URBAN DESIGN APPROACH TO TRANSPORTATION INFRASTRUCTURE RENEWAL PROJECTS

III

II.II.

ii ii s

11

MSc Urbanism Thesis Chih-Chu (Alex) Lee



COLOPHON

MSc Thesis Urban Stitch - a new urban design approach to transportation infrastructure projects

July 2017

Chih-Chu (Alex) Lee 4515943 alex9792003@gmail.com (M) +31-6-53747107 (H) +886-3-4521221

MSc Architecture, Urbanism, and Building Sciences Studio Design of the Urban Fabric Department of Urbanism Delft University of Technology

First Mentor Luisa Maria Calabrese Chair of Urban Design

Second Mentor Steffen Nijhuis Chair of Landscape Architecture

Board of Examiner Delegate Franklin van der Hoeven





Design of the Urban Fabric



Acknowledgement	06
Preface	08
Abstract	10
Introduction	12
1. RESEARCH OBJECTIVE	16
1.1 Problem Field	18
1.2 Problem Statement	21
1.3 Case Study Project	22
1.4 Research Questions	24
1.5 Outcome	24
1.6 Societal Relevance	25
1.7 Methodological Framework	26
2. PROBLEM ANALYSIS	28
2.1 Characteristics of Taoyuan City	30
2.2 Methodology of Conducting Problem Analysis	32
2.3.1 Overall Project Scale Analysis: Municipal Characteristics	32
2.3.2 Overall Project Scale Analysis: Site Characteristics	44
2.4 District Scale Analysis	52
2.5 Potential Actor Conflicts	60
3. THEORETICAL FRAMEWORK	66
3.1 Scenarios of Taoyuan Project	68
3.2 Urban/Landscape Theories that Supports Research Objective	78
3.3 Case Studies & Selected Principles	86
4. DESIGN	90
4.1 Design Strategy	92
4.2 Selections & Analysis of Design SIte	94
4.2.1 SWOT Analysis of the Test Design Site	96
4.2.2 Design Briefs for the Test Design Site	104
4.3 Test Design Application	108
4.3.1 Phasing: Preparation Actions	108
4.3.2 Design Intervention of TRA Taoyuan Project Corridor	128
4.3.3 Test Design Option I	134
4.3.4 Test Design Option II	142
4.3.5 Test Design Option III	150
5. EVALUATION & REFLECTION	158
5.1 Evaluation on Test Design	160
5.2 Examining Transferrability of Methodology	164
5.3 Potential adaptation of research-design process to practice	168
5.4 Conclusion	170
5.5 Reflection	170
BIBLIOGRAPHY	172

14

the d

"Urban Stitch - a new urban design approach to transportation infrastructure renewal projects" is the outcome of a graduation thesis conducted under studio Design of the Urban Fabrics, Faculty of Architecture and the Built Environment of Delft, University of Technology 2017.

The progress of the thesis making has not been all the way smooth. In fact, occasionally I am devoured by self depreciation and insecurity on my own ability to complete such longitudinal and in-depth academic project. However, at the very end of the project, I have been extremely grateful to this once-in-a-lifetime academic experience provided by TUDelft, as well a number of people who have helped me throughout the process of completing the thesis. First of all, I would like to thank Luisa for being so enthusiastic on my progress, as well always radiating such upbeating energy. I have always been appreciating the moments of tutorials with you the. The inspirations and out-of-the-box thinking you have given always provoked my creativity as a designer. Furthermore, I deeply appreciate the moments of personal talks with you throughout the two years of my TUDelft academic life, which have been extremely supportive. I would like to thank Steffen for his numerous input on my thesis as the second mentor. The methodological thinking and structuring have elevated my graduation project into a legitimate master thesis. Also, I am really thankful for you generosity to include me as a sit-in student in your design methodology course.

Moreover, I have an extensive list of friends to thank who have substaintially helped me towards completion of my graduation project. I am extremely thankful for John Lau, Vicky Lam, Eve Hocheng, Sylvie Chen, Shinny Cheng, Yi-Chuan Huang, Sumanth Rao, Antoine Canazzi, who have actually lend a hand to me during the production of my project. I am also extremely thankful to Marcello Vietti, Peny Mylona, Yi Yu, Kritika Sha, Rahul Dewan, Louise Kragh Hjerrild, Jessie Yang, and so on, who have been willing to spend time on discussing my projects, as well enduring my whiny moments whenever I lost my patient or confident during this longitudinal process. The list would go on forever if I include all my friends who have been supportive during the 10 months of work.

