industrialisation is not really considered to be the part of the nation's true identity. However, preserving industrial remains from the communist period adequately and interpreting them finding a consensus could facilitate the proper understanding of the past.

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Technologies Depicted in Sado Mine Picture Scrolls

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Abstract

There are a lot of historic documents which illustrate the gold and silver mines of Sado. Particularly, more than a hundred mining picture scrolls, including duplicates, which illustrate Sado Mine in the Edo period (1603~1867) remain both domestically and internationally. This fact makes Sado Mine outstanding among the mines in Japan. Mainly, a series of processes such as mining, smelting, and manufacturing oval gold coins in the Aikawa Gold and Silver Mine are drawn in detail in these picture scrolls.

Picture scrolls from other mines pale in comparison to those from Sado Mine in both number and content, which shows how significant Sado Mine was at that time. They served as an example for making picture scrolls of other mines and they are now valuable historical materials for studying mining technology and culture in the pre-modern period (18th~19th century) of Japan.

It is believed that they commenced drawing these scrolls by order of the eighth Shogun, Tokugawa Yoshimune, around the middle of 18th century. They are supposed to have been of some help in understanding the conditions of Sado Mine, which fell into stagnation at that time. From the middle of 18th century until the middle of 19th century, these picture scrolls were drawn by scroll artists and were submitted to the Magistrate Office to illustrate the complex mining process to the new incumbent when the Sado Magistrate or Assistant Magistrate changed.

The picture scrolls were drawn repeatedly for ages with a same basic composition. However, partial modifications were made according to developments in mining, such as the implementation of new technology or the renovation of the management system. We can understand the transitions of mining technology and the management system over a hundred some years by comparing scrolls from different periods. They certainly are outstanding historical documents which back up other existing remains and documents.

Since most of the documents about mining in Europe show the technology level from the 16th century, it is difficult to identify the development of mining technology before then. Therefore, it may be said that the Sado Gold and Silver Mine picture scrolls work as a missing link through which we can thoroughly understand historical documents and excavated archeological articles. Additionally, the picture scrolls are considered to have played an important role in spreading technology throughout Japan in place of mining schools, which they had in Europe.

In addition to gold and silver production technology, the Sado Mine picture scrolls depict mine workers' clothes and hairstyles, as well as buildings and townscapes, so they are also valuable materials for understanding pre-modern social life as well as mining history in Japan. We will

continue to study the picture scrolls to learn more about the transition of technology in Sado Mine.

Keywords: gold and silver mines; Sado; picture scrolls

Outline of Sado Gold and Silver Mine

Sado Gold and Silver Mine was always the top-ranking mine in Japan over about 600 years, from the 15th century until the 20th century. Gold was mainly mined there and the remains of each period are preserved in good condition.

In the 15th century, the introduction of placer mining was recorded at Nishimikawa area. From the middle of the 16th century, Tsurushi Silver Mine became the main mining place. Furthermore, gold and silver deposits were discovered at Aikawa at the beginning of the 17th century and they became established as the most important gold mine in Japan. After the Meiji Restoration which started in 1868, mining technology was modernized, so the management of Sado Gold and Silver Mine was chiefly shifted from the Government to Mitsubishi, the private company, but still Sado Gold and Silver Mine maintained its status as important for a long time. However, in 1952, seven years after the end of World War II, they scaled down much of the operations there, and eventually shut down the operations in 1989 and closed Sado Gold and Silver Mine virtually.

Especially, during the early Edo Period(1603-1867) gold production of Sado Gold and Silver Mine was the largest in Japan and the magistrate was sent from the Central Government to govern the Aikawa Gold and Silver Mine, which supported the economic base of Japan's feudal government. As a result of this, technologies before the Industrial Revolution still remain in good condition.

Formation of Sado Mine Picture Scrolls

There are a lot of historic documents which illustrate the gold and silver mines of Sado. Particularly, more than a hundred mining picture scrolls, including duplicates, which illustrate Sado Mine in the Edo period remain both domestically and internationally. This fact makes Sado Mine outstanding among the mines in Japan. Mainly, a series of processes such as mining, smelting, and manufacturing oval gold coins in the Aikawa Gold and Silver Mine are drawn in detail in these picture scrolls.

Picture scrolls from other mines pale in comparison to those from Sado Mine in both number and content, which shows how significant Sado Mine was at that time. They served as an example for making picture scrolls of other mines and they are now valuable historical materials for studying mining technology and culture in the pre-modern period(the 18th-19th century) of Japan.

It is believed that they commenced drawing these scrolls by order of the eighth Shogun, Tokugawa Yoshimune, around the middle of the 18th century. They are supposed to have been of some help in understanding the conditions of Sado Mine, which fell into stagnation at that time. From the middle of the 18th century until the middle of the 19th century, these picture scrolls were drawn by scroll artists and were submitted to the Magistrate Office to illustrate the complex mining process to the new incumbent when the Sado Magistrates or Assistant Magistrates changed.

The picture scrolls were drawn repeatedly for ages with the same basic composition. However,

partial modifications were made according to developments in mining, such as the implementation of new technology or the renovation of the management system. We can understand the transitions of mining technology and the management system over a century and several decades by comparing scrolls from different periods. They certainly are outstanding historical documents which back up other existing remains and documents.

Content of Sado Gold Mine Picture Scrolls

The followings are some of the typical picture scrolls.
Inside the mine, workers called 'daiku' mined at the mining area called 'shiki' and odd jobbers 'horiko' carried ores and water. Tools used for underground work and their changes can be seen in the scrolls.

Fig.1
Mine workers

For example, as for lighting, two kinds of lights were used inside the mine: pine torches and hanging lamps, and oil was also burned in unglazed dishes as the lighting of the workplace of the mine.

Fig.2
Two kinds of lamps used in the mine

Mine drainage was extremely important and difficult, so various attempts were done. In 1653 Archimedian screws, suishorin were introduced and in 1782 efficient hand pumps were also introduced, which both worked effectively. Both of them were the most advanced technology in Japan, but they often broke down and gradually they went out of use. The traditional way of using pails and buckets to drain water became a main way. This is also a clear example of the change of underground technology.

Fig.3
Drainage

As for selecting and smelting ores, originally smelters did the work at their own house, but in 1759 ores were gathered at the site called yoseseriba of the Magistrate Office. Then the following process was illustrated in the scrolls. In the process of ore selecting, they crushed ores with an iron hammer and riddled them with a bamboo basket. After that, they repeated riddling crushed ores with a selecting board and grinding them with a motar. And they drained ores which became muddy from the top of the cotton-cloth covered slant with water and obtained gold and silver by gravity screening.

Cupellation in smelting was introduced from the Asian Continent by way of the Iwami Silver Mine. However, in Sado Gold and Silver Mine they produced electrum, and they needed to separate gold from silver. This is why “cementation process with sulfur” and “cementation process with salt” were implemented and these processes are also drawn in the picture scroll. In 1994-1999 the excavation of Sado Magistrate Office was done and the remain of furnaces which were supposed to be used to obtain gold was discovered. In the process of separating gold from silver, they mixed gold obtained by cementation with salt, which contains a small amount of silver, up together with salt, formed it in a cylindrical shape and burnt it in a furnace. The silver binds to salt and silver chloride is produced. By rinsing them in water, gold and silver chloride is separated.

Fig.4
The Process of smelting gold at the Magistrate Office

Conclusion

Sado Gold and Silver Mine picture scrolls were drawn from the 18th century until the middle of the 19th century. Due to Japan’s isolation policy, much of the technologies before the Industrial Revolution remained and they came to be drawn on the scrolls.

Most of the technical books on European mines illustrated technological standards in the 16th century and it was not easy to learn how the mine technologies had developed before that time even in Europe, so it may be said that Sado Gold and Silver Mine picture scrolls are ‘missing link’.

In addition to gold and silver production technology, the Sado Mine picture scrolls depict mine workers’ clothes and hairstyles, as well as buildings and townscapes, so they are also valuable materials for understanding the social life in the 18th and 19th century as well as mining history in Japan. We will continue to study the picture scrolls to learn more about the transition of technology in Sado Mine.

The Summary of "The Modern Industrial Heritage Sites in Kyushu – Yamaguchi" and Comparative Analysis Coal Mines

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Abstract
"The Modern Industrial Heritage Sites in Kyushu and Yamaguchi" is a unique serial national property clustered within, or related to, the Kyushu-Yamaguchi region, Japan. This was entered on Japan's tentative list for nomination to the World Heritage List in January 2009. There are three main industrial typologies presented in the serial nomination: Iron and Steel, Shipbuilding and Coal Mining. These are the principal heavy industries that are the mainstay of the Emergence of Industrial Japan 1850-1910, each directly, or indirectly, dependent on the other. 'Pioneer' and 'growth' sites of each typology characterize the transfer and diffusion of Western technology through a highly distinctive social network.

According to "the Operational Guidelines for the Implementation of the World Heritage Convention: 3.2 Comparative Analysis", it is required that component parts should be compared and examined with similar heritages. In this paper, the summary of the "The Modern Industrial Heritage Sites in Kyushu and Yamaguchi" is told, and the domestic comparative analysis of the coal mine outlined.

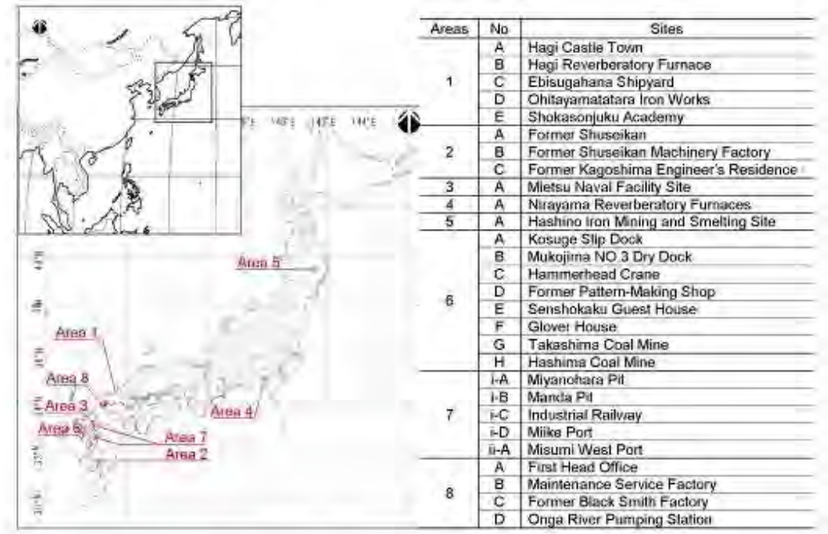
Keywords: coal mine; iron and steel works; shipyard; operational sites

1. Introduction

Japan became an industrialized country and joined the group of modern countries through industrialization in the late 19th century. Japan exposed the Industrial Revolution to Asian countries for the first time and opened the door to social and economic development with an independently planned program towards industrialization. Features that distinguish Japanese industrialization: it happened over 50 years and was a unique introduction and transfer process of western heavy industry technologies, such as coal mining, iron and steel, and shipbuilding. A series of heritage sites are related to each other and linked to the Kyushu and Yamaguchi region, the southwest feudal clans, and their successors. Their contribution to national development is a key element of the outstanding universal value of those properties. This heritage is the first class historical and archeological evidence that describes the rise of Japan as an industrialized country. Heavy industry in the early stage was strongly promoted from the viewpoint of national defense. Iron making, shipbuilding, and armament manufacturing were encouraged. The development of certain heavy industries is substantially influenced by domestic coal, leading to the dawn of Japan's modernization. In this investigation, heavy industry supported by the government forms a nucleus of this report. Not penetrated by western capitalism, Japan was economically independent, so the industrialization in Japan at that time was completely different from that of other colonized, or half-colonized, countries. Successive Japanese governments made every effort to promote industry and encourage private sectors. The world's leading technologies were introduced to Japan's ironworks, dockyards and coalmines until circa 1910. Some historical and core facilities in operation, such as the Yawata Ironworks, Nagasaki Shipyard, and Miike port represent the final stages of the emergence of industrial Japan. They remain in operation. The port and vertical shaft head frames of Miike coalmine, that were connected by coal mining railways, form a consistent and linear landscape of the western-style coal mining industry. A pioneering feature of coal mining in Japan was the Takashima coalmine and Hashima coalmine (nicknamed "Battleship Island").These were the first modernized collieries in Japan and pioneered undersea mining. The remarkable facilities are the most astonishing in the world, even now. Hashima island was one of the locations with the maximum population density in the world it's time.

2. Summary of Components

Japan's transition into an industrial nation in the second half of the nineteenth century was a phenomenon at that time unique in history; the first Asian country to undergo an industrial revolution and the first to delineate its own social and economic future through a forthright and self-determined programmed of industrialization designed to change the nature of the state, its position in its own geo-political and economic region and ultimately its place on the world stage. Many of the events that initiated Japan's industrialization took place in Kyushu and the Yamaguchi Prefecture of western Honshu. The two sites in this nomination that lies outside this area – at Kamaishi and Nirayama – are very closely associated, historically and technically, with the developments in Kyushu. The group of twenty eight sites in eight areas forms the basis for this Serial Nomination for World Heritage Inscription (Fig.1).



Areas	No	Sites
1	A	Hagi Castle Town
	B	Hagi Reverberatory Furnace
	C	Ebisugahana Shipyard
	D	Ohitayamatatara Iron Works
	E	Shokasonjuku Academy
2	A	Former Shuseikan
	B	Former Shuseikan Machinery Factory
	C	Former Kagoshima Engineer's Residence
3	A	Mietsu Naval Facility Site
4	A	Nirayama Reverberatory Furnaces
5	A	Hashino Iron Mining and Smelting Site
6	A	Kosuge Slip Dock
	B	Mukojima NO 3 Dry Dock
	C	Hammerhead Crane
	D	Former Pattern-Making Shop
	E	Senshokaku Guest House
	F	Glover House
	G	Takashima Coal Mine
	H	Hashima Coal Mine
7	i-A	Miyanohara Pit
	i-B	Manda Pit
	i-C	Industrial Railway
	i-D	Miike Port
	ii-A	Misumi West Port
8	A	First Head Office
	B	Maintenance Service Factory
	C	Former Black Smith Factory
	D	Onga River Pumping Station

Fig.1
Geographic Position of Areas and Name of Sites

Area 1 Hagi proto-industrial sites and Tokugawa (Edo) period cultural setting.
The Hagi area comprises remarkable evidence of autonomous proto-industrial iron making and shipbuilding sites together with the well-preserved feudal urban core of the former Choshu domain

capital of Hagi. These sites, intimately related as the property of the progressive Mori daimyo and pioneered alongside indigenous metallurgical and shipbuilding activity, are amongst the oldest in the serial nomination. They collectively illustrate the 'receiving' culture for the some of the earliest Western technology transfer to Japan.
Principal components comprise;
[1-A] Hagi Castle Town,[1-B] Hagi Reverberatory Furnace, [1-C] Ebisugahana Shipyard, [1-D] Ohitayamatatara Iron Works, [1-E] Shokasonjuku Academy.

Fig.2
View of old Shuseikan, the first industrial complex, in 1872.(Source: Shoko-Shuseikan)

Area 2 Shuseikan Pioneer Factory Complex.
The Shuseikan Pioneer Factory Complex are situated in the ornamental grounds of the Shimadzu villa in Kagoshima, Japan's historic 'southern gateway'. This "birthplace of the modern Japanese factory system" is open to the public. Shuseikan was the first industrial and military factory complex in Japan, begun in 1852 under the ownership of the powerful and autonomous Satsuma lords(Fig.2). It included iron manufacturing, cannon and small arms production, shipbuilding, textile production and a range of other activities. The Shuseikan 'Project' provided models of key industrial development aimed at achieving Western technology transfer, gave the Japanese valuable practical experience of the difficulties of transplanting the new technology, and contributed substantially to assimilation, adaptation and improvement of the technology to suit the geographical, cultural and historical context of Meiji Japan.
Principal components comprise;
[2-A] Former Shuseikan (included Terayama Charcoal Kiln, Sekiyoshi Leat),[2-B] Former Shuseikan Machinery Factory, [2-C] Former Kagoshima Engineer's Residence.

Area 3 Mietsu Shipyard Archaeological Site, Saga.
Mietsu Shipyard Archaeological Site, Saga is located on a flood plain on the western bank of the Hayatsue River, 6km north of the Ariake Sea. At 2.7m above sea level, substantial deposits of river

silt have preserved elements of the site since its abandonment by the Saga Maritime Academy in 1933. The Saga clan was responsible for the defence of Nagasaki, began construction of Mietsu in 1858 as a repair and assembly facility for one of the largest modern private navy in Japan. The first practical Japanese-built steamboat, the Ryofu-maru (1863-1865) was built/ assembled here.
Principal components comprise;
[3-A] Mietsu Naval Facility Site.

Area 4 Nirayama Reverberatory Furnaces.
Nirayama Reverberatory Furnaces(Fig.3) are the centrepiece of a park, the site of a former shogunate cannon manufactory (1857-1864) beside the Furukawa River in Izunokuni City on the Izu Peninsula, 70km southwest of Tokyo. They are the finest example of such a furnace type in the world, one of two substantial survivals of a number built across Japan during the 1850s. Their purpose was to increase cannon production for national defence, their design reflecting a blueprint and precise translation of a Dutch textbook by the Saga clan. The twin structures, with a pair of furnaces enclosed by firebricks in each stone base, meet at right-angles on the gate sides from which molten metal flows out so that all four may discharge molten metal into one place. Even though the application of reverberatory furnaces in Japan was short-lived, confined as it was to the closing years of the Tokugawa period, they represent a turning point in Japan's industrial history, the first major manifestation of Western technology.

Fig.3
Nirayama Reverberatory Furnaces

Principal components comprise;
[4-A] Nirayama Reverberatory Furnaces.

Area 5 Hashino Iron Mining and Smelting Site, Kamaishi.
Hashino iron mining and smelting site, Kamaishi, is a well-preserved industrial archaeological landscape that occupies a narrow river valley in remote and picturesque wooded and mountainous terrain. This pioneer commercial Japanese ironworks succeeded in producing pig iron from in situ iron ore (magnetite) in 1858, thus marking the birthplace of the modern Japanese steel industry. The massive stone masonry remains of three blast furnaces, beginning with the initial test furnace of 1858, are testimony to the transfer of Western blast furnace technology that was fused with traditional Japanese iron making technology. They are part of the only blast furnace ironworks group that operated in Japan during the early years of the Meiji era and are the oldest surviving remains of Western-style blast furnaces in Japan. The wider site evidences the whole process from resource exploitation and transport to ore processing and smelting.
Principal components comprise;
[5-A] Hashino Iron Mining and Smelting Site.