The special thanks go to my mom, who has always been supportive on the decisions I have made throughout my life, and selflessly offered the best to me. Without your hard work on supporting me I would never reached this altitude of my life.

Lastly, to whom it is reading this report, thank you for going through such personal paragraph and hope you enjoy my personal work in the upcoming report!

Fig.1 : Models as the demonstration of thesis outcome Author



The motivation of doing the thesis regarding to Taiwan will be elaborated on personal level. At the age of 13, my family have left Taiwan for pursuing new life and opportunity in Shanghai. Later on, I stepped into the designers' world by completing the bachelor degree of landscape studies in University of Hong Kong. Here now I'm standing on the land of the Netherlands towards the completion of my master degree of urbanism in TUDelft.

The 13 years of overseas experience developed a special emotion toward my homeland Taiwan. A certain part of me felt so detached from Taiwan due to the long absence on my homeland. I could not experience the gradual change of its urban environment and society firsthand. At times my mindset did not get with the trends or thinkings that are going between my Taiwanese friends. Furthermore, as a designer, I have never contributed an academic work based on my homeland. Yet, inside myself I still identify myself as a Taiwanese, since I am born here, my family members are living there, and I am speaking the common language and dialect of Taiwan. More importantly, I am eventually attached and caring about Taiwan mentally, since I felt anguished whenever I disagreed with what has been going wrong in Taiwan and its society, whether it is about the deficiencies of its urban environment, the wrongly made political decisions, or the flawed mindsets existing in its general society.

Therefore, I am here to utilize the knowledge that has been geared upon me throughout my academic experience and contribute them to the problems Taiwan have been enduring. This thesis, is a tiny gift I would like to give to my homeland.

Fig.2: Homeland Taiwan at night NASA



The history of Taiwan is closely attached to the establishment of transportation infrastructure. The thriving scene of urban Taiwan emerged in the 70s after the establishment of several national level infrastructure projects. They have become the backbone of both Taiwan's past economic glory as well the daily necessity of present society. As the technologies of transportation infrastructure has been advancing with time, it becomes a common trend of Taiwanese municipalities to renew its existing transportation infrastructure systems in order to boost up their city's image and advantage on competitiveness. Common practices of the renewal includes transferring the existing systems to either flyovers or underground.

However, inconsiderate planning practice of transportation infrastructure implementation could induce variety of urban problems. In fact, many of the existing spatial problems in urban Taiwan are the consequences of the implementation of these massive transportation infrastructure projects. Furthermore, many case studies has proven that the inconsiderate planning practice are vulnerable to socio-economic interference. Postponement or conflicts frequently occured as the consequence of fiscal pressure, change of political regime, or failure to include multiple actors in the implementation process. Therefore, it is concluded that the existing transportation infrastructure implementation process is detached with the real need of the urban environment, which is smaller scale of urban regeneration and inclusion of various actors presented in the transportation infrastructure renewal project.

Taiwan Railways Administration Taoyuan Railway Underground Project (shortened as TRA Taoyuan Project) is chosen as the case study of the thesis to further delve on the research of mentioned problem induced by transportation infrastructure. Existing urban problems in spatial, social, and economic aspects induced by the existing railway system will be unfolded. Future vulnerabilities that TRA Taoyuan Project would encounter during the implementation process will be predicted. To tackle the analyzed problems, urban design of the released corridor once occupied by the railway will be utilized as a method to encounter the concluded urban problems and further include the actions of demanded urban regeneration. Moreover, the research and design process conducted throughout the thesis will be documented and examined on its validity and potential to adopt into practice approach.

Keywords: implementation of transportation infrastructure, urban regeneration, inconsiderate planning practice, urban design, research and design process, Taiwan Railway Administration Taoyuan Railway Underground Project

> Fig.3: Existing railway under TRA Taoyuan Project scope will be transferred underground Author

INTRODUCTION

RENEWAL OF URBAN ENVIRONMENT IN TAIWAN

Taiwan, one of the earliest developed country in Asia, is facing a crucial need of renewal of urban facilities. The peak of its urban development should be traced back to the 70s when the National Government has promoted the industrial-driven Ten Major Construction Project (Liu, 2004). Selected are the important plans within the project that determined the development of the urban development in Taiwan:

1. Establishment of major transportation infrastructure systems.

2. Implementation of energy producing infrastructure.

3. Transition of agricultural and light industrial society into heavy industrial society:

The establishment of these projects has pushed Taiwan to one of the most grown and prosperous nation amongst all Asian nations, as these projects have achieved to completed connectivities in between different regions of Taiwan, reinforced connections with other parts of the world economics, and increased the energy supply for urbanization and transformation to industrialized society (Yeh, 1983). Eventually, the improved mobility and economic success fostered urban development, which has formed the basis of current urban spatial distribution of Taiwan (Fig 6.). Yet, starting from the late 80s, as the society of Taiwan has transformed into advanced technological and service industries, the previously industrial-based, fast paced urban development has also gradually slowed down (Chang, 2007). As result, the Taiwanese urban structure of 30-50 year history is now facing the state of decaying and ageing. Therefore, to secure the wellbeing of inhabitant of the urban environment, regeneration in existing Taiwanese urban environment is totally in urgent. Moreover, the aged Taiwanese urban environment does not provide great assets when competing with the emerging Asian cities from China and South East Asia. As Hall and Hubbard stated, the competitiveness of a city to attract global capital by restructured physical, social, and economic advantages to investors in the global market (1998). In order to restructure the competitiveness of Taiwan, a correct direction of urban renewal should be set to guide and integrate existing urban environment with crucial renovations.

In the thesis, the renewal of transportation infrastructure in Taiwan will be specifically studied. According to Brooks and Menon, the remarkable growth of developing Asia in recent decades has been the result of expansion of international trade, which has been facilitated by the development of both physical and institutional supporting infrastructure (2008). Annexed with the previously mentioned criteria of city competitiveness, the importance of urban regeneration on infrastructure systems becomes particularly significant under the context of Taiwan. As the construction technologies has rapidly developed and matured throughout the decades since the economic boom in Taiwan, many of the established systems under Ten Major Construction Project are facing the phase of renovation to cope with the immensely expanded demand on the provided services. Taking as example, several municipalities has decided to reconstruction their segments of Taiwan Railways Administration (TRA), one of the most determining actors on the urban growth of Taiwanese urban environment. Several ongoing projects include TRA Elevated Railway Project in Taichung and TRA Underground Railway Project in Kaohsiung and Tainan aim to accommodate the transition and integration of new transportation modes, demolish physical barrier of railway, alleviate traffic congestion, etc (Railway Reconstruction Bureau, 2015). Therefore, the broad interest of this thesis lies on the renewal of large scale transportation infrastructure under Taiwanese urban context, which is momentous on the functioning of Taiwanese urban environment.



http://pic.pimg.tw/ ytseng3/1376074583-4036734515.jpg



http://km.moc.gov.tw/myphoto/gallery% 2F%B2%A3%B7~%AB%D8%B3%5D%2F%A4Q %A4j%AB%D8%B3%5D%2F/cca220002-hp-197503270127010060l-0001-i.jpg

Fig.4, 5 (Photo): Historical photos of mobility and industry development of Taiwan

Fig. 6 (Map): Mapping of spatial distribution of Taiwanese urban environment in relation to transportation systems





Fig. 7: Taiwan's prosperity during 70s due to implementation of several national projects tw.aboluowang.com

NUMBER OF STREET

0.8

a a a with

N- 10

11



The thesis will delve into the impact from large scale infrastructure renewal on urban environment. Addressed in the previous chapter, it seems to be benefitial and inevitable for Taiwan to undergo a series of transportation infrastructure renewal projects. However, during the gathering of fundamental knowledge about large scale infrastructure renewal projects in Taiwan, many adverse impacts from these projects on urban environment has been discovered. By reviewing on urban history research and news media, the concerns on the implementation of transportation infrastructure projects under Taiwanese context could be arranged in two directions: the sociospatial aspect on how transportation infrastructure induced deficiencies in the function urban environment, and the socio-political aspect on how social and political factors could become interference on implementation of transportation infrastructure projects.