Area 6 Nagasaki Shipyard Facilities, Coal Mining Islands and Associated Sites.
Nagasaki, in western Kyushu, is one of the world's great natural harbours and the birthplace of the modern Japanese shipbuilding and coal mining industries. Shipyards in the harbour and coal mining islands off the Nagasaki Peninsula bear testimony to some of the first industrial

collaborations between Japan and the West in the late-1860s, and some of the most remarkable technological and scientific achievements made in these industrial sectors during the following 50 years. The experience and skill of Western mechanized coal mining was subsequently diffused to Miike and elsewhere in Japan, and Asia, so too the shipbuilding achievements of the Nagasaki Shipyard. The sites are closely related through ownership and function, strategically situated in what was feudal Japan's only legitimate 'window on the world', a centre with a tradition of early scientific and technological exchange with the West. Steamships, ship repair and coal became synonymous with Nagasaki, the nominated sites first being heavily influenced by the Tokugawa shogunate, Thomas Glover and feudal clansmen; and later wholly controlled by the great Mitsubishi zaibatsu.
Principal components comprise;
[6-A] Kosuge Slip Dock(Fig.4), [6-B] Mukojima NO.3 Dry Dock, [6-C] Hammerhead Crane, [6-D] Former Pattern-Making Shop, [6-E] Senshokaku Guest House, [6-F] Glover House, [6-G] Takashima Coal Mine, [6-H] Hashima Coal Mine.

Area 7 Miike Coal Mines, Railway and Ports.

Fig.4
Kosuge Slip Dock

Miike coal mines, railway and ports are the best surviving example of an early-1900s integrated system of Western-style coal extraction, rail transport and marine shipping in Japan. It was the second Japanese colliery to be modernized and, under the ownership of Mitsui zaibatsu, became the nation's largest and most significant in East Asian export markets. Western-style, red brick, shaft-head buildings and tall steel head frames are testimony to the transplant of the most advanced Western steam-powered pumping, winding and ventilation technology available. Miike coal railway, amongst Japan's earliest (1878), was extended in 1905 to Miike Port (1908), the largest coal export port to be built in Japan(Fig.5). Its distinctive 'hummingbird' layout, together with original hydraulic- powered Western-style lock gates and customs house, survive in their active industrial context. A separate associated site is Misumi West Port, one of the Meiji government's first major port construction projects. It handled the export of Miike coal and is the only early Meiji port to have survived substantially intact, its well-preserved components constructed in hybrid Japanese - Western style.
Principal components comprise;
[7i-A] Miyanohara Pit,
[7i-B] Manda Pit,
[7i-C] Industrial Railway,
[7i-D] Miike Port,
[7ii-A] Misumi West Port.

Fig.5
Miike Coal Mines, Railway and Port

Area 8 Yawata Steelworks.
Yawata Steelworks comprises the historic core of the first successful fully integrated iron and steel works in Asia. Its establishment as a State-owned steel works, designed according to the latest Western technology available at that time, marks the beginning of a major phase in the history of iron and steel making in Japan, Asia, and the world. Furthermore, its position in the series of iron and steel sites represents the transition from the pioneer phase to the final growth phase of the Emergence of Industrial Japan.
Principal components comprise;
[8-A] First Head Office, [8-B] Maintenance Service Factory, [8-C] Former Black Smith Factory, [8-D] Onga River Pumping Station.

3. Comparative analysis coal mines
Within the serial nomination industry comprises iron and steel, shipbuilding, and coal mining. Our consortium, getting advice of industrial heritage experts, has been conducting domestic and international comparative analyses of each heavy industry. According to "the Operational Guidelines for the Implementation of the World Heritage Convention: 3.2 Comparative Analysis", it is required that component parts should be compared and examined with similar heritages[1] . In this paper, domestic comparative analysis of coal mining is presented as an example. The criteria and method of investigation are shown below.

Investigation 1;
Abstraction criteria of coalmines investigated (literature research, interviews to experts)
· Coal output, natural conditions (presence of mineral deposit, quality of coal, coal bed)
· Introduction of modern coal mining technology and the development of the coal industry
· Relation to the Story
· Period of coal mining (the period from 1850 to1910 suggested in this report)
Investigation 2;

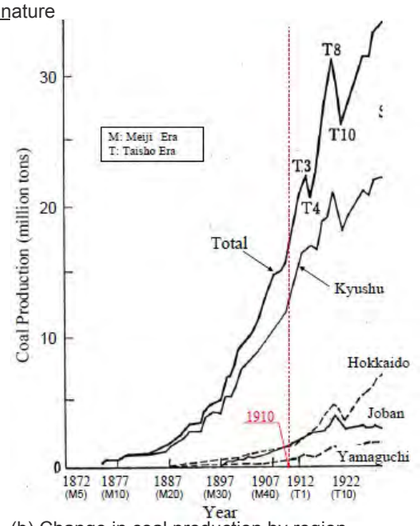
1 UNESCO, Operational Guidelines for the Implementation of the World Heritage Convention (Paris: World Heritage Centre, 2011), 32-34, http://whc.unesco.org/en/guidelines

Investigation of Heritages (field survey, detailed literature research, interviews to experts)
• Condition of coal mining facilities (shaft towers, winches, power facilities, chimneys, etc.)
• Condition of coal-related facilities (ports, railways, offices, houses, etc.)
Japanese major coalfields are located in Ishikari, Kushiro in Hokkaido, Chikuho, Kasuya, Miike, Karatsu, Sasebo, Nishisonogi (Takashima, Sakito, Matsushima), Amakusa in Kyushu, and Ube, Omine in the West Main Island. The important natural conditions for coal mining are presence of coal, coal quality (calorific value and caking property), thickness of coal bed, thickness per coal bed, inclination, depth, and geographical fault. Furthermore, closely related to the presence of coal, clean coal yield (quantity of clean coal / raw coal after beneficiation) determines coal quality as commercial products. Natural conditions of major coalfields are shown in Fig.6(a)[2] ; in terms of natural conditions, Miike coal has the advantage overall from the viewpoint of coal quality, thickness, and clean coal yield.

Region	Coalfield	Coal quality	Thickness	Thickness of Coal*1	Inclination*2	Depth	Refining yield rate*3	Overall
Hokkaido	Ishikari	○	○			600m ~	70 ~ 80%	○
	Kushiro		○			~ 600m	70 ~ 80%	○
	Rumoi	×	○		△	~ 600m	70 ~ 80%	
Kyushu	Takashima	○	○		△	600m ~	About 60%	○
	Chikuho			○		~ 600m	About 60%	△
	Karatsu			○		~ 600m	About 60%	△
	Miike	○	○			600m ~	More than 90%	◎
	Kasuya	×		○		~ 300m	About 60%	
	Sasebo	×		○		~ 300m	About 60%	
West Main Island	Omine		○			~ 300m	70 ~ 80%	
	Ube	×		○		~ 300m	70 ~ 80%	
Eest Main Island	Joban		○			~ 600m	About 60%	△

*1 Thickness of Coal about 1m
*2 Middle and steep incline exist (more than 25 degree)
*3 Refining yield rate: the ratio of raw coal brought to a coal dressing plant to dressed coal

(a) Coalfield condition of nature



(b) Change in coal production by region

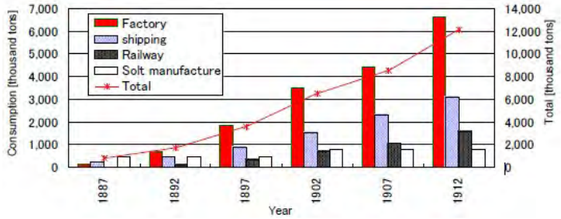
Fig.6 (a),(b)
Natural condition, coal production

In the end of the Edo era, feudal clans and the shogunate were mining in various regions in Japan. In the beginning of the Meiji era, the government started to acquire local coalmines one after another. Especially, it assigned the major producers Takashima and Miike as the centers of modernization, and exported coal for vessels (bunker coal) to Hong Kong and Shanghai. Coal, often is called “Black Diamond”, brought big profits to Zaibatsu firms, and enabled them to establish the base of development. In the late 17th century, coal was extracted as fuel for private use, and in the end of the 18th century, it was sold to the salt manufacturing industry. Also, the opening of the port of Nagasaki and military buildup by feudal clans boosted the demand.

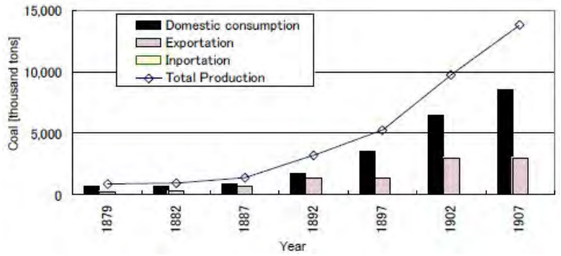
2 Toshifumi Yada, Japanese Coal Industry after War, (Tokyo: Shinpyo ron, 1975), 11-13.

The major producer was Kyushu (90%) at that time, others were Hokkaido, Joban, and Yamaguchi (Fig.6 (b))[3] . In the early Meiji Period, the exporting of coal was an important prop (Fig.7 (a)), and on the other hand, the salt manufacturing industry was a good domestic market. From the middle to late Meiji Period, increasing domestic demand, especially in factories, vessels and railways; rapidly the market for coal grew (Fig.7 (b))[4] .

The annual coal output of Japan peaked at 56.3 million tons in 1940.
In view of the foreign technology introduction (cultural exchange) and the contribution to overseas especially Asia and to Japan’s modernization, which have great significance to the outstanding universal value of this nomination, (1) Introduction of technologies from abroad, (2) Export, (3) Supply to the domestic market, (4) Output scale, (5) State of conservation are organized (Fig.8).



(a)Japan‘s coal output, amount of imports, exports, and consumption



(b) Details of domestic consumption

Fig.7 (a),(b)
Japan‘s coal output, domestic consumption

Region	Coal field	Coal mine	①	②	③	④	⑤ Mining	⑤ Transport	⑤ Port	⑤ Institution	Overall
Hokkaido	Kushiro	Shiranuka	○	△	△	△					
		Harutori									
	Kayanuma	Kayanuma									
	Ishikari	Horonai						△		△	
		Yubari					△				
Eest Japan Island	Joban	Yoshima	△		△			△			
		Mituboshi					△				
Wast Japan Island	Ube	Okinoyama	△		△		△				
		Higashimisome									
	Omine	Navy’s	△								
Kyushu	Takashima	Takashima	○	○	○	○		○		△	○
		Hashima						○		○	○
	Miike	Mitsuyama	○	○	○	○					
		Kattachi							○	△	
		Miyanohara						○			○
		Manda						○			○
	Chikuho	Mitsuitagawa	○	○	○	○		△			
		Mitubishihojo							△		
		Nittetsufutase									

① Introduction of technologies from abroad, ② Export, ③ Supply to the domestic market,
④ Output scale, ⑤ State of conservation are organized

Fig.8
Comparative evaluation of domestic coal mining heritages

3 Yada, Japanese Coal Industry after War, 45.
4 Yada, Japanese Coal Industry after War, 37-43.

Hokkaido;
The Shiranuka coalmine, the Kayanuma coalmine, and Ishikari coalmine developed, with undergoing introduction of modern technologies, transportation by nearly 300km railways, development of the Otaru Port and Muroran Port (these ports were managed by the government first, and by a private firm (Hokutan)). In Kushiro city, coal mining and sulfur production were closely related. Sulfur was exported to USA. The Zaibatsus promoted Hokkaido and started to manage the Ishikari coalfield after Mitsui and Mitsubishi gained power in the Kyushu region. Survived heritages are limited to the exits of galleries, some part of railways, and various facilities.

East Main Island;
In the Joban coalmine, with its geographical advantage, coal was supplied to the Keihin Industrial Area by railway transportation, and fine coal was also marketed as fuel for the silk industry. However, the output was lower than that of Kyushu and Hokkaido, so the coal was only offered to the domestic markets. Thus, it does not have a "representativeness" such as a coal supply for vessels and the acquisition of foreign currency by coal export, which was the motive power to promote modernization. Heritages in the specified period survive partially.

West Main Island;
The Ube coalfields grew the coal industry with supply for the salt manufacturing industry in the end of the Edo era, and community development by local leaders. After the development of the undersea coalmine and landfill with earth removal for coal mining, it still retains the original form of the Ube industrial area. However, coal was supplied mainly to the domestic market due to low output compared to Kyushu and Hokkaido. Also, it transferred modern technology from Kyushu, the technological front line. Heritages in the specified period partially survive. The Ohmine coalfield, producing anthracite, was rapidly exploited as a fuel supplier for the navy, and at the same time for building railways. However, both output scale and use were limited, and there are no heritages in the specified period.

Kyushu;
In 1910, coal produced in Kyushu accounted about 90 % of total domestic output. There are some representative coalfields of Japan in those days. The Takashima coalmine, which the Saga feudal clan and Glover jointly developed, applied western technologies for the first time in Japan (the Hokkei pit: 1868). Undergoing a change of the management from the government to a private entity, it exported coal to Shanghai and Hong Kong to gain foreign currency, while it also supplied coal to other domestic industries, whose growth was stimulated by the coal industry. With respect to heritages, some exits remain in the island. As for the Hokkei pit, some remains around it were found by excavation and research. The current landform of entire Takashima was constructed with reclaimed from earth removal for coal mining. In the Hashima coalmine, coal was extracted with modern technology introduced by Mitsubishi as well as the Takashima coalmine, and was exported to Shanghai and Hong Kong for acquisition of foreign currency. It was developed at the same time as the Nagasaki Shipyard managed by Mitsubishi, and fine coal was also supplied as material for cokes to the Yawata ironworks, with an integrated manufacturing system for iron and steel. This island's landscape, called "Gunkanjima", was formed by reclaimed with earth removal for coal mining, the expanded embankment, and reinforced concrete buildings, such as high-rise apartments. It has the original form of those days, even though it is being weathered due to the severe natural ocean environment. Surviving industrial facilities prove that coal mining was executed utilizing a limited space. The Miike coalmine, introduced modern technology as a

government-owned model mine, took a leading role for other private-owned coalmines, such as the Chikuho coalfield. Similar to the Takashima coalmine, coal was exported to Shanghai and Hong Kong for acquisition of foreign currency, and supplied to the domestic market. It was also transferred to the Yawata Ironworks by railways and ships. There are some remains such as towers and hoisting facilities in the Manda pit and Miyanohara pit, with the best conditions among the domestic coalmines in the specified period. The Miike Port was built in 1908, and keeps the original form still now. The Misuminishi Port was completed using a combination of Dutch design and Japanese stone building techniques. The cityscape, which was formed at the same time when the port was built, also keeps the original features of those days. The coal railways between the coalmine and the Miike port also remains its original form, so it will enable us to systemically consider coal mining, coal transport, and shipping. The Chikuho coalfield was the biggest coalfield in Japan in those days. In the end of the Edo period, Chikuho was just an area of gathered small-scale coalmines. In the Meiji era, modern technology was installed and those small mines were combined and formed a large-scale coalmine. It was also a coal supplier to the Yawata Ironworks. It is strongly related to the suggested story of this report, and the Sakubei Yamamoto Collection of paintings, that depicts labor and life in the Chikuho coalmine, was inscribed on the Memory of the World of UNESCO (2011). However, remaining heritages are limited to chimneys, towers, and a part of railways.

Based on the investigation mentioned above, Takashima (the Takashima coalmine and Hashima coalmine) (Fig.9)and Miike (the Miyanohara pit, the Manda pit, the Miike port, the Misumi west port, and the Miike coal mine industrial railway)(Fig.10) are selected as the component parts.

Fig.9
Hashima coalmine (Takashima coal field)

Fig.10
Miike Coal mine

4 . Conclusions
In this paper, the summary of the "The Modern Industrial Heritage Sites in Kyushu and Yamaguchi" is told, and the domestic comparative analysis of the coal mine outlined.

This rapid achievement – in a little over 50 years - was characterized by a unique process of Western technology transfer, particularly within the heavy industrial sectors of iron and steel, shipbuilding and coal mining.

The outstanding universal value of the group of interrelated sites – each linked to the Kyushu-Yamaguchi region and the influences of powerful southwestern feudal clans and their successors - is founded primarily on their role in the shaping of the nation; they represent the primal historical and archaeological evidence of the emergence of modern industrial Japan.

Within the serial nomination industry comprises three principal related typologies – iron and steel, shipbuilding and coal mining - and contains sites that are testimony to the mechanism of technology transfer, its development and large-scale Western-style establishment.

Coal provided the fuel for Japan's rapidly expanding industries, and an export commodity that earned income to continue the industrial expansion. Included in the series are mines that were the first to introduce Western technology and organization (Takashima and Hashima), and the largest and most technically advanced (Miike).

Our nomination is challenging, in that some sites are still in operation, whose management system is yet to be well established in Japan, and concrete structures in Hashima (Gunkanjima or Battleship Island) are exposed to threats. We aim to get our sites inscribed as World Heritage early, solving these problems and preparing nomination dossier and management plan.

CHAPTER TWO

SECTION IV: SOCIAL AND ECONOMIC IMPACTS

Organizing Industrial Heritage in North Rhine-Westphalia (NRW), Germany

KARABAIC, Milena

Abstract

1.Perspectives and Chances for a "Charter Industrial Heritage NRW 2020"

Industrialisation has shaped the face and identity of North Rhine Westphalia, its landscapes and its mentalities in a characteristic manner to a greater extent than in almost any other region in Europe. Industrial heritage sites of varying qualities and of different scales are to be found in every part of the state. Over the past decades, numerous protagonists have, through their activities to preserve industrial heritage, contributed in creating a unique industrial landscape in North Rhine Westphalia comprising industrial museums, listed sites cornmernorating = ist commemorate = erinnern gemeint? industry, labour and technology, symbols of structural change and venues for present-day culture. Industrial heritage is the feature unique to the entire state of North Rhine-Westphalia and it is therefore also an important part of national heritage.

2.Sustainable factors of continuous success

Industrial heritage offers an essential starting point for sustainable development processes in the towns and regions. Key fields of these activities are preservation of historical monuments, urban regeneration, landscape management, cultural development and tourism. But in the face of new competitors and with the experience that the limits of growth haveobviously been reached, questions of consolidation, budget cuts and sharing visitors' attention become more important. rising. The industrial heritage protagonists in NRW consequently set up a "Working Group Industrial heritage NRW" appointed by the federal state to draw a concept to maintain and consolidate the leading position of industrial heritage in NRW on the international platform in the future.

3.Advantage of alliance: Positions and Visions for NRW

As a result of the efforts a "Charter Industrial Heritage NRW 2020" has been formulated. Thecharter and its conclusions were presented to the public in November 2011 on a conference in Dortmund, Germany. In order to achieve resp. to realize the strategy several key areas connected to particular measures had been defined. Based on the commitments of these recommendations the charter gives the guidelines for the participants and all those involved and holding a stake in future of industrial heritage in NRW.

4.Presentation and the first experiences with the "Charter Industrial Heritage NRW 2020"

How is the state of discussion and participation (nearly one year after publishing in November 2011)? Is there a perceptible movement or structural change in organizing and maintaining industrial heritage in NRW? Review and outlook concerning the implementation of the main topics of the charter will be given.

Adopted in Dortmund on I1 th November 2011 at the Conference “Industrial Heritage 2020.

Positions and Visions for North Rhine Westphalia”

Industrialisation has shaped the composition, character and identity of North Rhine Westphalia, its landscapes and its mentalities in a characteristic manner to a greater extent than in almost any other region in Europe. Industrial heritage sites of varying qualities and of different scales are to be found in every part of the state. Over the past decades, numerous protagonists have, through their activities to preserve industrial

heritage, contributed to create a unique industrial heritage landscape in North Rhine Westphalia comprising industrial museums, listed sites commemorating industry, labour and technology, symbols of structural change and venues for present-day culture. Industrial heritage is the feature unique to the entire state of North Rhine Westphalia. It is therefore also an important part of national heritage.