1.1 PROBLEM FIELD

Deficiencies in the Functioning of Urban Environemnt in Relationship with Establishment of Transportation Infrastructure

While the Ten Major Construction Project has pushed the economic development of Taiwan to its climax, the mere pursuit of economic development and neglect on the quality of urban planning has left several negative phenomenon in the Taiwanese urban environment. The improvement of mobility brought huge transformations on urban distribution of Taiwan, including the rising of Taipei and Kaohsiung as highly populated metropolitan region with high building density, the drastic growth of second grade cities, and the formation of satellite cities (Liu, 2004). The growth of second grade cities and satellite cities have been mostly radial from transportation nodes such as train stations or intersections of main roads, as the proximity to these nodes provide the most immediate access to mobility services. Add upon to it, the implementation of 91 new industrial parks and export processing zones in peri-urban areas further changed the urban structure of Taiwan from its previous agriculture-led landscape (Liu and Tung, 2003). The industrial activities therefore starts to interfere in urban environment due to its adjacency to urban living environment (fig. 8, 11). Individual industrial activities also started to scatter in the peri-urban areas as peri-urban areas would have less regulations as the obscure zone, both ignored by rural and urban administrations (Douglas, 2006). Together the mobilityand industry-induced development caused the hyper density within the urban environment since the concentrated development around transportation nodes and peri-urban industrial areas constrained the growth of cities and accessibility to rural agricultural environment. Any type of new developments could only infill the underused patches in high density urban area, or sprawl to the peri-urban areas along the transportation infrastructure systems. The consequence further aggregated the fragmentation of urban environment and degradation of both urban living condition and rural agricultural practice (Huang, Wang, and Budd, 2009). Adding upon the hyper density of the urban environment, the unsatisfactory quantity and quality of public spaces has also been the aftermath of the economic-driven planning, which greatly overlooked of the integration of social and environmental wellbeing (Tseng, 1999). As conclusion, the development policies established during the 70s have proven to be shortsighted as the infrastructure and industrial development only pursue economic development, yet neglected the consideration of the growth of urban environment and wellbeing within the society, thus resulted a flawed performance of urban environment with aged, fragmented, and hyper densified urban environment without adequate public spaces or facilities.

Fig. 8 (Map): Distribution of transportation infrastructure, urban region, and industrial zones in Taiwan Author

Fig. 9,10,11 (Photos): Photos showing the urban deficiencies of Taoyuan City. maps.google.com ettoday.net





Concentrated urban development leading to overdensification.



Unsatisfactory quality of open spaces.



Potential hazard when industrial activities are located in close proximity to city centre.







Fig. 12 (Diagram): potential project implementation vulnerability in a democratic society Author

Fig. 13 (Photo): Postponement of Taipei Dome udn.com.tw

Fig. 14 (Photo): Protest of Dapu Incident pnn.pts.org.tw

Fig. 15 (Diagram): suggesting integrative approach of transportation infrastructure implementation Author

Vulnerabilities during Implementation Process

Urban regeneration is crucial to alleviate the malfunctioning urban environment in Taiwan caused by shortsighted urban policy and also boost up the competitiveness of Taiwan in globalizedmarket. Yet, news suggested that Taichung, one of the most rapidly developing city in Taiwan, had difficulties to complete constructions of large scale projects in Taiwan even under the crucial need of urban regeneration (Trend in Metropolitan Taichung, 2011). The reasons behind the postponement or suspense of project construction is heavily related to Taiwanese socio-political processes during the project's implementation. As a democratic society, Taiwanese society has strong interest on the country's politics, which could have impacted heavily on the construction process. The electoral system of democratic process impacts hugely on ongoing constructions and plans as many ongoing constructions inherited from the previous reign would be disapproved by the new constitution. One of the most hotly debated case is the Taipei Dome for 2017 Universiade. It has been postponed since the newly elected Taipei major government in 2014, due to the suspect of corruption, breached the contract due to delay of construction period, and failed the safety regulation that would lead to soil subsidence (Controversies around Taipei Dome, 2016). As a result from this democratic process, the project has been ceased till now. Another aspect that has heavily influenced the construction process of Taiwanese process is the pressure from public strife. Regeneration projects in Taiwan have been questioned on its true intention, feasibility, and false prediction of future vision (AFP, 2007). These projects have even associated with controversies, for example, unfair land acquisition, environmental and preservation issue, gentrification, delayed construction process, corruption. These factors could have provoked public anger as they conflict with the civil rights of local residents. Dapu incident has been the most controversial case of urban generation in Taiwan and induced series of protest from society, since its unfair land acquisition has led to violence and suspected murder of local resident (Luo and Kuang, 2014). As a consequence, urban regeneration has become sensitive and problematic topic to Taiwanese society.