The industrial heritage protagonists in NRW are committed to a wide definition of industrial heritage. This self-conception, which does not only cover immediate legacies and sites bearing witness to 10 industrial and technological historic places but also includes the environment associated with industry in the form of infrastructure, urban development, social and political culture as well as witnesses of everyday life. Immaterial evidence such as personal memories and social traditions are also incorporated. Industrial heritage covers all activities aimed at preserving and using these legacies as well as interpreting and communicating them through interdisciplinary endeavours of all types, i.e. also as part of a lively regional historical culture anchored in the local communities.

Lndustrial heritage offers an essential starting point for sustainable development processes in the towns and regions. Key fields of industrial heritage activities in North Rhine Westphalia are preservation of historical monuments, urban regeneration, landscape management, cultural-development and tourism design and development.

Many industrial heritage sectors and projects in North Rhine Westphalia also fulfil an internationally recognised pioneering and model role; these include the organisation of industrial monument preservation and the establishment of industrial museums by the regional authorities Landschaftsverband Rheinland, LVR, and Landschaftsverband Westfalen-Lippe, LWL, the International Building Exhibition (IBA) Emscher Park, the foundation of the ‘Stiftung Industriedenkmalpflege und ‘Geschichtskultur” (Trust for the Preservation of Industrial Monuments and Historical Culture), the development of the Industrial Heritage Route by the regional authority Regionalverband Ruhr, RVR, the transformation of industrial monuments in 10 venues for cultural events and the creation of the industrial heritage portal on the World Heritage Site Zollverein in Essen.

Continued and additional efforts of all those involved are required to maintain and consolidate the leading position of industrial heritage in North Rhine Westphalia on the international Stage in future. The “Working Group Industrial Heritage NRW” appointed by the federal state has formulated key areas with a particular need for action in order to achieve this aim. It has made the following recommendations and has called for commitments.

By using industrial monuments as incentives for urban development

Lndustrial areas are a distinctive feature of urban development in large sections of the state; frequently they were the starting point for and later the center point of selilement ? continuous development. The decommissioning of industrial sites as a result of the structural change still often leads to the demolition of the erstwhile landmark. Numerous examples demonstrate, however, that the preservation of industrial heritage and its integration in new urban developments are successful and can contribute to maintaining regional identities, to image building and to value creation. Properly owners, developers, investors and local authorities are therefore encouraged to take on the sometimes specific challenges relating to the preservation and conversion of industrial monuments and to use their potential as a stimulus for urban development.

Involve companies

Industrial history heritage is also preserved and updated by companies as part of modern corporate culture. Fundamentally the preservation of historic buildings in line with the relevant regulations is not inconsistent with modern production processes. If it is understood to be part of the corporate history, it can make an imporiant contribution? The entrepreneurial protagonists are therefore encouraged to become involved in endeavours to preserve industrial heritage.

Handle industrial monuments appropriately

Time and again the maintaining and use of monuments from the Induslrial Age pose challenges for the authorities responsible for preserving monuments. This applies in particular to the large plans in the mal, iron and steel industry which were often only designed to be used for a limited period of time and also to technically sophislicated transport facilities. In such cases it is necessary to draw up appropriate strategies and concepts and to update the classical principles relating to monument preservation.

Preserve authentic locations

Lndustrial heritage can be best experienced and presented inoriginal locations and facilities. When maintaining and using industrial monuments, the aim is therefore to retain the authenticity. A historic location is more attractive to tourists when it is used as a cullural venue; in addition appropriate communication means and a wide range of presentation forms should be developed and applied.

Safeguard and pass on knowledge

key challenge is to amass, preserve and pass on all available verbal, written, visual and concrete knowledge about industrial heritage. Industrial museums and also industrial monuments used as tourist venues should convincingly integrate the “recounted history” in their site presentations. Furthermore industrial heritage should be more firmly anchored in the learning, teaching and research guidelines of schools, universities and further education institutions and form a part of the educational objectives of adult learning centres and modern media centres.

Comply with quality standards

The objective is that all protagonists commit to comply with the jointly agreed and guaranteed quality standards by

- handling the historic sites appropriately from a monument preservation, museum and archival point of view, i.e. according to professional standards in this regard
- complying with academic standards in documentation and interpretation,

- addressing all social groups in a form suitable to the respective target groups und
- providing qualily Services for visitors and Users of industrial heritage facilities; participation in the “ServiceQualität Deutschland in NRW’ is recommended.

Strengthen voluntary commitment

Industrial heritage becomes alive in particular through voluntary commitment: ‘Former employees” contribute their technical knowledge about the production processes or the localion history during the monument presealionphase and when welcoming visitors; those interested in a specific topic or item initiate and assist in studying, preserving, overhauling, maintaining and communicating the industrial heritage. The public authorities are called upon to support this voluntary commitment financially and in the most appropriate manner. Individuals, initiatives, associations and organisations are encouraged to become involved in industrial heritage or to continue their commitment.

Promote tourism to Industrial Sites

Numerous industrial heritage sites have a high level of touristic potential either as individual sites or in an association of regional networks. This applies both to the Industrial Heritage Route with its anchor points in the Ruhr area and to other sites and regions in the state. Cooperation, between those involved in industrial heritage and those involved in tourism at state, regional and local level should be intensified wilh the aim of jointly developing, promoting and marketing high quality industrial tourism products.Integration of the sites and regional routes in North Rhine Westphalia in the European Industrial Heritage Route (ERIH) is to be continued on a permanent basis.

CHAPTER TWO

Develop Umbrella Brand “Industrial Heritage NRW”

To gain public and political attention. The protagonisls of industrial heritage require an appropriate image and a jointly communicated umbrella brand “Industrial Heritage North Rhine Westphalia” which takes account of the different regional industrial heritage identities. The activities required for this are being prepared, initialed, CO-ordinated and followed up by the “Working Group Industrial Heritage NRW in CO-operation with the regional networks. Organisational and network structures are also being discussedin this connection.

Saving and Valorising Industrial Heritage with Local Organisations and Volunteers in Belgium

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Abstract
The subject of my paper is in fact inspired by practices in heritage management in Taiwan and other Asiatic countries, were much local heritage projects are successful because or an active support of local communities, local education programs and the aid of many enthusiast volunteers.

In Belgium, the industrial heritage movement started around 1975-1980 with the aid and support of local organisations. The role of the academic world has been very modest in the field of industrial heritage.

Since about twenty years the heritage movement has undergone a metamorphosis through a more professional practice and more public support (by the government and local authorities). But the role of volunteers in local or regional heritage organisations has remained of great importance all the time.

A sustainable heritage practice, included the field of the industrial and technological heritage, without the cooperation and enthusiasm of local communities or without their involvement in heritage education projects is “as a harbour without water” or “as a pub without beer” as people say in Belgium.

The presentation will demonstrate this opinion with self made images by the author including photos of concrete projects of volunteer work in saving and valorising industrial and engineering heritage in different regions of Belgium.

Keywords: Belgium; saving and valorising industrial

INTRODUCTION

The subject of my paper is actually inspired by some practices in industrial and handcrafts heritage management in Taiwan and other Asiatic countries, were much local heritage projects seems successful by the active support of local communities, thanks to local education programmes and the aid of many enthusiast volunteers (1).

Also in Belgium, a country of nearly the same size as Taiwan, the industrial heritage movement enjoys support of local organisations and aid of volunteers in different regions, especially in Flanders, although the context of these two countries with a very distinct history is very different.

PIONEER PERIOD 1975-1980

In Belgium, one of the first industrialised countries in the world, the interest and care for industrial remnants started in the period 1975-1980.

The initial important role of the academic world concerning intentions for the set-up of education programmes about industrial archaeology and heritage was quickly confronted with the economic recession during the 1970ies and the financial restrictions concerning the creation of new departments. Looking back, the significance of universities has been very modest in the field of industrial heritage research. In the Ghent University, for example the “working group industrial heritage” (WIARUG), active about conservation of old workers housing in Ghent during the pioneering years-, became afterwards merely (as we call this) ‘a tiger made of paper’ and is dissolved now.

On the other hand, it is hopeful that, especially during recent years, committees and platforms were created within and between universities concerning the care of the own “scientific heritage”, including historical measure instruments and all kind of tools and even relatively young machinery, used for academic education and research. This care includes the making of detailed inventories, the presentation and exhibition of collections, cooperation between academic institutions and the organisation of public events, publications, etc. This successful and professional movement is relatively young (since circa 2005), compared to the development of industrial archaeology in the different parts of Belgium, were private non-profit associations, supported mainly by volunteers, had and have a leading role.

NATIONAL, REGIONAL PLATFORMS

Let’s go back now to the start of industrial archaeology in the 1970ies: by then, Belgium, already with a administrative division in two communities (Flanders and Wallonia) -especially in cultural and heritage matters- had witnessed the short existence of the unsuccessful “national” organisation, the ‘Centre for Industrial Archaeology’ (1975-1977), resulting in a series of articles in canonized national journals, quite successful temporary exhibitions as “The reign of the Machine”, in 1975 (2). Shortly after 1975, some new museums (as MIAT in Ghent) started, as well as regional associations, animated by volunteers only: in Flanders (northern part of Belgium) the Vlaamse Vereniging voor Industriële Archeologie (VVIA, created in 1978, with Adriaan Linters as first president, www.vvia.be) and in Wallonia (the southern part of the country) Patrimoine Industriel Wallonie – Bruxelles (PIWB, created in 1984, with Claude Gaier as first president www.patrimoineindustriel.be). It is important to mention that these to organisations worked with volunteers only during the first years and with a very small staff of temporary employees afterwards…

In 1996, SIWE was created (www.siwe.be). The Stichting voor Industrieel en Wetenschappelijk Erfgoed, or Foundation for the Industrial and Scientific Heritage, was set up on the initiative of André Cresens, to promote actively the study and conservation of Flanders’ industrial heritage, by building bridges between the players in the field of industrial heritage on the one hand, and scientific and technological heritage on the other. We remark that the concept and terminology “industrial archaeology” was no longer used. At the end of the millenium SIWE entered in a unintentional competition with VVIA (see above) in order to be nominated by public authorities as the one and only representative association for industrial heritage in Flanders. Also important to understand the public policy in heritage is to clarify that two distinct Flemish ministries have authority: one ministry (of Environment and Planning) has authority in protection and conservation-

matters of monuments (buildings, immovable heritage), another ministry (Ministry of Culture) has authority about movable and immaterial heritage…

In 2001, the Flemish government (Ministry of Culture) accepted SIWE as the mediator for the field of industrial archaeology in Flanders and Brussels (with Stichting replaced by Steunpunt, or "Backing point"). This was part of a thorough reconsideration of the whole field of heritage ('erfgoed' in Dutch), which embraced a very large variety of interests, ranging from folklore, genealogy and local history to industrial heritage (Flemish decree of October 1998). Popular culture, taken indeed in its most broad sense, was the common trait. The Flemish Centre for Popular Culture coordinates the whole topic (www.vcv.be). This seems to be a unique development, which may open up the field of industrial archaeology, linking it to the history of daily life, and both material and immaterial culture. Still, a difficult problem remains to be solved, since different ministries "cover" these fields: the ministry of Culture (immaterial and mobile heritage) another ministry for the protection of industrial monuments.

Meanwhile a new decree (Decree Cultural Heritage, 2008) leaded to the foundation and recognition (at the end of 2011) of ETWIE ('Expertisecentrum voor Technologisch, Wetenschappelijk en Industrieel Erfgoed'), a new Flemish "expertise centre", that will defend and activate the broad field of "technological, scientific and industrial heritage". The future of SIWE, now reduced to a volunteer association (fig. 1), with the same status as VVIA, is uncertain.

TICCIH-Belgium (created in 1985) had a vague existence up to the late 1980s, but the 1990 TICCIH congress in Brussels boosted the activities, bringing together all industrial heritage associations of the entire country, to return to a state of lethargy by the year 2000 and having no real programme or activities since then...

CONSOLIDATION: 1980-1990

Let's return again to our general survey of industrial heritage care development "on the field" (in practice).

During the eighties (1980-1990) arose a "consolidation phase", that may be linked to the aspiration for more professionalism. It appeared that enthusiastic amateurs and a handful of committed academics were hardly in a position to influence decisions with regard to preservation, re-use or protection of industrial heritage Yet, through their continuing discourses and actions in the 1970s and 1980s, these people formed the basis of initiatives that eventually turned out to be successful. A nice example is provided by the Museum for Industrial Archaeology and Textiles (MIAT, www.miat.be). It is part of the Ghent city museums, and above all subsidised by the city. In 1990 it was established in an ancient textile mill, and since then its activities are expanding: the "friends of the MIAT-museum" (VIAT) publishes a review, organises permanent and temporary exhibitions, offers lectures, etc. The MIAT has groups of volunteers specialised in restoration and demonstration of spinning machines and weaving looms. Another group runs printing machinery in a reconstructed printing shop. The same museum, installed in a huge spinning mill, was strongly involved with all kind of activities during the famous "Gentse Feesten", an amazing kind of popular open air festival in the town of Ghent.

Another less classic example is La Fonderie, "Museum for the social and economic history and actuality of the Brussels region" (Sint-Jans-Molenbeek), founded by Guido Vanderhulst in 1984

and supported by the local government (www.lafonderie.be). La Fonderie (fig. 2) is not a classical museum at all, but an outstanding research and documentation centre, linking in all activities past and present dimensions of economic and social life. Attention for social struggle in the industrial past is of the same importance as saving material industrial heritage in the derelict industrial zones of the Brussels canal-axe. La Fonderie also organises temporary exhibitions, publishes a review and promotes industrial tourism through thematic visits by boat, bike, bus, on foot, or with public transport. All these activities and broad public interest serves at regular times to strengthen militant conservation actions in favour of industrial monuments. Examples are committee "Tour et Taxis 21" who succeed to save the unique site transport and harbour-heritage of Tour & Taxis, partly re-used (Royal Warehouse, Customs-Warehouse) since about 2000 for a large range of private and public functions and events (fig. 3).

Unfortunately, not all initiatives went through a successful process from enthusiastic amateurism to professionalism. Energeia, for example, the museum of electricity opened in de port-zone of Ghent in 1986, but was already closed before the year 2000 as a consequence of new PR policy of Electrabel (owner and private energy producer).

MORE PROFESSIONALISM: 1990-2000

In the 1990s we reach the "professional phase" of industrial heritage management in Belgium. An example of this 'professionalism' is the legal status of museums in Flanders, that has been deeply reconsidered: only museums that have been approved (after long and repeated examination of all management aspects) by the Ministry of Culture, may obtain an enduring subsidy from the Flemish government, apart from other local support by municipalities. Rightly, requirements are high, but this caused difficulties for a great deal of industrial and technical museums. Hence, smaller museums often did not meet the standards, and were forced to sell part of their collection, to close down of to continue their activities with volunteers, as in de Railway collection Centre in Louvain, located in a remarkable shed structure, that will probably be demolished in 2013 (fig. 4).

It remains a question whether the museum policy of the Flemish government has played a role, but since about 1995 the world of (larger) museums has gone through a process of rejuvenation. For example, the Diamond Museum (Antwerp, www.diamantmuseum.be) has been renovated with support of the Province of Antwerp and private sponsors. Diamonds belong to the category of 'easy items', just like lace, chocolate and breweries. Much less popular are the sector mining, metallurgy, chemistry, nuclear power…

This explains the slow development of the Flemish Mine Museum in Beringen (www.geocities.com/vlaamsmijnmuseum/ en www.toerismeberingen.be), who was opened thanks to the pioneering role of Bert Van Doorslaer and is managed by a coherent group of volunteers ex-miners and mining engineers. Only a very small crew of employees is working here.

The similar situation can be observed in the Flemish Museum of Tramways and Buses (VLATAM, Antwerp), initiated Erik Keutgens with a great team of amateurs. Although financed by the Flemish public transport company "De Lijn", much of restoration work, maintenance, city trips with historic trams and buses is executed by volunteers.(3)

Another example is the 400 years old (protected) Paper mill Winderickx in Alsemberg, the owners and family of former paper mill, transformer as Centre of old and new energy – Herisem mill, are

personally involved in all kind of tasks, from research in archives to demonstration of traditional papermaking and the restored steam engine (fig. 5).

THEATHS AND OPPORTUNITIES IN RECENT DEVELOPMENTS (2000 -)

In fact one can observe during recent years a double movement in the small heritage of my country: one the one hand, the public authorities try to support all branches and niches within the cultural and heritage field by the creation of 'dome'- (or 'cupola'-) organisations who served as coaches but also as organs of control. To limit the overview to Flanders, following organisations are in the running: about immobile heritage (the reponsability of one specific ministery), VCM ('Forum voor Erfgoedverenigingen') –defending the interests of about 300 local of thematic heritage organisations, mainly involved with movable and mobile heritage-, SVE – 'Stichting Vlaams Erfgoed' (a tentative of a Flemish 'National Trust', inspired on the British model, patronating restorations and the respectful re-use of problematic monuments), 'Coordination Centre Open Heritage Day', 'Monumentenwacht' (an public service that may diagnose the material state of protected and non-protected buildings and report this to owners or users),…

Recently (in 2011), mainly because of budget-restrictions, all these organisations melted into 'NEO', one great institution (Nieuwe Erfgoed Organisatie) nowadays called "HERITA".

About material (mobile) and immaterial heritage FARO (Vlaams Steunpunt voor Cultureel Erfgoed) was created, also divided in a lot of specialist working committees and translating the policies of Flemish Ministery of Culture to the field of local and thematic organisations.

All these "cupolas" incite local organisation to work in a more professional way. At the other side, they absorb an important part of the public financial support, so that few finances are left for research and conservation about concrete topics and remnants of industrial of technological heritage 'on the field'…

Also typical for recent trends is the focus of public support to main, prestigious museum projects of reconversion of old industrial testimonies. The MAS (Museum on the River, www.mas.be), opened in 2011 in Antwerp, that includes collections of various local museums, including the former 'National Maritime Museum' is a good example. In one year time the MAS became a major tourist attraction and as a well sponsored institution (by public and private sponsors !) gave an strong impulse to the revalorisation of the surroundings and 'Het Eilandje', a popular harbour district, now confronted with real estate speculation and the perverse effects of gentrification. In contrast, very near of the MAS, one can admire the fleet of small historic ships (used for inland navigation), forming the "Rijn- en Binnenvaartmuseum". This nice collection of ships and the 'water related collections' presented in the vessels, located in Bonapartedock, the oldest dock of Antwerp, are managed by a staff of senior volunteers only.

These examples make clear that a well-balanced equilibrium in the management of industrial heritage implicates two elements: on one side expertise, professional and modern management (= the condition for a generous public support), at the other side passion, devotion and group-dynamism of volunteers.

An industrial heritage highlight were the two elements seems in balance is the "Stoomcentrum" in Maldegem (see www.stoomcentrum.be), combining the running of a railway line with steam trains

and old diesel-powered trains with a training centre for restoration of old railway equipment, a regional railway museum, etc (fig. 6).

About this last point, these are a lot of similarities between Flanders and Wallonia, two regions with a different heritage legislation and cultural autonomy. In Wallonia, the government support generously a limited number of industrial monuments, mostly open to the public as museum or cultural centre. The "Institut du Patrimoine Wallon" (www.ipw.be)

Has an important role as 'mouthpiece' and mediator of public policies and the heritage associations and local organizations.

Three years ago, four outstanding coalmining sites were proposed by the Walloon regional government for a nomination by UNESCO on the World Heritage List: Grand Hornu (Borinage), Bois-du-Luc (Centre), Bois du Cazier (Charleroi area) and Blegny (near Liège). This application (http://www.sitesmajeursdewallonie.be) is also the recognition of the many efforts of those who have worked to safeguard these sites, often in difficult conditions. This heritage should not only be "simply" conserved but also developed and used. The strict criteria for recognition have been met architecturally by Grand Hornu, socially by Bois-du-Luc, as regards memory by Bois du Cazier (fig. 7), and technically by Blegny. Application files were accepted and taken in consideration by ICOMOS. The 2010 annual session of UNESCO didn't result in 'green light' and formulated different remarks about the application-dossier, who is now under revision and completed before a definitive decision.

Let's resume the basis information about these four industrial heritage sites:

-Grand Hornu site (near Mons) was built by Henri Degorge between 1810 and 1830. The contemporary project, developed between 1984 and 1989, was crowned in 2002 with the opening of the MAC's or Museum of Contemporary Arts (www.mac-s.be).

The non-profit organisation "Grand Hornu-Images" (www.grand-hornu.be), located in a part of the Grand-Hornu site (opposite the MAC's) was created by the Province of Hainault, based on initial reflection about the site's future and explores the realm of the relationship between art, design and industry.

-Bois-du-Luc (www.ecomuseeboisduluc.be) is an almost intact example of a 19th century mining town. Since 1983, it aimed at presenting the ethnological heritage of this industrial area between Mons and Charleroi. Listed in 1996 and belonging to the region, the Ecomuseum was handed over on a long lease to the non-profit organisation of the same name. The Walloon Heritage Institute installed here recently a centre of industrial archives, joining the non-profit Safeguarding of Industrial Archives of Mons Couchant (SAICOM, www.saicom.be). The two associations work together for the conservation and digitalisation of the industrial archives of the Borinage and the Centre. In 2008 the Ecomuseum became part of the European Route of Industrial Heritage (ERIH). In 2011 the Ecomuseum of Bois-du-Luc edited the "Discovery booklet - Itinéraire de la Culture Industrielle" (ICI) describing a vast international network of industrial heritage sites in Hainault and Nord – Pas-de-Calais (France), that can be explored on foot, by bicycle or by car (www.ici-itineraire.eu). The ICI is also a unique toolkit, presenting industrial heritage without borders.

-The Bois du Cazier site (www.leboisducazier.be) is linked to the 1956 mining disaster with 262 casualties. In 2006 the collection of archives was improved and the Industry Museum representation renewed. The Glass Museum was opened for the public. Also the educational department and services were developed in order to attract more young visitors. Since 2007, Bois du Cazier belongs to the "International Coalition of Sites of Conscience", bringing together museums dealing with themes such as war, totalitarianism, and labour. On site a great number of temporary exhibitions about specific themes (glass-industry, mining labour in art and photography) has been presented. In 2011, the Centenary of the "International Exhibition Charleroi 1911" was commemorated by different scientific and media-events.

-The Blegny Mine (www.blegnymine.be), north of Liège, offers a unique attraction: going down into the underground galleries of a coalmine. It was opened to the public as soon as its economic activity stopped. Visitors can discover a mining museum at the Sainte-Marie pit (dating from the early 19th Century), and explore the biotope of the nearby slag-heap.

STRONG AND WEAK POINTS

A recent trend is the improvement of the presentation of quite a lot of industrial heritage sites. Examples are numerous in Flandres and Wallonia: the new look of museums as the National Jenevermuseum in Hasselt (www.jenevermuseum.be) or the renewed maritime museum of Baasrode (www.scheepswervenbaasrode.be), the reopened Fishery Museum in Oostduinkerke (www.visserijmuseum.be), the renovation of the Machinery collection in the Department of Applied Sciences, Heverlee (University of Louvain) and the new HistarUZ (Museum of Medicine, www.uzleuven.be/histaruz), also in Louvain. An example in Wallonia is "La Maison de la Métallurgie et de l'Industrie" (www.mmil.be) in Liège (fig. 8).

The improved presentation goes often hand in hand with a more professional management, quite always with the cooperation of volunteers. But the higher professionalism implicates also a higher investment of time and energy of the staff in 'paper work', administration, redaction of management plans, self-evaluations, SWOT-analyses, etc. But also working with volunteers implicate additional tasks: recent changes in legistation obliges the board of each association to take an insurance policy for volunteers, in order to avoid responsibility problems in case of accidents. Further the volunteers has to be trained, guided and encouraged for their work. This needs permanent efforts.

It is striking that most efforts by volunteers were made in private associations, especially in the sector of transport heritage. Volunteers improve the research and restoration of mobile heritage (cars, trains, buses, trams, other public transport, fluvial transport).

Some examples in Wallonia are the car museum "Mahy-mobiles" (www.mahymoblies.be) in Leuze, the "Historical tramway Lobbes-Thuin" (www.asvi.be), the Bocq railway (www.cfbocq.be) and «Chemin de Fer à Vapeur des 3 Vallées» (http://cfv3v.in-site-out.com), connecting Mariembourg and the railway museum of Treignes, the most popular destination in southern Belgium for steam locomotive – amateurs.

In Flanders, the decree on "Maritime heritage" (2002), which led to setting up of several associations that are linked to "water heritage" is under revision now, with the support of WEV (Watererfgoed Vlaanderen, www.wev.be), a dynamic new platform in full development that organised all kind

of meetings and hearings about the harbour heritage of Antwerp (2008), Ghent (2010) or the reopening of the Antwerp south-docks (2011). Alongside these initiatives, media events may be mentioned such as WaterkAnt in Antwerp (a "maritime celebration" with numerous vessels of all times) or 'Oostende voor Anker'.

The Contactforum voor Erfgoedverenigingen ("Centre for Heritage Associations", www.forumvoorerfgoedverenigingen.be), that became recently part of a new heritage organisation "NEO" did a lot of pioneer work before WEV was founded. and coordinated research and initiatives with regard to "rolling, riding and flying heritage". This led in 2008 to the launching of META, Mobiliteits-Erfgoed Tram en autobus ("Mobile Heritage of tram and bus", see www.metavzw.be), that coordinates the restoration of public transport heritage and the Public transport Museum in Schepdaal (Dilbeek). This renewed museum celebrates in 2012 his 50th birthday. META supported also the 125th birthday programme (in 2010) of the coastal tramway (the longest tramway of the world, still in operation).

For the railway-heritage, FEBELRAIL (www.febelrail.be) is the most significant national platform. Some of the Flemish affiliated members are Kolenspoor (railway line As-Eisden, http://www.kolenspoor.be), BVS - Stoomtrein Dendermonde-Puurs (http://www.stoomtrein.be) or Stoomcentrum Maldegem (railway line Maldegem-Eeklo, www.stoomcentrum.be) organising the yearly 'Stoomfestival', attracting many amateurs of steam railway heritage from all over Belgium and other countries.

A lot of weak points remain in the small world of industrial and technological heritage:

Concerning the care for volunteers:
-the necessity of rejuvenate the ageing (and largely masculine) audience and interested people;
-the permanent need of adapted training, education and guidance;
-the need of protection, insurance and improvement of work conditions of the volunteers, regarding their functions;

Concerning the heritage itself:
-an urgent need of adapted spaces and storerooms for the sustainable conservation of collections:
-the permanent the need of long term heritage strategy and policy, especially in the conservation of large 20th C industrial monuments and landscapes;
-the need a more respect for industrial buildings and installations, when reused of renovated for new functions (4);
-not forgetting the permanent care of more financial possibilities and media-support for the branch of industrial heritage in general.

About each of these items, the associations described above (IPW, PIWB, SIWE, VCM, VVIA…) organised successful meetings during recent years.

CONCLUSIONS

Since about twenty years the Belgian heritage movement in general, included the industrial heritage segment, has undergone in all regions a metamorphosis through a more professional practice and more public support (by the government and local authorities). But the role of volunteers in local or regional heritage organisations has remained of great importance all the time.

A sustainable heritage practice, also in the field of the industrial and technological heritage, is not possible without the cooperation and enthusiasm of local communities or without their involvement in heritage education projects. The absence in an institution or association of volunteers is “as a harbour without water” or “as a pub without beer” as people says in Belgium.

The presentation demonstrated this opinion showing concrete projects set-up by local associations, widely supported by volunteer work in saving and valorising of industrial and engineering heritage in different regions of Belgium (5).

FIGS:

Fig.1. Preparing press-meeting about demolition of Brewery “De Dijle” in Louvain. Volunteers of SIWE and LHG (Leuvens Historisch Genootschap / Louvain Historical Society), april 2012.
Fig.2. Staff and volunteers of ‘La Fonderie’ (Brussels) meeting during opening of an exhibition, 2009.
Fig.3. Poster “Save the Harbour Avenue” (Brussels) attached to one of 450 endangered trees along the “Avenue du Port”, facing Tour et Taxis, 2011.
Fig.4. Volunteer guide of SIWE at work in Railway-heritage Centre, Leuven, 2007.
Fig.5. Traditional papermaking in cardboard- and paper mill Winderickx in Alsemberg (Flanders), demonstrated by the owner, 2008.
Fig.6.Volunteer steam locomotive driver in the “Stoomcentrum” (Steam heritage centre) in Maldegem (Flanders).
Fig.7. Old miners welcome all kind of visitors at the ‘Le Bois du Cazier”-mine accident memorial in Charleroi (Wallonia), 2011.
Fig.8. Volunteer guide at work during a visit of the “Maison de la Métallurgie et de l’Industrie” in Liège (Wallonia), 2010.(Source: all photographs by the author, Patrick Viaene)

NOTES:

1. As presented by Hsiao-Wei LIN in “Local cultural museums as an interpretation for the conservation of industrial heritage – An application on Jyy-Liau-Uo paper village in Taiwan” during the ICOHTEC, TICCIH & Worklab Conference (10th tot 15th of August 2010) in Tampere, Finland.
2. An important and successfull exhibition in this period was «Le Règne de la Machine. Rencontre avec l’Archéologie Industrielle» / «En toen kwam de machine. Ontmoeting met de Industriële Archeologie”. Brussels, (Crédit Communal / Gemeentekrediet), 1975.
3. For an on-line survey of Belgian industrial and technical museums and associations, see for Flanders: www.siwe.be, www.vub.ac.be/SCEG/ia/musea.html, www.vvia.be, www.mot.be/directory/directory1.htm; for Wallonia: www.patrimoineindustriel.be: for Brussels: www.monument.irisnet.be/nl/patrimoine.
4. This topic, as many others, was not developed in our paper, regarding the less importance involvement of volunteers in this field.
5. A lot of publications concerns our topic and industrial heritage management in Belgium are listed in can the on-line Referencess “Industrial archaeology and industrial heritage in Belgium” (www.viat.be). It comes along with a paper version, published by TIC, or Tijdschrift voor industriële cultuur (www.miat.gent.be/tic/indextic.htm). The State Archives (www.arch.be) have continued efforts concerning inventories of business archives.

The Fool Push A Train--The Sweet Journey Story of Xihu Sugar Factory Transition

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Abstract

In the narrow sense, Xihu Sugar Factory was constructed in 1919, which is a single sugar factory in Chungha County. She stopped sugar production on March 8th, 2002. In the broad sense, Xihu Sugar Factory (Taichung Operation Branch), she congregated fifteen sugar factories of Taiwan Sugar Corporation, 36% of Taiwan sugar industrial domain.

Xihu Sugar Factory has four major areas of importance from the viewpoint of community. 1.ice-pops are delicious. 2.the sugar train network was a major transportation for both public and the Factory. 3.the huge sugar mill building is recognized as local landmark. 4.the Factory's waterways had the worm and sweet water that was used in many ways.

While Xihu Sugar Factory was closing, they planned to simply dismantle the entire factory and railway network in order to get easy money. The sugar mill building and facilities was assigned to sale seventy million NT as scrap metal. But, now that Xihu Sugar Factory is keeping original form and opening transition from a industrial giant to an industrial heritage site. The Factory gained more than four hundred million NT after this transition.

The survival of this industrial heritage site began from Xihu Culture Studio has together assistance from funs, employees, Taiwan Sugar Corporation, academics and government. We are so honor to present the story of Xihu Sugar Factory transition that started as one into more than 420 fools have been pushing the Factory moving to industrial heritage site.

Keyword： Xihu Sugar Factory sugar Xihu Culture Studio

Content

While sugar beets grow in Europe, Japan and North America, bastions of super powers, the sugarcane plants are predominantly found in South Asia, Australia, Africa, Hawaii and Latin America in former colonial holdings. The age, included rule first by Netherlands (1624-1662) who landed in Tainan, Taiwan on August 26th, 1624, followed by Spain (1626-1642, north Taiwan only), Ming Dynasty (1661-1683), Qing Dynasty (1683-1895) and Japan (1895- 1945). Kuo Ming Tang Nationalist Government[1] successively.

1 Kuo Ming Tang National Government, President Chiang Kai-Shek蔣介石(October 31th,1887~April 15th,1975) leaded his loyalists withdraw to Taiwan.
英中對照: Xihu Sugar Factory溪湖糖廠; Chunghua County彰化縣; Taiwan Sugar Corporation台灣糖業公司; Ministry of Culture文化部; Xihu Culture Studio溪湖文化工作室; Tainan台南; Ming Dynasty明朝; Qing Dynasty清朝; Li Deng-Hui李登輝; Chen Di陳第; East Aborigine Record東番記; Girim二林社; Davolee東螺社; Fort San Domingo淡水紅毛城

In 1996, Taiwanese elected Li Deng-Hui as their President peacefully. The total is 371 years and 210 days from August 26, 1624 to March 23, 1996. This period is the prime time of sugar in Taiwan also. Now, only two sugar factories in Taiwan, the sugar empire was gone.

1.The foundation of Xihu Sugar Factory in the colonial period

Even before Taiwan was colonized by Netherlands, Chinese author Chen Di noted in his "East Aborigine Record" in 1603 that Taiwanese grew sugarcanes.

Netherlands(1624-1662) Official Hans Putmans drafted a plan on February 1st, 1635 that offered money and buffalo to encourage Taiwanese to plant sugarcanes. It wasn't long before sugar business became the most important export of Taiwan for the next 350 years.

Captain Clas Janssen chased Chinese pirates in Girim on March 22th, 1633. Official Paulus Traudenius led 400 soldiers to conquer Davolee on November 25th, 1641. Girim and Davolee both have established sugarcane farms and Xihu Sugar Factory.

Spanish (1626-1642) missionaries come to Girim in February, 1636. Netherland Commander Hendrick Harrousse attacked Spanish Fort San Domingo in August, 1642. 180 Spanish soldiers were forced to retreat from Taiwan forever.

Ming Dynasty (1661-1683), the remnants of the failed King Zheng Cheng-Gong[2] encouraged his loyalists escaped to Taiwan, and threw out Netherlands. He commanded soldiers to reclaim wastelands, started trade with English. King Zheng Jing, succeed from his father, was recorded that led 3000 soldiers to Dajia, Taichung. They ate sugarcanes for survived, but he was killed practically by aborigines whom hided in sugar farm.

Qing Dynasty (1683-1895) didn't encourage immigration to Taiwan, to plant sugarcanes. Even with no government support, Chinese author Yu Yong-He in "Taiwan Tourism Daily" noted the abundance of sugarcane fields in 1697. Sugar was simply so profitable, numerous of sugar immigration villages was established throughout Chunghua area. In 1856, Robint Co., Ltd. started exported sugar business in Taiwan. In 1872, sugar was sold to Landon 2,016 tons. In 1880, exported 63,675 tons of sugar total in Taiwan.

Japanese (1895-1945) imported new sugar breeds in 1919. They had learned Industrial Revolution technology from Europe and U.S.A. then constructed many modern sugar factories around this island. They produced more than 78,000 tons of sugar yearly in Taiwan. Xihu Sugar Factory was corporate expansion first time and modernized.

2.The corporate expansion of Xihu Sugar Factory

The first corporate expansion of Xihu Sugar Factory in Japanese occupation Gu Xian-Roan, the most powerful Taiwanese, he merged 18 traditional sugar mills in 12 years. Six of among, he took over 1.Erlin Sugar Mill (Girim) and 2.Mazhibao Sugar Mill in 1901. Later, 3.Dingliao Sugar Mill in Xihu, 4.Dafeng Branch in Sansheng, Puyan, 5.Lianjiaocuo Sugar Mill in Pitao (Davolee) and

2 Zheng Cheng-Gong鄭成功 leds 25000 soldier and 900 ships attacked Netherlands in Tainan on April 21,1661.
英中對照: Ming Dynasty明朝; Zhen Jing鄭經; Dajia大甲; Taichung台中; Qing Dynasty清朝; Yu Yong-He郁永河; Taiwan tourism daily裨海紀遊; Chunghua彰化; Gu Xian-Roan辜顯榮; Erlin二林; Mazhibao馬芝堡; Dingliao頂寮; Xihu溪湖; Dafeng Branch大豐分館; Sansheng三省莊;Puyan埔鹽; Lianjiaocuo連交厝; Pitao埤頭; Davolee東螺社; Chen zi 's陳梓; Dapaisha Sugar Co., Ltd.大排沙製糖公司; Yamato Sugar Co., Ltd.大和製糖株式會社; Meiji Sugar Co., Ltd's明治製糖株式會社; Keiko Sugar Factory溪湖製糖所

6.Chen zi 's Dapaisha Sugar Co., Ltd. (at Girim) to construct "Yamato Sugar Co., Ltd." in 1919. The capital ￥500 million Japanese Yen. He laid the sugar railway more than hundred kilometers. His ambitious made him closed to bankruptcy. So, Meiji Sugar Co., Ltd took over Yamato Sugar Co., Ltd. and renamed by Japanese "Keiko Sugar Factory" next year.

Sugar business is not always good. So, modern sugar factories were merged each other by two periods, forty two factories survival finally in 1940 when Japan was the strongest country in Asia in the beginning of World War II (1939-1945). Japanese sugar production was on the top two in the world, the most of sugar came from Taiwan.

The second corporate expansion of Xihu Sugar Factory after World War Ⅱ

Japan withdrew from Taiwan on October 25th, 1945. Taiwan Sugar Corporation reorganized 42 modern sugar factories from Japanese remained, was inaugurated on May 1st, 1946. And thus became a state-owned enterprise as yet.

Chunghua County had four sugar factories, 1.Keiko Sugar Factory (Xihu Sugar Factory named later); 2.Linbenyuan Sugar Co., Ltd[3] (Hizou Sugar Factory named later); 3.Niitaka Sugar Co., Ltd[4] (Chunghua Sugar Factory named later) and 4.Sungo Co., Ltd[5] (Gensay Farm). Keiko Sugar Factory took over all above and linked together in 1954. She was renamed by Chinese "Xihu Sugar Factory". Also, Xizou Sugar Factory became the head office of Taiwan Sugar Corporation from February, 1955 to May, 1970.

The third corporate expansion of Xihu Sugar Factory in 1968

Nantou County had three major sugar factories in 1940. They were Nantou Sugar Factory[6] ; Puli Sugar Factory[7] and Zhushan Factory[8] .

Xihu Sugar Factory entered her third period of corporate expansion in 1968, took over Nantou three primary factories and their holdings, creating the largest sugar production facility in all of Asia. After Alcohol Factory and Chipboard Factory was closed, Xihu Sugar Factory had twenty three hectares be located downtown Xihu; four storey mill's building on one hectare; squeezed four thousand tons of sugarcanes daily; 321 km sugar railway; 3,164 hectares sugarcane farms; 40.2 hectares botanical farm; one hectare orchid greenhouse; one Paint Factory; 150 head of cows and eighty thousand head of pigs at the peak.

3 Linbenyuan Sugar Co., Ltd.林本源製糖株式會社 - Lin Wei-Yuan 林維源, The richest person in Taiwan, moved his capital ￥200 million from Shanghai to Xizou 溪州(Davolee), constructed Linbenyuan Sugar Co., Ltd. Ensuiko Sugar Co., Ltd.鹽水港製糖株式會社 took over on February 21th, 1927. The scope from Tianzhong 田中 to Erlin 二林(Girim).
4 Niitaka Sugar Co., Ltd. 新高製糖株式會社 - Takashima 高島小金治 built Niitaka Sugar Co., Ltd. in Hemei 和美, Chunghua County 彰化縣 on October 30th, 1909. They changed named to Zhongliao Sugar Factory 中寮糖廠, meanwhile created second sugar factory on March 14th, 1921. Capital ￥2800 millions. The scope is from Chunghua city 彰化市 to Xianxi線西. Dai-Nihon Sugar Co., Ltd.大日本製糖株式會社 took over it in April 1935.
5 Sungo Co., Ltd. 三五公司 - Touenketugiryubi愛九澤直哉 established Sungo Co., Ltd. to reclaim wasteland in Erlin二林(Girim). Also named Gensay Farm源成農場 in June 1910 (named Sungo because the Farm was founded in Meiji 35 (明治35年). He constructed modern sugar factory on December 21th, 1933. Capital ￥335 millions. The scope is from Zhutang竹塘 to Erlin.
6 Nantou Sugar Factory 南投製糖所 - There had 2 sugar mills in Nantou City南投市 in 1895. Meiji Sugar Co., Ltd. 明治製糖株式會社 took over Nantou Sugar Factory in 1912. The factory was closed in 1968.
7 Puli Sugar Factory 埔里製糖所 - PulLi 埔里 had brown sugar mills. Japanese forced them associated as Pulishe Sugar Factory 埔里社製糖所 in 1916. But misfortune floods happed in the year so she was merged by Taiwan Sugar Co., Ltd. 台灣製糖株式會社 and named Puli Sugar Factory. Xihu Sugar Factory merged Puli on July 1st, 1991
8 Zhushan Factory 竹山工廠 - Yunlin Reclaim Association Co., Ltd. 雲林拓殖合資會社 constructed Xiakan Factory 下崁工廠 in Zhushan竹山 in 1909. Then changed name to Zhushan Factory in 1929. Showa Sugar Co., Ltd. 昭和製糖株式會社 took over it.
英中對照: Chunghua County彰化縣; Keiko Sugar Factory溪湖製糖所; Xihu Sugar Factory溪湖糖廠; Taiwan Sugar Corporation台糖公司; Keiko Sugar Factory溪湖製糖所; Nantou County南投縣; Alcoho Factory酒精工廠; Chipboard Factory蔗板工廠; Paint Factory油漆工廠

The fourth corporate expansion of Xihu Sugar Factory during this transition

Xihu Sugar Factory's acquisitions were no limited. The fourth period expansion started on January 1st, 2004 when its parent company, Taiwan Sugar Corporation made revolutionary organizational changes.

Xihu Sugar Factory absorbed eight[9] more sugar factories in north of Taiwan, and she was named "Central Administrative District of Taiwan Sugar Corporation Property Manage Center". Later, on October 1st, 2005, the entity was again renamed "Taiwan Sugar Corporation Taichung Operation Branch" to increase her power. But she was better known as Xihu Sugar Factory remains. The Factory's operating zone was from Hsinchu to Chunghua which encompassed five counties, creating maybe the most valuable sugar factory in Taiwan, maybe, or in the world also?

To get a better idea of just how successful Xihu Sugar Factory was, we can take a look at how it claimed the properties of its competitors. In 1940, Taiwan had forty two modern sugar factories. Each of these factories was the crowning achievements of various regional sugar producers. Starting from this point, Xihu Sugar Factory was able to absorb 15 of its competitors, 15/42 fully 36% of Taiwan sugar industry domain.

Xizou Sugar Factory was the head office of Taiwan Sugar Corporation. The employee took the sugar industrial processing technology transplanted to other countries in South Asia, Africa and China to help them constructed new sugar factory, for example, Thailand in 1955, Zaire in 1962, Malaysia in 1964, Rwanda in 1968, Philippines in 1969, Indonesia in 1973, Liberia in 1973, Central African Republic in 1975 and Vietnam in 1994. Xihu Sugar Factory is a important pathway of sugar history in the Orient and Africa. As the most successful creation of the sugar industry in Taiwan, Xihu Sugar Factory is a sweet gift from colonized legacy.

3.Introduce Xihu Culture Studio

"Xihu", "Xi" means river, "Hu" means lakes. The longest and widest river in Taiwan was crossing Xihu before. Xihu was called "Hicou" fifty year ago remain. "Hicou" means the gulf. C.J. Young found a Portuguese nautical map in Chicago Library. Taiwan was drawn from 1 to 3 islands. It's became interested in him to accumulate more Xihu history.

He worked in a supermarket chain's computer department, began to understand the manner of commerce trust how they work so powerful.

Lockheed Martin Corporation was assigned to write Taipei Flight Information Region. C.J. Young came back Taiwan, had an interview as an autopilot system programmer. While Taiwan was applying to join GATT, later known as World Trade Organization. With his former experience in chains, C.J. Young began to worry about the farmers in his hometown and how they would be affected by globalization, so decided to stay here.

On September 21, 1999, Taiwan was hit by the biggest earthquake in the recorded which measured 7.3 on the Richter Scales. There were 2,415 deaths and 105,479 houses damage. He joined a

9 eight more sugar factories are Xinzhu新竹, Zhunan竹南, Miaoli苗栗, Yuemei月眉, Tanzi潭子, Taichung台中, Shalu沙鹿 and Wuri Sugar Factory 烏日製糖所
英中對照: Xihu Sugar Factory溪湖糖廠; Central Administrative District of Taiwan Sugar Corporation Property Manage Center台糖公司資產管理中心中區營運處; Taiwan Sugar Corporation Taichung Operation Branch台灣糖業公司台中區處; Taiwan Sugar Corporation 台糖公司; Hsinchu新竹; Chunghua彰化; Xihu Culture Studio溪湖文化工作室; Hicou海口; Portuguese葡萄牙; Taipei Flight Information Region台北飛航情報區

volunteer team to support the reconstruction effort. Taiwanese government invested more than seven hundred billions NT into the damaged area in the period. That's means the other regions of the country receiving little government funding. Xihu Culture Studio was established to do something in his hometown.

The Studio completed a book that written with Taiwan Folk Village, a famous outdoor museum of cultural tourism site. It was entitled "Xihu Sugar Industry Narrate History[10] ". C.J. Young continued gather more data to complete his second book, "Digital Xihu General History". "Digital Xihu General History" becomes the foundation of the third book, the official "Xihu Town Annals", also is the blueprint of Xihu Town urban development plan. Less study documents of Xihu before, so we try to understand Xihu from her history to the future's development capabilities.

Involving heavily with community development, we coordinate with Xihu Town Hall and community to apply most of government funds at the period. Education is a primary goal of the Studio. We opened a culture class at a local community college and senior high school. The Studio has assisted many students writing their university theses.

Xihu Culture Studio, the midwife of Xihu Sugar Factory transition, accompanies with the Factory follow four community viewpoint step by step. They are 1.Ice-pop Store improve; 2.the sugar train reused; 3.the sugar mill building and facilities are keeping original form and reopen to public; 4.the sugar factory's waterways system is survival.

4.The found of Ice-pop Store and "Ice-pop Culture Park"

Refined sugar was a very valuable trade commodity in early Taiwan. 74% of foreign exchange came from sugar export. For example, Taiwan Sugar Corporation exported 853,000 tons of refined sugar to abroad in 1957. Got four hundred and ten million US dollars forget exchange in 1975.

It was very important for Taiwanese survival when fired with mainland China. So Taiwanese could not enjoy it. Even, the people would be punished if they ate factory's sugarcanes. Only during harvest time, the farmer would mix brown sugar and ice rock together to make cold drinks in countryside. The people who lived in city could enjoy ice-pops, but chemistry sweetener was predominantly be used.

Xihu Sugar Factory's Ice-pop Store has operated since the 1950's. The Factory use homemade refined sugar to develop a good reputation for quality and taste, but it provided for employees only at the beginning.

There were three major developments that created their ice-pop business. First, Director Wu Zu-Chung[11] expanded the business plan and opened the sale of ice-pops to the public. The minor profits of these sales were split amongst the Factory employees. In 1999, the second major change was when Director Xu Rong-Hua[12] and Farm Supervisor Guo Yu-Yi[13] proposed a plan

10 Xihu Sugar Industry Narrate History溪湖糖廠口述歷史調查 Changhua County Cultural Affairs Bureau 彰化縣文化局 issued 3 books in 2002.
11 Wu Zu-Chung吳祖澄 transferred from Hualin花蓮Sugar Factory meanwhile he took the idea came here.
英中對照: Xihu Culture Studio溪湖文化工作室; Taiwan Folk Village 台灣民俗村; Digital Xihu General History溪湖通史; Xihu Town Annals溪湖鎮志; Xihu Town Hall溪湖鎮公所;Ice-pop Store溪湖糖廠冰品部; Ice-pop Culture Park枝仔冰文化走廊
12 Xu Rong-Hua徐榮華, the Director of the Xihu Sugar Factory. He agreed with Xihu Culture Studio to run " Sugar Train Memorial Activity" and "Ice-pop Culture Park".

to decorate Ice-pop Store's customer service environment. The catch was that it would freeze employee's profit sharing for a year. Ninety percent of employees disagreed with this plan first.

Manager Hong Ying-Hui[14] instituted the third development in Ice-pop Factory. Xihu Sugar Factory had a production line which produced frozen pork dumplings. The line was converted to produce the more profitable ice-pops.

"Ice-pop Cultural Park" proven that the culture is a good business

Xihu Culture Studio joined into the Factory transition first time in 1999. We were as an ice-pop quality control taster and leisure programs creator. Studio provided Xihu Senior High School Orchestra and community drum team to celebrate the grand opening.

Xihu is a small town of approximately forty three thousand residents. Xihu Town Hall's culture budget had allocated only twenty thousand dollars NT yearly only. We co-operated with Ice-pop Store to improve opportunities for poor cultural activities in Xihu.

We created "Ice-pop Cultural Park" in an open area next Ice-pop Store. With no financial assistance, we had to establish something with very low operating costs which also promoted community involvement with the Factory. Members of the Studio, everybody was playing street performance every weekend. For example, initially, we ran arts and crafts projects using rice straw donated by area farmers. We invited local talent cram schools to post their studied results. Also made display boards to introduce Xihu area and the Factory. Display board also drew a tourism map that leaded the tourist could reach fruit farmers.

Cheap ice-pops and free entertainment made "Ice-pop Cultural Park" became the only one popular leisure destinations in south of Chunghua County in the period.

Outside interest in using the Park for more mainstream exhibitions quickly followed. For example, we arranged Taiwan National Museum of History chose to show their “Past Dynasties Money Display” for the week starting May 2, 2004. Rich our culture.

Growing public presence allowed us to develop our relationship with the media as well. We went to Formosa TV with a challenge for Nantou Winery[15] on April 22th, 2005, the most famous ice-pop maker and a popular tourist destination in Taiwan. We got a winner.

The Ice-pop Store had $0.8 million NT income yearly before. The year following "Ice-pop Culture Park" was establishment, Ice-pop Store made $20 million NT. Highest $35 million NT income when "Ice-pop Culture Park" was there. Now, the Ice-pop Store gets $26 million NT yearly. Xihu Culture Studio had broken the ice with Xihu Sugar Factory. We had rewarded their faith in our plan and proven that culture is a good business. The Studio created the opportunity advance to next concern, the sugar railway transition.

13 Guo Yu-Yi 郭宇一 , he went to Vietnam to build a new sugar factory, also, China is inviting him now.
14 Hon Ying-Hui洪英輝, one of the most import person who keep sugar train and transition running.
15 Nantou Winery南投酒廠, transition to tourism factory in 1996, the former planner is now the Ministry of Economic Affairs Shih Yen-Shiang施顏祥.
英中對照: Ice-pop Store溪湖糖廠冰品部; Ice-pop Factory5製冰工廠; Ice-pop Culture Park枝仔冰文化走廊; Xihu Culture Studio溪湖文化工作室; Xihu Senior High School Orchestra溪湖高中管樂隊; Xihu Town Hall溪湖鎮公所; Chunghua County彰化縣; Taiwan National Museum of History國立歷史博物館; Past Dynasties Money Display歷代錢幣展; Formosa TV民視

5.The sugar railway of Xihu Sugar Factory

The found of Chinese and Taiwanese railway

Shanghai laid the first Chinese railway in 1876, but the train crushed a soldier in next year, so the unfortunate monster was threw into the sea and the tracks were shipped to Tainan, Taiwan by Governor Ding Ri-Chang[16] . It was waited in storage until Governor Liu Ming-Zhuan[17] created “Taiwan Railway Business Bureau”. Chief engineer Becker came from England. He selected June 9, 1887, the birthday of George Stephenson[18] , to celebrate the first day of starting to construct the railroad between Keelung and Taipei. It's completed in October, 1891.

The found of Xihu sugar railway

On September 14, 1910, Lin Wei-Yuan, the richest Taiwanese man during the time of Japanese occupation, completed laying the light rail from Tianzongyang to Xizou for cargo and passenger use. Gu Xian-Rong, the most powerful Taiwanese man in the time, laid a light rail from Dongluoxibao to Erlin in 1912. Gu continued to lay rail, linking Xihu, Yuanlin and Lugang while he was constructing Yamato Sugar Co., Ltd. in 1919. His inheritor, Meiji Sugar Co., Ltd., continued to expand the sugar railway network.

Four sugar factory's railway networks in Chunghua County was linked all together after the Factory's second corporate expansion. More than 321 km of track provided a quick, cheap transportation of harvested sugarcane to the processing facility. Meanwhile, 74 stations on over 125.9km of track[19] provided both cargo and passenger transportation.

In fact, the private railway network owned by the Factory was the most important transportation system for rural residents for over half a century.

The situation of Xihu sugar railway after Korean War

After Korean War (June 25th, 1950 - July 27th, 1953), American military expanded its presence in Taiwan. Taiwan received significant American financial support through Economic Cooperation Administration. Transportation policy in Taiwan was changed from Japanese railway network model to American automobile-based transportation system. So, the Xihu sugar train stopped passenger's transportation in June, 1974. Sugarcane was carried only on the railways.

In 2002, the last season of Xihu Sugar Factory's sugar production, railway fans chased after sugar trains to take pictures and films. C.J. Young, was the only one could go for ride-along with driver Chen Yong-Chun[20] in engine room. He told C.J. Young that he would retire soon, but he was one of the labor union leaders, worried about his engineer brothers. C.J. Young asked him join our sugar train transition team. He agreed and became a very important figure in our cause.

The last sugar train came back at nightfall on March 6th, 2002. A long string of firecrackers welcomed the train back to garage as before. A signify the end of operations perfectly in the year. The sugar trains has run continuously for over 92 years.

16 Ding Ri-Chang丁日昌 He had waited funds to lay railway from Tainan台南 to Gaoxiong高雄.
17 Liu Ming-Zhuan劉銘傳 He started to modernize Taiwan.
18 George Stephenson, the Englishman who built the first public railway line in the world to use steam-powered locomotives.
19 Xihu Sugar Factory had 43.1km and 18 stations; Changhua Sugar Factory had 22.5km and 25 stations; Xizou Sugar Factory had 29.3km and 16 stations; Nantou Sugar Factory had 31km and 15 stations.
英中對照: Xihu Culture Studio溪湖文化工作室; Xihu Sugar Factory溪湖糖廠; Shanghai上海; Tainan台南; Taiwan Railway Business Bureau台灣鐵路商業總局; Keelung基隆; Taipei台北; Lin Wei-Yuan林維源; Tianzhongyang田中央; Xizou溪州; Gu Xian-Rong辜顯榮; Dongluoxibao東螺西堡; Erlin二林; Yuanlin員林; Lugang鹿港; Yamato Sugar Co., Ltd.大和製糖株式會社; Meiji Sugar Co., Ltd.明治製糖株式會社; Chunghua County彰化縣; Economic Cooperation Administration美援會1949-1957

6.The transition of Xihu sugar railway

"Sugar Train Memorial Activity" started the transition of Xihu sugar railway in 1995, Chen Jian-Quan, chief of Xizou KMT People Service Center petitioned for and received the authorization to open passenger services on the sugar train during Mid-Autumn Festival holiday. A sugar train ran trips from Xizou Station to Zunliao Village on September 9th, 1995. This is the first time of the sugar train resurrection in Taiwan.

Xihu Culture Studio was interested in testing the possibility of using the sugar train network as a tourism and light rail attraction. We ran "Sugar Train Memorial Activity" to test the marketability of the sugar train three times.

(1)The first time was on June 6th, 2000, during Dragon Boat Festival holiday. Xihu Town Hall Chief Yang Zong-Zhe and the Studio conducted "Sugar Train Memorial Activity". Three thousand people took the sugar train. It was so wildly successful that after making six trips, the lines were still so long, the train was forced to make two more runs.

(2)The second time was a year later in 2001. Taiwan economy was in a slump. TVBS, 24 hours television news report network, had a special series entitled "Fighting to Rescue Taiwan". C.J. Young e-mailed to the producer and anchorwoman Zhan Yi-Yi, asked her to publicize the difficulties what Xihu faced.
"Fighting to Rescue Taiwan" part 2 focused on Xihu and aired from June 3rd to June 7th. Each day had a new segment that ran for 5 minutes, 24 times during whole day. More, we were able to get their commit to running the trains that weekend. People from across island flocked to the Factory. Even the chairman of TVBS, Qiu Fu-Sheng, and General Manager, Li Tao, stayed here all day. Nationally, the public's perception was very high.

(3)One year later, in 2002, the Studio found itself looking for support to run the sugar train again. We had raise to a total $240,000NT[21] . The money was used by the Factory to renovate carriages to be used on a tourism train. The Studio enlisted the help of nine schools children from Xihu to paint ten carriages.
On June 15, 2002, during Dragon Boat Festival holiday, the painted tourism train ran inside of the Factory, making a trip of 1 kilometer. The first time cost for the rider was $50NT. The feedback was overwhelmingly positive. Furthermore, there were some people staying the night in local hotels with the hope of riding the train the next day. At review meeting, railroad fans Huang Jin-Bao, Wan Zhi-Chao, Yang Zhao-Ting and C.J. Young proposed a revised plan to the Factory's Director Hong Ying-Hui. We addressed the possibility of the lengthening the train ride outside and increasing the fare to $100NT.

<u>The sugar tourism train is running every weekend now</u>

On June 16, 2002, the train would run outdoors as a 7 kilometer route, going to Zhuoshui and back. It was obvious that the sugar train was a success. Xihu Sugar Factory had decided to continue running the sugar tourism train every weekend.

20 Chen Yong-Chun陳永春, he was the most important person who reused the sugar tourism train.
英中對照: Xihu Sugar Factory溪湖糖廠; C.J.Young楊清仁; Sugar Train Memorial Activity五分車回憶之旅; Chen Jian-Quan陳建全; Xizou KMT People Service Center國民黨溪州民眾服務社; Mid-Autumn Festival中秋節; Xizou Station溪州車站; Zunliao Village圳寮村; Dragon Boat Festival端午節; Xihu Culture Stdio溪湖文化工作室; Xihu Town Hall溪湖鎮公所; Yang Zong-Zhe楊宗哲; Fighting to Rescue Taiwan搶救台灣大作戰; Zhan Yi-Yi詹怡宜; Qiu Fu-Sheng邱復生; Li Tao李濤
21 Xihu Rotary Club扶輪社 120,000 NT; Xihu Town Hall溪湖鎮公所 50,000NT; Chunghua County Cultural Affairs Bureau彰化縣文化局 20,000NT and Ministry of Culture文化部 50,000NT. Total $240,000NT.

The train became famous quickly, so the Factory began construction on 10 more carriages the next month. The Studio invited artists help us to paint the new carriages on September 29th, 2002. After completion, the art on the carriages was appraised at over ten million dollars NT. In December, 2003, a third carriage set was constructed and painted with orchids. The first orchid farm of Taiwan Sugar Corporation was planted in Xihu Sugar Factory by Director Tang Bi-Jing. Now orchids were significant because it is a very successful business of Taiwan.

In 2003, the Studio became involved another plan with Chunghua County Cultural Affairs Bureau Chief Chen Qing-Fang. We named it "Sugar Train Runs Everywhere in Taiwan.[22] " We moved heavy sugar train and displayed in important occasion three times, 1. ran at "Taiwan Lantern Festival Celebration" in Taichung[23] , 2.during "Xiluo Bridge 50 Year Anniversary Celebration Activity[24] " in Chunghua and 3.at Office of President "Chunghua Month Activity[25] " in Taipei. Furthermore, the Studio submitted many press reports for publishing throughout this island. Xihu sugar tourism train became a symbol of Chunghua County's cultural heritage.

Railway fans continued actively promoted the sugar train. For example, they entered the Xihu sugar tourism train into internet to challenge the world most benefit tourism railway competition, our train received first place in the international category.

The success of the Xihu sugar tourism train received a lot of attention from other train heritage conservation groups. Shortly after, a Diema 175, diesel oil engine from Taiwan Sugar Corporation was sold to Welshpool & Llanfair Preserved Railway in the United Kingdom to do same thing we doing.

7.The breaking point of the Xihu Sugar Factory transition

Taking the sugar train, eating ice-pops, enjoying free leisure programs and free sugar factory tour was a fresh combination that improved public awareness of Taiwan sugar industrial heritage. The number of tourists literally increased from 0 to 350,000 in a year. A bright future for Xihu Sugar Factory seemed to be just around the bend. But !

On March 1, 2003, Alishan National Forest Park Railway's[26] train derailed. Three of four passenger carriages jumped the track with one falling into a chasm. Of the 17 people who died and 205 hurt. All tourism trains in Taiwan were forced to discontinue operation. "The fool push a train" is the impression at the moment:

22 Sugar Train Runs Everywhere in Taiwan一台火車凸全台灣. The sugar train has huge volume and louder steam whistle sound that can get excellent advertisement.
23 Taiwan Lantern Festival Celebration台灣燈會 - February 13th, 2003, we settled artists went to Taichung台中 painted the train again. Mayor Jason Hu胡自強 sold 2003 Taiwan Lamp Festiva2003台灣燈會in Taichung and Wong Chin-chu翁金珠 sold 2004 National Flower Exhibition2004國家花卉博覽會 in Chunghua彰化.
24 Xiluo Bridge 50 Year Anniversary Celebration Activity西螺大橋通車50周年紀念慶祝活動 - Opened on March 29th, 2003, The President Chen took the train. Xiluo Bridge, has 1939.03km, was the longest bridge in Far East before. The sugar railway was dismantled from the bridge in 1979.
25 Office of the President Chunghua Month Activity總統府彰化周活動- August 10 2003, the train power-on Office of the President 總統府. The Present Chen ascended the train again.
英中對照: Dragon Boat Festival端午節; Huang Jin-Bao黃金寶; Wan Zhi-Chao萬志超; Yang Zhao-Ting楊肇庭; C.J. Young楊清仁; Hong Ying-Hui洪英輝; Zhuoshui 濁水; Tang Bi-Jing唐必敬; Changhua County Cultural Affairs Bureau彰化縣文化局; Chen Qing-Fang陳慶芳; Taichung台中; Taipei台北
26 Alishan Forest Railway阿里山森林鐵路. Alishan阿里山is the most famous leisure place in Taiwan. The subsequent investigation revealed that shoddy maintenance of the engine resulted in a catastrophic brake failure, a problem that was exacerbated by the poor condition the track was in.
英中對照: Chunghua County彰化縣; Diema 175德馬175內燃機車頭; Ministry of Transportation交通部

"The sugar train took 55 carriages of sugarcanes, 400 tons total, 30 km speed. 3000 numbers ran trip yearly and no accident 13 years more. The painted sugar tourism train, pull 10 carriages of passenger, 45 tons, 10 km speed limited and 6 meter brake stop safety.

The sugar train's passenger license began from September 14, 1910. The newly license issued by Ministry of Transportation on September 16th, 1961. The Factory stop it in June, 1974 because no benefit. We applied resurrection in the end of last year, and hope it could pass soon. This transition from a hundred years old giant state-run company is an incredible story. Employee conscious organize and invest by them self. No any financial assist, we are reaching goal nearly. Now, what's next?

Let's go back to the opening metaphor. A train stops on the track. A fool tries to push it back. People come to help. When everybody is sweating and tire out. The engine driver comes to fix machine and move a little. Finally, the boss joined them to direct the traffic. So far so good, but a commander force folks stop it immediately, because the other accident. Those fools stay there in puzzle, the accident trains run far away along. Those fools have jitters there still."

After the uncertain moment, government, academics and Taiwan Sugar Corporation join the rank. Xihu Sugar Factory moves forward to industrial heritage site. Patience and unselfish, make the transition keeping going, include folks and officials.

8.Assistances from Chunghua County government and Taiwan Sugar Corporation

After a storm comes a calm. November 29th, 2002, President Chen Shui-Bian, toured Xihu Sugar Factory. Chunghua County Magistrate Wong Chin-Chu[27] asked President Chen for assistance in the Factory's transition. President Chen passed along the request to Chairman of Taiwan Sugar Corporation Wu Nai-Ren, he immediately agreed to preserve the site. But just said yes only, nothing happen. The transition is a long story still.

Council of Agriculture and Xihu Town Hall supported the Studio to present "2003 Farm & Fish Zone Leisure Activity Program" every weekend. "Ice-pop Culture Park" crossed street to factory side, we tried to trigger the industrial heritage development.

During the period, Chunghua County Hall support the Studio a lot:
(1)Without their help, we could not get the tourism train operating license on July 19th, 2003. After Xihu Sugar Factory did, other tourism trains were followed us legally.

(2)SARS panic occurred in 2003. All public activities were stopped because of fears that contact with others would spread the disease in Taiwan. But "2004 National Flower Exhibition" in Xizou was held the prepare routine. Sooner, SARS passed after July 5th, 2003 in Taiwan. Public participation was extremely high, as entertainment options were very limited. This was further compounded by the fact that the Flower Exhibition was held during the hectic Chinese New Year holiday. The sugar train was not just offered a tourism funs, also, It's ran between parking lots and

27 Chunghua County Magistrate Wong Chin-Chu彰化縣長翁金珠, She supported this transition by political function and power from many of her updated duties and position.
英中對照: Chen Shui-Bian陳水扁; Wu Nai-Ren吳乃仁; Council of Agriculture 行政院農業委員會; 2003 Farm & Fish Zone Leisure Activity Program九二農漁休閒園區活動; Ice-pop Culture Park枝仔冰文化走廊; 2004 National Flower Exhibition 2004國家花卉博覽會; Ukraine Folk Show烏克蘭傳統歌舞表演; Grape Fairy Beauty Contest葡萄仙子選拔; Foreign Laborers Food and Culture Event外籍勞工在台灣異國美食暨心靈饗宴園遊; Chunghua Urban and Rural Development Department彰化縣城鄉發展局; Yang Hong-Kui楊宏奎; Lugang (鹿港); Tianwei田尾; Erlin Central Taiwan Science Park二林中部科學園區; Ministry of Culture文化部

the Flower Exhibition as a rail light to ameliorate the traffic jams caused by the influx of tourists.

(3)Chunghua County Hall used the Factory as a venue for activities. A stage was constructed by carriages in the Factory's square, and the public was able to enjoy varied shows and contests, for example, such as "Ukrainian Folk Show"; "Grape Fairy Beauty Contest" and "Foreign Laborers Food and Culture Event".

(4)Chunghua Urban and Rural Development Department chief Yang Hong-Kui, converted unused sugar railway beds into a bike tourism path connecting to Lugang and Tianwei, very famous sightseeing areas. We try to use sugar railway as the foundation of a green transportation system from Erlin Central Taiwan Science Park to Lugang.

9.The vision has wide changed from Ministry of Culture and academics

At a national level, Ministry of Culture did great jobs in this transition:
(1)Taiwan central government began to move state-run holdings into private ownership, much of the historical value of sites were being destroyed. So, Ministry of Culture started to check for cultural value in for-sale property from September, 2004 to 2005.

(2)"Operation Directions for Subsidizing Industrial Reusing Program" was created in 2006. Chunghua County Cultural Affairs Bureau chief Chen Yun-Yong contacted with C.J. Young to formalize a plan for entrance into the program. Entrance into this program would complicate Taiwan Sugar Corporation's policy. We negotiated with the Factory over several times before getting management approval to pursue a transition plan.

(3)Ministry of Culture[28] officials Wang Shou-Lai, Shi Guo-Long, Nian Zhen-Yu, Xu You-Ren, Chen Zheng-San and Cai Ying-Mei keeping patience strongly supported the push for Xihu Sugar Factory to meet international industrial heritage standards.

(4)Organized an advisory board. Professor Yang Min-Zhi[29] leaded a team of academics, included professors Yang Kai-Cheng, Xu Guo-Wei, Liu Li-Wei, Xiao Ming-Yu, Weng Zheng-Kai, Hong Cui-Ran, Chen Bo-Nian, and Xu Hui-Min. The advisory board arranged systematic seminars to educate industrial heritage holder on how to operate an industrial heritage site based on international standards.

(5)Ministry of Culture realized that most of the people involved with the transition had no experience with industrial heritage sites. To improve our knowledge, Ministry of Culture arranged five schedule trips to overseas industrial heritage sites that in Czech Republic, Germany, the U.K., South Korea and Japan.

(6)Plans of the Factory transition was made very carefully. Starting with a master plant, the Studio

28 Ministry of Culture officials Wang Shou-Lai王壽來, Shi Guo-Long施國隆, Nian Zhen-Yu粘振裕, Xu You-Ren許有仁, Chen Zheng-San陳政三and Cai Ying-Mei蔡煐美updated the transition to international issue.
29 Yang Min-Zhi楊敏芝, the leader of Taiwan industrial heritages processing has a direction, profesor Yang Kai-Cheng楊凱成; Xu Guo-Wei許國威; Liu Li-Wei劉立偉; Xiao Ming-Yu蕭明瑜; Weng Zheng-Kai翁政凱; Hong Cui-Ran洪粹然; Chen Bo-Nian陳柏年; Xu Hui-Min徐慧民 etc. be a tear work.
英中對照: Operation Directions for Subsidizing Industrtage Reusing Program文化資產再利用計畫; Cultural Affairs Bureau彰化縣文化局;Chen Yun-Yong陳允勇; Ministry of Culture 文化部; Railway Cultural Festival鐵道文化節; Light Sound Factory Celebrations Performance光音劇場表演; Taiwan Sugar Railway Cultural Conference台灣蔗糖鐵道文化論壇; Centennial Sugar Train magnificent Result Publish百年糖鐵風雲成果發表會; Sugar Train and Sugar Factory World Industrial Heritage Seminar糖鐵和糖廠世界工業遺產研討會; Lin Xiao-Wei林曉薇; Ti-Chang Hwang黃狄昌; Xu Ji-Sheng徐繼聖

accompanied to create five plans to meet transition goals. The advisory board finished the other five more reports to better develop Taiwan industrial heritages.

(7)A performance stage inside the sugar mill building was installed by Ministry of Culture of, and subsequent performances by members of the local community.

(8)To help public exposure, such as “Railway Culture Festival” and “Light Sound Factory Celebration Performance” have received government subsidies since 2007.

(9)Opened academic conferences and seminars such as “Taiwan Sugar Railway Culture Conference”; “Centennial Sugar Train magnificent Result Publish”; “ Sugar Train & Sugar Factory World Industrial Heritage Seminar”, etc. Members of the advisory board and Professors Lin Xiao-Wei and Ti-Chang Hwang were active participants in presenting research and educating the Xihu residents.

(10)Invited foreign experts on industrial heritage who from TICCIH and Ruhr to visit Xihu Sugar Factory. The presentations established the international value of Xihu Sugar Factory. This was exceedingly well-timed as the newly appointed Manager Xu Ji-Sheng, was intent on changing same factory holdings. The added attention from the international community stalled his plan.

Xihu Culture Studio is co-operating with Ministry of Culture to do many things in the transition above and below:

The reusing of number 346 steam locomotive

The number 346 steam locomotive was constructed in Belgium. The purchase price was $ 276,776 NT, started duty in 1949. The engine retired in May 1977, when an engineer driving it at excessively high speeds caused it to jump its track. The incautious engineer who caused the accident was Chen Yong-Chun.

To carried refined sugar from Xihu Sugar Factory to Gaoxiong Harbor to export aboard, the number 346 had carried total 51 thousand kilometer mileages, 36.4 thousand carriages and 1820 thousand tons refined sugar on duty before retired.

Steam locomotive is a symbol of Industrial Revolution. She is easy to convince the Factory environment had cultural implications. The Studio was very interested in reusing the engine. So, we asked National Chunghua University of Education Professors Lin Qing-Yi and Huang Jing-Xiong to examine the Engine 346's conditions under privacy in October, 2002. After we're sure she can work then Ministry of Culture was funding full reusing of Engine 346 starting on January 30th, 2007.

Number 346 steam locomotive repair process

While the overhaul of 346 was far from smooth, two major legal hurdles almost prevented us from completing our project. First, no regulatory organization handled the inspection and certification of moveable furnaces which, in essence, is what a steam locomotive is. Second, the coal burning steam locomotive would produce prodigious amounts of air pollution. The issues were not in the purview of Ministry of Culture could address. We were instructed by Cai Ying-Mei[30] , official of Ministry of Culture, to hold two meetings of experts to compose a plan to resolve these issues.

Steam locomotive fan Huang Wen-Zhen provided the information we needed advance our project to President.

Chen Yong-Chun was the last employee in Taiwan Sugar Corporation who had the certification to operate and repair steam locomotives. We needed to obtain Chen's working knowledge of Industrial Revolution era technology, and disseminate it to our pool of engineer candidates. While modern maintenance mostly boils down to ordering parts from warehouses, but keeping an antique steam locomotive in operation involves hand-making replacement parts. Without him to educate a new crop of engineer-blacksmiths, the ability to maintain and operate steam sugar train technology would be buried with him.

A rumor was circulated inside of the Factory that the 346 reused plan would be purely superficial. We used the old traditional hand-making Industrial Revolution technology to repair the number 346 engine strongly, and broke the Factory internal gossip.

The Studio asked Wang An-Sheng joining the repair process. Locomotive 346's reusing was the subject of a documentary film directed by Wang featured on Chunghwa Telecom's, the widest broadcast of internet-based TV service. It provided the public with an inside-view of the reusing. With many people seeing the documentary, they had an opinion on our project. After steam engine was repaired, Taiwan Railway Administration official Song Hong-kang helped us to educate engineers on modern railway regulations.

“Locomotive 346 Resurrection Celebration” ran on December 9th, 2007. The Engine 346 was able to run all day, hauling passengers on seven kilometer tours. She has continued to run every weekend up to the present day.

Xihu Sugar Factory Steam Museum takes shape

At its peak, the rail yard housed and maintained seven steam locomotives that we had before. But only two steam locomotives remain inside the Factory before transition. The others, two of them moved to elsewhere, and three of them sold to Japan after they retired. For expmple, number 347 was sold, price $375,000 NT, has run in Central Park of Kahoku-Cho, Yamagata-Ken, Japan since 1988.

From the beginning, Chen Yong-Chun and C.J. Young shared a similar dream to preserve the sugar railway. One important aspect of this was seven stream locomotives represent in the Factory's rail yard as before. With the transition of Xihu Sugar Factory into a cultural heritage site, our goal was closer to being realized. Manager Lai Cai-Leng[31] shared in our opinion. We started looking for other locomotives and welcome home.

First, we located the third steam locomotive number 604 from Nantou Sugar Factory on August 20th, 2008. Second, we had bountiful feast and tipsy drinks with Yuemei Sugar Factory's

30 Cai Ying-Mei蔡瑛美, she is a never give up woman who is keeping Taiwan industrial heritage sites going.
英中對照: Xihu Culture Studio溪湖文化工作室; Ministry of Culture文化部; Belgium比利時; Chen Yong-Chun陳永春; Xihu Sugar Factory溪湖糖廠; Gaoxiong Harbor高雄港; National Chunghua University of Education國立彰化師範大學; Lin Qing-Yi林清一; Huang Jing-Xiong黃靖雄; Huang Wen-Zhen黃文鎮
31 Lai Cai-Leng賴才棱, he kept the Factory original form and the only one district got benefit for many years.
英中對照: Wang An-Sheng王安生; Chungwa Telecom中華電信; Taiwan Railway Administration台灣鐵路管理局; Song Hong-Kang宋鴻康; Locomotive 346 Resurrection Celebration346復行慶祝活動; Steam Museum蒸情博物館; Kahoku-Cho, Yamagata-Ken山形縣河北町; Chen Yong-Chun陳永春; C.J. Young楊清仁; Nantou Sugar Factory南投糖廠; Yuemei Sugar Factory月眉糖廠; Taichung Sugar Factory台中糖廠

management and got a happily negotiated exchange. Then, the fourth steam locomotive number 326 welcomed home on October 15th, 2008. Tourists were very interested in four steam locomotives together, so the Factory converted the former locomotive repair section into Xihu Sugar Factory Steam Museum.

10.The goal of Xihu Culture Studio about the Factory's railway transition

While the colonial powers constructed and maintained one of the world most pervasive railway networks in Taiwan. But the sugar railway is having more of a problem surviving by ourselves with the shortsightedness.

Here is a case similar. Taichung Sugar Factory was closed in 1993. Ten years later, when Taichung City Hall reviewed the urban development[32] , C.J. Young suggested that use the convenient sugar railway network to solve many problems. Unfortunately, after the hasty sale of the network's land and track, the option to build upon the between downtowns existing network was closed. Instead of having a MRT, Taichung city is looking at spending over $51 billion NT for the establishment of a mass surround rail system now. Taiwan Sugar Corporation lost more and more than $30 billion NT of their property developing profit under this case. Now, who can ignore the value of industrial heritage when it's exist?

From the beginning of Xihu Sugar Factory's railway transition, repurposing the sugar railway network into a light rail system is Xihu Culture Studio's final goal. Congressman Wong Jin-Zhu endorsed the value, and led Ministry of Transportation investigated the Xihu sugar railway system as a light rail possibility on March 13th, 2001.

In 2007, Chunghua County Cultural Affairs Bureau submitted a plan to utilize resurrection from Lugang to Xihu has a tourism and passenger light rail. Chen Yong-Chun efforts to preserve the sugar train received national attention. Central News Agency covered his meeting with new President Ma Ying-Jiu in a piece named "A True Taiwanese Hero"[33] on April 1st, 2009. He took our plan to President Ma Ying-Jiu. We are still waiting the off course issue.

11.The crisis management of the sugar mill building and facilities before closing

Xihu Sugar Factory was operating at a two hundred million NT dollars shortfall yearly. The four story's sugar mill building is constructed on one hectare land. The value of the sugar mill facilities more than 3.6 billion NT. However, this appraisal is not included the historical and cultural value yet. But the sugar mill was assigned to a pile of scrap metal, it would be sold out seventy million NT 10 years before.

After the transition, the Factory's tourism incomes from Ice-pop Store, gift shop, restaurant and sugar train ticket fare are thirty five millions NT yearly. Xihu Sugar Factory transition 10 years anniversary. The Factory has gained four hundred millions NT since 2002. Keeping the Factory original form is worth much better than sold as scrap metal.

But, the beginning is not so bright. Early on, Taiwanese had no understanding of industrial

32 Taichung City Hall台中市政府, the urban development review was directed by mayor Zhang Wen-Ying張溫鷹.
33 A True Taiwanese Hero台灣真英雄 - Chen Yong-Chun陳永春 had the majesty summon as "A Taiwan True Hero" from Central News Agency中央通訊社 because he famous in pushed the sugar train.
英中對照:Wong Jin-Zhu翁金珠; Ministry of Transportation交通部; Chunghua county Cultural Affairs彰化縣文化局; Lugang鹿港; Ma Ying-Jiu馬英九; Ice-pop Store冰品部

heritage. Everybody knew that sugar factories were a cultural heritage. However, for most of the holder, the heritage portion of this phrase was taken more in a legal sense as an inheritance of property. The "heritage" of Xihu Sugar Factory was the land and iron in the structure, which was easily evaluated by accountants. "Culture" was much more difficult to evaluate and was not something they were interested in.

While the Studio understood that the cultural worth of the Factory far exceeded whatever the worth of seventy million NT scrap metal was in the time. National Yun-Lin University of Science & Technology professor Qiu Shang-Jia had a meeting with C.J. Young six months before the Factory closing. We felt that ripping down the Factory facilities would have been a colossal loss, was tired to keep the Factory survival. We didn't really have a clear idea of how to utilize the Factory in that time. So, Professor Qiu and C.J. Young thought that keeping the Factory original form first. Keeping the Factory original form sounds easy, but we had to do something faster than excavator came in.

Congressmen Wong Jin-Zhu, Qiu Chuang-Jin and Tu Ming-Da advocate for our cause. We visited Chairman of Taiwan Sugar Corporation, Wu Nai-Ren, and discussed our plans for the transition of Xihu Sugar Factory. He told us that he had finished his tour all twenty four sugar factories before taking the duty. Xihu Sugar Factory is so ugly. Even he is a Taichung resident, couldn't get a fun there. He would have put Xihu Sugar Factory in the bottom two or three position in all company's factories. Rejected our suggestions at once, and when he faced congressmen, also put his legs on the table[34] , it's clear that the Factory was just waiting for a demolition permit to level the entire lot.

The months preceding the closing of the Factory were a chaotic rush. Some employee were tried to transfer to other factories. Scrap metal companies were calculated the worth of metal. The Studio was photographing and video recording the Factory grounds and machinery for posterity. As they say, it's always darkest before the dawn. Nobody could imagine that Xihu Sugar Factory would be so honor can present here today.

12.A big gift from Taiwan Sugar Corporation

As the Factory closing date drew near, the Factory Director Hong Ying-Hui had a strong impressive decision that he wouldn't fire any single of 174 workers from him. So he kept the tourism train running to create employee's jobs. While, no any financial support, he contacted the labor union and asked for their co-operation, and more importantly, their funding from Ice-pop Store to fuel a transition plan for the Factory. Xihu Culture Studio was working very successful with "Ice-pop Culture Park" venture and it had made the labor union a lot of benefit. Employees trust in Director Hong's leadership and the Studio's transition plan, we worked together very compact. So Xihu Sugar Factory began its transition to industrial tourism factory site by oneself without any assistance.

Finally, Chairman Wu Nai-Ren changed Xihu Sugar Factory's policy. He pushed to establish “Newly Developing Undertaking Centre” temporary to help employees into the transition plan.

34 Sorry Chairman Wu ! Talk about the difficult situation. It is a mission impossible at the moment.
英中對照:National Yun-Lin University of Science & Technology國立雲林科技大學; Qiu Shang-Jia邱上嘉; C.J.Young楊清仁;Wong Jin-Zhu翁金珠; Qiu Chuang-Jin邱創進; Tu Ming-Da涂明達; Wu Nai-Ren吳乃仁; Hong Ying-Hui洪英輝; Ice-pop Store冰品部; Ice-pop Culture Park枝仔冰文化走廊; Newly Developing Undertaking Centre新興事業發展中心; Taiwan Sugar Corporation Taichung Operation Branch台糖公司台中區處

CHAPTER TWO

Moreover, on October 1st, 2005, located “Taiwan Sugar Corporation Taichung Operation Branch” in Xihu, outlaying country area, instead of convenience Taichung city. Not only the Factory workers keeping their jobs, also constantly refreshed with employees that were let go from other sugar factory closings. This, more than anything, allowed for the funding necessary for the preservation and maintenance of Xihu site.

Chairman Wu Nai-Ren talked to C.J. Young, "I give you a big gift[35] ."

The sugar mill building and facilities keep the original form and reopen to public

Many speculators were quick to propose uses here for their business and send plans to the Studio, to look for a co-operating opportunity. They would gave the Studio big profit. But, however, the most of the plans were not particularly inspired that they would involve too much modification in heritage site. We against all lure and resolved to hold out on developing the site until a good idea could be found. The Factory Manager Lai Cai-Leng was under intense pressure to keep the Factory original form and to find a way to make the Factory profitable.

As they say, everything good comes to he who waits. Our factory site and our efforts received even more attention from international media sources. For example, NHK Japan reporter came here on November 1st, 2008. China Central Television and China National Radio also covered the site on April 18th, 2009.

On April 18th, 2009, Governor of Shizuoka Prefecture, Japan, Honorable Ishikawa Yoshinobu, the president of county federation in Japan, visited the Xihu Sugar Factory, the site of his birthplace. The exposure brought many more international railway fans.

The “Light Sound Factory” concept be used inside the sugar mill building

In 2001, Taiwanese Public TV broadcasted a series entitled, "The Vision of a City." The material discussed was the development of several of world most famous cities. The nine and ten public concerned the development of Ruhr, Germany. The Studio saw it had many similarities between Ruhr sites and the Factory, so we tried to study from them. The Studio was heavily influenced by the way Ruhr handled their transition.

The Studio tried to do that none any single nail hammer into the sugar mill's building and equipments. So we created a concept to both make the Factory more attractive and to preserve it. The Factory interior was quite dark, we set up spotlights to help bring more color and light into the murky interior. We were fortunate to spend only a little money, and we got dazzling results. The Studio also played classical music to modify the sugar mill inside, concord with colorful light and heavy metals environment got special feeling.

Ministry of Culture appreciative the idea, named it "Light Sound Factory" and start to developing the sugar mill.

Professor Yang Kai-Cheng of the advisory board led members on a tour of Ruhr in 2006. We were able to touch what Ruhr had done. Its courage us we are doing in the right way.

35 Manager Hong Ying-Hui洪英輝was got the word also. He is worth to get the award.
英中對照: Taichung city台中市; Wu Nai-Ren吳乃仁; Lai Cai-Leng賴才棱; China Central Televesion中國中央電視台; China National Radio中國國家廣播電台; Shizuoka Prefecture靜岡縣; Honorable Ishikawa Yoshinobu 石川嘉延; Light Sound Factory光音工廠; Taiwanese Public TV公共電視台; The Vision of a City城市的遠見; Ministry of Culture文化部; Yang Kai-Cheng楊凱成

13.Conserving Xihu Sugar Factory waterways and other recent events

Sugarcane has about 63% water inside the body, became pieces of sugar must takes a whole day. Xihu Sugar Factory pressed 4,000 tons of sugarcanes daily, that means she was producing 2,500 tons of boiling water what vented into cooling system before being released through irrigation channels every day. Children would swim and took bath in the warm and clean water, women would take dirty clothes for washing in the cold winter. Moreover, the farmers would use the cool water to irrigate their fields. No accidents with the watercourses were ever recorded.

Ministry of Culture asserted that the water system was a fantastic feat of engineering, but the Factory ignored it. The Factory Manager Xu Ji-Sheng took the advice seriously, and halted all development plans for the waterways. He then received the head office financial support to maintain the holdings to the south of the Factory, including most of the waterways, as a park. Furthermore, he supported Chunghua County Cultural Affairs Bureau's designation that Factory Train Station[36] structure as a historical building.

14.The sweet journey of Xihu Sugar Factory transition

To retrospect, this is a long, long sweet journey story of Xihu Sugar Factory. Started from colonist Netherlands (1624-1662), the explorers open Taiwan sugar history into world stage. Following Ming Dynasty (1661-1683), Qing Dynasty (1683-1895), Japanese (1895-1945) foundation, Xihu Sugar Factory has took over fifteen sugar factories in modern age. Meanwhile, Taiwan sugar industrial technology passing down to 10 countries in Asia and Africa. This is a sweet pathway of world sugar history. Xihu Sugar Factory becomes an important culture heritage site of sugar industrial.

The colonial proprietor did not destroy it before. Sugar business grow up to the most important economy development sector for us. But we, this generation, near-miss to erase Xihu Sugar Factory from the map, also break the pathway of sugar industrial revolution.

Xihu Culture Studio and more than 420 fools accompany with Xihu Sugar Factory have been keeping the transition fifteen years. We are keeping the Factory original form first, then looking Mr. Right can appear soon.

God bless Xihu Sugar Factory! We hope the Factory respects the history and less self-seeking, can open mind and keep humble to studying the top best of international ideas. To maintain and develop this world standard sugar industrial heritage site.

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36 Factory Train Station工廠前站, the sugar train station constructed in 1921, keeping the original shape as 90 years before.
英中對照: Xihu Sugar Factory溪湖糖廠; Ministry of Culture文化部; Xu Ji-Sheng徐繼聖; Chunghua County Cultural Affairs Bureau彰化縣文化局; Ming Dynasty明朝; Qing Dynasty清朝; KMT國民黨; Xihu Culture Studio溪湖文化工作室

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The Regeneration Plan of the Traditional Industrial Heritage: by the Case of Judong Canal, Hsinchu County, Taiwan

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Abstract
Judong Canal, built in 1926, used to be the prime water supply channel to irrigate the fertile plain of Touchien riverbank. Throughout the years, Judong Township has become an important rice-barn in this area due to its bounteous water resources. With booming economic development in Taiwan since the 1980s, the newly developed Hsinchu Science Park has become the primary 3C industry production and research base. As for supplying the huge water usage for industrial purposes, the water for original irrigation has thus shifted to the industry. The function and institution of the traditional Judong Canal system have been transformed into a complete new system; however, the old irrigation channel still remains and kept intake.

This research studied the possibility and vision of a regeneration plan for the traditional irrigation canal system in which virtually concluded not only irrigation channel, but also traditional Hakka settlement, paddy field, irrigation pond, old power plant, old oil drill well, etc. It is almost composed of industrial, historic, humanistic, and agricultural sources to from a holistic industrial heritage for further development. Based on this concept, this study aims to conclude the following tasks:
(1) To discover plentiful heritage resources of the studied area.
(2) To initiate a development plan to combine all landscape resources.
(3) To encourage a people participation activity plan.
(4) To construct a comprehensive plan for operation models and planning concepts.
To draw up an executive institution and maintenance organization plan.

Keywords: irrigation; industry; landscape; Hsinchu County

1. Introduction

(1)Research Motivation

The whole of Judong Township needs to be traversed, from Ruanqiao, Yuandong, Shangguan, Touchong, Erchong, and Sanchong to Baoshan Reservoir and Baoshan Reservoir No.2, to tour and experience the impressive landscape of Judong Canal. It is a long journey, and most of the channels go through mountain ridges, hence the many tunnels seen today. The construction was as arduous and difficult as the National Highway No.5, except that in this case, it is a highway that carries water rather than cars.

Judong Canal carries water from Shangping River of the upstream of Touqian River. Its clear water quality meets the high standard demanded by the process required for hi-tech industry and is therefore the most ideal choice for Hsinchu Science Park. Weirs are established by Shangping

River at Zaoshupai, Judong Township to guide water to Judong Canal, flowing past Judong Township and through over 10 tunnels before going into Baoshan Reservior. Therefore, Judong Canal does not simply play the role of irrigation for fields in Judong, but is also the main water supply source for Hsinchu Science Park.

Strolling along the roads by Judong Canal and appreciating the co-existence of the natural scenery and irrigation engineering of the fields is like personally witnessing Taiwan developing from the traditional agriculture in the reclamation period to the irrigation construction, which marked the beginning of modernism, to the advancement of the hi-tech industry today. This indicates that touring Judong Canal allows people to witness the modernization process of Taiwan. No wonder Judong citizens refer to Judong Canal as the mother river, because in the early days this canal was used to irrigate fields with 800 acres, and today it provides high quality water source needed for hi-tech products.

(2)Research Purpose

Yuandong and Ruanqiao settlements are defined as future cultural waterfront recreation landscapes of Judong Township, Hsinchu County. The space landscape of Judong Canal is explained in detail from the perspective of Ruanqiao and Yuandong. Ruanqiao is the starting point and can in fact be called the essence of Judong Canal. Therefore, this canal has gone through several different periods of time. Strolling along the canal, people can see Pak Kong Temple and the settlement of the Peng families living in Ruanqiao. The settlement traverses the stone arch bridge of the canal. There are different stories behind each scenery. Due to high quality water, residents do their best to protect for this mother river. Colorful variegated carps can be seen swimming in relaxation among the water plants in the clear water of the canal.

Hakka villagers, known for their frugal way of living, will not leave this water unused. These local villagers skillfully incorporated irrigated water into shallow ponds, which gradually formed into a clothes washing space that Hakka people call “washing pit”. With its beautiful landscape, transforming this landscape, albeit underdeveloped, into a pleasant waterfront environment will not be difficult. For example, the clothes washing and watercourse scenery of the Porta Genova district of Milan, Italy has become a popular local historical tourism spot.

When the main channel of Judong Canal flows pass Yuandong, it enters the mountains through No.1 Tunnel and becomes an underground canal. However, the old channel of Judong Canal still flows by the highlands of Yuandong, and the original features of the old canal are still preserved. The advantage of this is that there is still room for various possibilities for future planning.

The interesting thing is that when Yuandong Junior High School, Tongtex Secondary High School, and Yuandong Elementary School on Yuandong highlands are pushed aside, a green corridor is formed and correlates with the old Judong Canal at the foot of the mountain. This path comes to an end at CPC Ziyuanzhuang, and emerges from No.3 Tunnel, indicating the main route of Judong Canal. Ziyuanzhuang is named from the large amount of natural gas exploited during the Japanese Colonial period, where a whole area of Japanese-style dormitories and houses, similar to the Taiwan Sugar dormitories seen today, were found. If the original Ziyuanzhuang had not been replaced by modern apartments due to the depletion of natural gas, cultural asset would have been preserved.

(3)Research Scope: Plan of the whole area

The 21 kilometer long Judong Canal, an inlet channel that supplies Hsinchu Science Park and Baoshan Reservoir (including Reservoir No.1 and No.2) water, quietly streams pass a green field. Judong Canal first flows through fields, then between mountains and 14 tunnels, passing by Ruanqiao Power Plant before entering No.1 Tunnel. Then, the canal passes Ruanqiao, Yuandong, and Shangguan for about 6 kilometers. Preserving the state of irrigation canals and open channels is the main focus of this study.

The long-shaped settlement connected by Yuandong and Ruanqiao is located in the southwest of Judong, adjacent to tourism and agriculture-oriented townships such as Hengshan, Wufeng, and Baoshan. This area is the intersection of the metropolitan and non-metropolitan districts of Hsinchu city.

(4)Research Method

This study investigated the development of Judong Canal and settlements by exploring the exploitation history of this area that has been slowly forgotten by people. Topics such as the settlement pattern before the development of Judong Canal, the effect of ancient development on settlements, the relation of the sustainable development of Judong Canal and settlements, and the civic culture of Judong Canal settlements were discussed in this study to suggest topics including the settlement community development condition, substantial environment, industrial pattern, water and culture condition, development course, Judong Canal environmental development, landscape maintenance, and future development.

2. Literature Review

(1)Analysis of Judong Canal Resources

Yuandong and Ruanqiao are important water spaces of Judong as well as the area in which water and cultural resources are concentrated. We hope to conduct a comprehensive investigation on the history, industry, and humanism of Judong Canal. Basic data of the aforementioned are collected and the characteristics and geographical relationship of the cultural assets within the urban planning of villages are connected to develop landscape space planning based on Judong Canal.

Judong Canal

· Canal resources
  Judong Canal, No.1 Tunnel, Baoshan Reservoir No.2, road leading tourists around the canal, Judong Canal spillway, Gueishan Power Station, grit chamber
· Pond resources
  The Gan family pond
· River resources
  Shangping River, weirs, water supply plant
· Temples and historic spots
  Shinto shrine, Sietian Temple, San Yuan Temple, Xiu Shan Tang, the Gan family Bohai Temple, Shishan Temple, arch bridges of the Japanese Colonial period
· Schools organizations
  Yuandong Elementary School, Tongtex Secondary High School, Yuandong Junior High School
· Community stations
  Rice factories, organic rice collecting center, Ruanqiao activity center, washing pits

· Building settlement
The buildings in this area are mainly distributed in the east. The population and building density in Yuandong are higher than that of Ruanqiao.
· Green lands
The green areas are mostly agricultural and mountain and forest areas, indicating that this area is mainly green with beautiful environment.
· Road system
County highway No.122 (49.664 km) with Nanliao, Hsinchu City to the west and Wufeng Township, Hsinchu County to the east

(2)Historical data analysis
· Ziyuanzhuang
The Japanese discovered natural gas at the anticline of Yuandong in the 2nd year of the Showa period (1927). Nippon Mining obtained mining rights in March 1933 and officially began drilling in March the following year. They leaked a large amount of natural gas 299 meters under which accidently lead to a fire. Since then, Japan has excavated a total of 23 wells in Judong, among which 9 wells collect natural gas. To exploit the oil fields of Judong Township, the Japanese built Ziyuanzhuang in Yuandong as dormitories to accommodate technical personnel. Ziyuanzhuang partially exists today after reconstruction. Small shops can still be found in Japanese architecture. The development of Yuandong is greatly related to Ziyuanzhuang (Wang Liang Xing, Chen Yu-Yi, 2007: 328).

· Push car tunnel
Push cars, driven by manpower, were used as the main route of transportation for the military across Taiwan during the Japanese Colonial period. Judong established the Hsinchu Development Company in the 40th year of the Meiji period (1907) with Hsinchu as the center and rails designed to areas including Judong, Yuandong, and Beipu. In the 12th year of the Taisho period (1923), local gentries formed Judong Rail Association and built railways from Judong to Shangping for the transportation of wooden materials and various goods. However, due to the development of highways and roads, this railway slowly began deteriorating from lack of attention and repair. Although remains of the push car tunnel, located next to Nanqing Highway, still exists today because it is a private land, there are no passageways connected (Dian Han Culture Studio, 2006:51)

· Mountain shrine
In the 10th year of the Showa period, Gan families in Yuandong offered land to build a mountain shrine on the school campus. The campus had a large space with an area of 4.173 hectares among which 1.5 are dormitories and the playground. The usage rate of land is 36% with the rest being forest land and sloped lands. The land of Yuandong Elementary School originally belonged to the CPC Corporation and was later donated to the school for employers of CPC to study at. Previous presidents were mostly senior executives of CPC Corporation. The pedestal and stone lights of the mountain shrine that is currently located at the back playground of Yuandong Elementary School are still preserved. Although the words or dates on the stone lights are partially removed, some parts can still be clearly seen (Dian Han Culture Studio, 2006: 54).

(3)Water resources analysis
· Baoshan Reservoir
Baoshan Reservoir is an off-stream reservoir located at a side stream of Toucian River on Judong hill and upstream valley of Chaishan River. Source of water comes from Shangping River of Toucian River. Its path streams along to the weirs established by Zaoshupai during the high flow period or wet seasons and channels water into the entrance of Judong Canal, Ruanqiao. Water conveyance and storage takes place at the tunnel of Judong Canal. The reservoir is located approximately 16 km from Hsinchu City at a side stream of Toucian River and upstream of Caishu River (Shanhu Village, Baoshan Township). Judong Canal was originally designed as an irrigation canal. Due to the increasing shortage of water in Hsinchu and Judong areas, the Japanese government extracted water from Judong Canal to build Baoshan Reservoir to supply water to the people of Hsinchu City as well as Hsinchu Science Park (The Society of Wilderness Hsinchu Branch, http://sowhc.sow.org.tw/html/observation/sacan/no3/no3.html).

· Shangping River and Toucian River
Shuqilin Record, Fengyu Gazette, and Hsinchu Subprefecture Gazette named Shangping River as “Tuozai River”, and Tamsui Subprefecture Gazette Manuscript called it “Kinmen River”. Shangping River, the main stream of Toucian River, originated from Luchangtashan and Shijialushan and converges with Youluo River at Jiyoulin where it becomes “Toucian River”. Toucian River flows northwest through Hsinchu plain before it merges with the sea. The water of this area is clear with abundant fishes including sweetfish, pale chubs, groupers, lake candidus dace (candidia barbata), eels, and dojo loach (misgurnus anguillicaudatus).
Toucian River is the main basin of Hsinchu area. Judong relies on the left bank of Toucian River to look over Hengshan Township, Cyonglin Township, and Zhubei City. The basin of the entire Toucian River has an area of 565.97 km2 and includes Shangping River and Youluo River of the upstream. Toucian River is the 13th largest river in Taiwan and 17th longest river with its 63.03 km in length. Toucian River and its upstream provides the people of Judong water and is also the main source of water for industrial use and irrigation. The two banks of Toucian River form into an alluvial plain, making it the essence of Hsinchu area (Lin Yu Wei, Wang Liang Xing, 2005: 64).

· Ruanqiao Power Plant
The Ruanqiao Power Plant was built by the Japanese in 1919 using the water amount utilized for irrigation and power plants that generate electric power from energy produced from different water lines. Two Francis lateral axis water turbine generators with 100KW malfunctioned after World War II and eventually abolished. After Judong Canal was reformed, the “Ruanqiao Hydroelectric Powerhouse Recovery Project” was implemented in 1988. Construction began on 1 July 1991 and finished on 30 November 1992 (Dian Han Culture Studio, 2006: 43).

3. Plan conception of the whole area
This project is mainly divided into two sections. For Yuandong, this project aims at culture, humanism, and landscapes such as Ziyuanzhuang, Xietong Temple, and the old house of the Gan family as the focus for local planning. For Ruanqiao, the main focus is natural ecology and agricultural irrigation works such as the Judong Canal plan and organic rice collecting center.

(1)Exhibition of the oil resources of Ziyuanzhuang

· Environmental analysis

Ziyuanzhuang is the dormitory for employees of CPC (Chinese Petrol Company), accommodating mostly mechanical maintenance workers and family members of CPC in Judong. Part of the building was repaired and built as CPC ice shop and place for community gatherings by re-using existing space. In addition, because Judong No.3 tunnel passes through this area, Ziyuanzhuang is also an important sightseeing spot. Therefore, this study suggests transforming Ziyuanzhuang as a place for both tourism and exhibition purposes.

Today, only a few family members remain and a few small shops that serve CPC employees still operating in Ziyuanzhuang. We suggest to transform abandoned dormitories into a exhibition center for the history of CPC with distinguishing features and selling point to attract people and unique welfare station. Thus, these abandoned buildings can be revived and reused to recreate the original essence of Ziyuanzhuang.

· Plan conception

Nearby places such as the No.3 tunnel irrigation canal and dormitories of the Japanese Colonial period constructs different spaces for experience. The exhibition area allows people to become familiarized with the stories of Ziyuanzhuang from the past and the history of oil, as well as provide people with information on the basin and sightseeing spots of Judong Canal. CPC related products can be displayed in this area to provide tourists with different choices.

(2)Construction of Exhibition of Water supply plant

· Environmental analysis

The irrigation area of Judong Canal is 800 hectares, which is approximately 13% of the total irrigation area. Judong Canal supplies domestic water (Yuandong Water Treatment Plant) and water for industrial use (Baoshan Reservoir supplies water for Hsinchu Science Park). Due to this, Judong Canal has also become an important source of water for people in Hsinchu.

· Plan conception

The water supply plant is situated on a stream terrace where people can look far into the distance at the scenery of Shangping River. We suggest to establish observation decks around the area for people to stop at when they want to take a rest. Moreover, the water supply plant can also be used as an exhibition and water resource education center.

4. Waterfront ecology park

· Environmental analysis

The waterfront ecology park provides people with a complete space for rest and recreation. With its green landscape, abundant flowers and plants, natural resources, and quality facilities and rest spots, this park combines conveniency and beautiful green scenery allowing residents to get close to the nature and observe the ecological environment.

This park is equipped with resting facilities as well as a natural waterfront space for people. Natural water resource from the river allows people to enjoy the water and culture, experience the nature of the ecological environment, and bask in the pleasant and cool atmosphere of summer.

· Plan conception

The ecological engineering method of the Hakka piled-up stone culture was used as stone rip raps, an embankment, or trails to clearly define the space for activities. Adding exposition billboards allows people to get a detailed description of the ecological landscape. The pavement can be reconstructed making the activity space safer and more consistent and enhancing the accessibility and usage. People can stop and rest or stroll along the trail with piled-up stones as well as enjoy the fun of the waters.

The main focus of the Ruanqiao area is natural ecological environment and agricultural irrigation works such as the route planning of Judong Canal and the organic rice collecting center.

(1)Rice factory exhibition

· Environmental analysis

Ruanqiao is blessed and exceptionally rich in natural resources. Rice fields are located nect to Judong Canal and are irrigated using uncontaminated river water from the mountains. When rice is growing, chemical fertilizer and insecticides are forbidden. The main types of rice currently cultivated are Taikeng 9, Taoyuan 1, and Tainung 71 (Yihchuan Aromatic Rice). The Jhudong District Farmers' Association further imported premium Koshihikari Rice and Xinding Rice from Japan, ranking Ruanqiao No.1 in the market of organic rice.

· Plan conception

A post or the entrance of residences in general are used as demonstration spots using the results of the development of local creative products to establish a special area to sell creative products. By doing so the visual image is enhanced to attract visitors and strengthen their willingness to purchase. In recent years, due to the development of organic farming, Ruanqiao organic rice has become one of the special local products of Judong Township because of its irrigation convenience and rich fertile soil. It is as if a European barn is placed in the middle of a green field of organic rice. The view is simply magnificent.

(2)Hydroelectric Power Exhibition

· Plan conception

The rich water culture space of Judong Canal such as Ruanqiao Power Plant, channels, and streams are combined to plan various areas of water facilities. The purpose of this is to increase resting spots and water space and allow the whole corridor to form a complete route. The concept of water is thus continued as the focus of this plan. Complete descriptions on Judong Canal and pond culture are provided to visitors, causing this important resource of Judong to become a tourism feature to share with others. We suggest adding simple boulevards with flowers and plants to enhance the beauty of the overall environment and connect the relation between power plants, canal roads for visitors to explore, and washing pond.

· Environmental analysis

This area has two constructions, irrigation works of power plants from the Japanese Colonial period and the 100-year Nuomi Bridge, with are both important in terms of education and time. However, few people visit or use this area today.

· Plan conception

The hinterland of this area is smaller. We suggest building a wooden platform that extends out

for people to view the scenery. In addition, this area is also suitable for flowers and plants to enhance and perfect the environment.

(3)Judong Canal grit chamber educational park improvement area

· Environmental analysis

Grit chambers are important irrigation works. However, there is a lack of educational system and simple resting space causing tourists visiting this area to leave in a hurry.

· Plan conception

By mainly exhibiting water resources and irrigation works, irrigation and education can be combined and irrigation culture can be incorporated into the lives of residents. The original appearance of Judong Canal is still preserved, therefore we suggest building an exhibition center to make Judong Canal into the window people visit to understand the irrigation culture of the area. Exposition and display services are provided in the center to provide visitors the opportunity to gain a better understanding of the features of Judong.

5. Conclusion and Suggestion

This study mainly investigated Yuandong and Ruanqiao areas, combining the irrigation resources rich in local features and Yuandong Elementary School, Tongtex Secondary High School, and Yuandong Junior High School as well as completing the connection of school resources.

(1)The presentation and preservation of cultural landscape and scenery

Since the reclamation of canals in the Japanese Colonial period, this canal has been operated by various administrative units due to different needs causing it to have different features. Some preserves the original features of earth and rockfill canals, some are newly constructed with concrete, while some even irrigate water using the box culvert method. These canals built in different ways or the unique irrigation construction landscape allow people to tour around and experience this beautiful spot.

(2)The promotion and revitalization of cultural heritage

Judong Canal witnessed the development history of ancient people and also nurtures rich ecology. Due to the transition of times, development of the industry and commerce, and the downfall of agriculture, the significance of Judong Canal has gradually been forgotten by people. However, these canals and channels of different sizes have become a part of the water culture history of Judong area. Judong Canal provides recreation, rest, and irrigation for tourists and has therefore become an important cultural feature of the Hakka community of Judong as well as a sightseeing spot that improves the local environment and quality recreation.

(3)Follow-up management and maintenance

· Allocation of administrative personnel from the township office

Zhudong Township Office is an administration unit responsible for assisting communities in maintenance work. This study established a post in this area. Due to the involvement of non-governmental organizations, the township office can receive rental payments and use it as maintenance fee, thus reducing the burden of the office. Zhudong Township Office is an administrative unit in charge of managing and maintaining various groups.

· Community volunteer

We hope to encourage Yuandong and Ruan Bridge Community Development Association as well as teachers from elementary and junior high schools to participate in the tour and exposition activity. Our goal is to supervise and provide people with a safe, comfortable, and quality living environment.

· Supervision unit

During the primary stage of completion of the project, a construction warranty is used to ensure that all mechanical equipment are maintained and managed. Some maintenance and management are more technical, so if handed to local units directly, maintenance and management work may not be properly executed. The 3-5 year warranty should be used to create an inventory for maintenance and management techniques and then transferred to local units.

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CHAPTER THREE ：
TAIPEI DECLARATION

TAIPEI DECLARATION ON ASIAN INDUSTRIAL HERITAGE/ FU, Chao-Ching

TAIPEI DECLARATION

Taipei Declaration on Asian Industrial Heritage

FU, Chao-Ching

Taipei Declaration on Asian Industrial Heritage is the first international industrial heritage document named in an Asian city. It was initiated by the organizing committee of the 15th TICCIH Congress held in Taipei and adopted by the congress. The Declaration is composed of a preamble and eleven articles. The preamble starts with the backgrounds of the declaration and stresses that it is an outcome of the common agreement of the first TICCIH congress held in Asia between November 5 and 8, 2012. Article I place the declaration in the context of the international heritage development, especially the documents related to UNESCO, ICOMOS and TICCIH. Article II stresses the necessity to take action to preserve and conserve Asian industrial heritage at different levels due to various factors. Recognizing the uniqueness of Asian industrial heritage and differences with its Western counterparts, Article III proposes a wider scope for the definition of Asian industrial heritage. Article IV acknowledges the close relationship between the modernization of Asian countries and their industrial heritage and argues that the strong link among nation's history, the life of the people and industrial heritage should be emphasized.

Realizing that Asian industrial heritage is developed along with the exploitation of the natural environment in many aspects, Article V recognizes that Asian industrial heritage is often categorized as "cultural landscapes" defined by World Heritage Convention. Its interaction with the land offers the feature of hetero-topography. Article VI re-evaluates the significance of the built facilities of the Asian industrial heritage, including factories and machinery. Their pioneering characteristics are also noticed. Article VII stresses the technological aspects of the Asian industrial heritage and proposes to recognize associated know-how and technologies as intangible heritage. In order to achieve a sustainable development, Article VIII proposes a flexible preservation and conservation strategy and agrees with the adaptive reuse of the Asian industrial heritage if it is an appropriate solution.

In order to safeguard the authenticity and integrity of the Asian industrial heritage, Article IX stresses that the core value of the industrial heritage should not be sacrificed whenever conservation plans are executed. Article X re-confirms the importance of the participation and engagement of local people in the preservation and conservation of the Asian industrial heritage. And Article XI recognizes the necessity to establish an Asian network for preserving and conserving industrial heritage based on the proposal by the Asian Industrial Forum held during the 15th TICCIH Congress.

Preamble
The Fifteenth TICCIH General Assembly was held in Taipei from November 5th to 8th, 2012. This is the first TICCIH General Assembly in Asia; the event signifies TICCIH's increasing attention to the Asian industrial heritage, which are now under increasing threat. After the four-day Assembly, the participants have reached a mutual agreement that adopting a declaration based on Asian industrial heritage to promote their conservation and preservation is appropriate and necessary.

I. The declaration acknowledges the existence and contributions of the World Heritage Convention adopted by UNESCO, the Venice Charter adopted by the Second International Congress of Architects and Specialists of Historic Buildings, various charters and declarations adopted by ICOMOS, the Nizhny Tagil Charter for the Industrial Heritage adopted by TICCIH, the Joint ICOMOS-TICCIH Principles for the Conservation of Industrial Heritage, Sites, Structures, Areas and Landscapes as well as the Convention for the Safeguarding of the Intangible Cultural Heritage adopted by UNESCO. Following their spirit and foundation, this declaration develops its contents.

II. We recognize that rapid changes in urban expansion, land exploitation, population growth, industrial structure, technology innovation and method of production leads to the vacancy and demolition of industrial heritage in urban and suburban areas. Therefore, starting appropriate conservation strategies at international, national and local levels is a must and a high priority task.

III. We recognize that industrial development in Asia is different from its counterparts in the West. The development of native manufacturing methods and facilities is part of the local history. The definition of industrial heritage in Asia should be broadened to include technologies, machinery and producing facilities, built structures and built environment of pre-industrial revolution and post-industrial revolution periods.

IV. We recognize that industrial heritage in Asia, witnessing the process of the modernization, contributes to the identity of regions and countries, and forms an integral part of the history. Furthermore, the achievement of industrialization in Asia is always achieved with the help of hard-working local people. Industrial heritage is closely associated with the life history, memories, and stories of local people and social changes.

V. We recognize that industrial heritage in Asia is deeply related to the natural resources, land development and vernacular economy. Industrial heritage in Asia is always part of a comprehensive cultural landscape, either in urban or in rural settings. In addition to the built environment, it strongly reflects the interaction of humans and the land, featuring the characteristics of hetero-topography.

VI. We recognize that many key elements of industrial heritage in Asia were imported by colonizers or countries in the Western World, that the factories and facilities are pioneering avant-garde, incorporating aesthetic and scientific values that reflect the history of architecture, construction techniques and equipment which should be preserved in ways that reflect their integrity. Workers housing, sources of materials and transportation facilities are all contributing parts of this integrity and should also be considered for preservation.

VII. We recognize that industrial heritage in Asia includes the operations of the machinery and the necessary technical know-how, often embodied in local residents as technicians. While preserving the industrial heritage, the operational technology and associated archives and documents should also be conserved. The intangible heritage associated with industrial heritage and local people should also be treated as parts of an integrated complex.

VIII. We recognize that in order to ensure sustainable development of the industrial heritage in Asia, the strategies and methods for conservation must be flexible. Except for the structures and sites of exceptional architectural and artistic values for which intervention is undesirable, adaptive reuse of the industrial heritage for a new function to safeguard their conservation is accepted.

IX. We recognize that flexibility can be applied to the conservation of industrial heritage in Asia. However, the adaptive reuse for a new function should not be achieved at the sacrifice of the universal value and core value of the industrial heritage.

X. We recognize that industrial heritage in Asia is strongly related to local people. Therefore, the participation and engagement of the local people should be encouraged in the conservation of every industrial heritage site.

XI. We recognize that both national and trans-national industrial heritage are equally important and the need of the future cooperation between Asian countries to promote the conservation of them is crucial. Therefore, the participants of the 15th TICCIH Congress agree that it is necessary to establish an Asian network for industrial heritage within the framework of TICCIH.

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