In conclusion, majority of the controversies of implementation of a transportation infrastructure project have been involved with social issues in Taiwan. However, many of the feasibility reports on the renewal of infrastructure systems have only accented the studies on the technical feasibility, environmental assess impact, and financial evaluation, yet the studies on related social context of the its located urban environment has been absent. A project will no longer become successful in terms of sustainability if the social aspects are missing out.



1.2 PROBLEM STATEMENT

Concluded from the chapter of problem field, the urban planning practice in Taiwan detached implementation of transportation infrastructure from the consideration of its urban environment. While the implementation of transportation infrastructure always aims to generate revenue for urban dwellers, the economy and industry focused transportation infrastructure projects from the previous era has introduced deficiencies of urban environment in Taiwan. However, nowadays, a more considerate approach to implement transportation infrastructure in urban environment is yet to be practiced. While national or municipal resources have all dedicated to the establishment of transportation infrastructure, little attention was left to the actual improvement of existing urban problems. Furthermore, inconsideration of the implementation processes could also result potential postponement, which is the

consequence from the conflict between actor groups and change of government.

Therefore, the objective of the thesis is to utilize transportation infrastructure project as an opportunity to integrate and further trigger opportunities of physical, social, and economic regeneration of urban environment that are detached in the current practice and have resulted unsatisfactory performance of urban environment and project implementation.

1.3 CASE STUDY PROJECT

The TRA Taoyuan Underground Railway Project (fig. 16) will be the case this thesis specifically investigate into. This particular project is believed to be an ideal paradigm of the infrastructural regeneration projects in Taiwan, as the mentioned problems in the problem field chapter are all reflected in the context of the project. The thesis will specifically work on the potential of urban design on the on-ground corridor after the railway has been transmitted underground.

First, elemental facts of the project have been summarized from the TRA Feasibility Report on Transition of Elevated Railway Project to Underground Project in Taoyuan Urban Area (2015), including (will be supported with construction drawings from the government package):

1. The project transits a total length of 17.945 km of railway passing through urban Taoyuan City to underground. The transition starts from the northern side of Fengming Bridge in Yinge District, New Taipei City, to the western side of Provincial Route 66.

2. The whole construction covers in total 8 station, including the building of existing three stations (From north to south: Taoyuan, Neili, Zhongli) underground, and implementation of additional 5 stations (From north to south: Fengming, Zhonglu, Yongfeng, Chungyuan, Pingzhen).

3. The needed width for the underground project varies in between 23-25m. Additional 2m is needed for construction purpose.

4. Taoyuan Metro Project will be constructed beneath the TRA Taoyuan Underground Railway Project. The Feasibility Report has also addressed details in multidisciplinary aspects within its 12 chapters, which are:

- 1. Introduction
- 2. Basic date and site analysis
- 3. Analysis and prediction on traffic volume
- 4. Proposal of the routing

5. Feasibility studies on construction technique and operation

- 6. Draft on the transition of railway line and station
- 7. Feasibility studies on land acquisition
- 8. Environmental impact assessment
- 9. Estimation of project funding
- 10. Initial financial evaluation
- 11. Comparative studies between the elevation and underground proposal of railway
- 12. Summary and suggestions

However, as mentioned in the previous chapter, the report of this particular project also proved that the social consideration and awareness on transportation infrastructure renewal projects have yet to be included as a part of the feasibility studies report. This site of thesis will focus on railway corridor evacuated after the existing railway being transferred underground. The particular design of the railway corridor has only been mentioned to integrate with other ongoing urban regeneration and regional planning projects. Strategies to alleviate spatial problems in urban environment created by the establishment of TRA railways has not been addressed. Evaluations on socio-political vulnerabilities during implementation has not been executed either. Therefore, the thesis will test on the applicability of elevating the TRA Taoyuan Project into an urban regeneration approach that integrates the other parts of urban environment in the thesis.



1.4 RESEARCH QUESTION

Main Question

According to the objective set from problem statement, the main research question is structured as:

How to elevate TRA Taoyuan Project into an opportunity to integrate and trigger desired urban regeneration actions of its located urban environment?

Sub-questions

The sub-questions are formed with progress stages of the thesis. The stages and sub-questions are:

Stage I: Problem Analysis

What are the existing and potential urban problems that are (potentially) related to the implementation of TRA Taoyuan Project?

- Characteristics of Taoyuan City.

- Urban problems that are induced by the existing railway system.

- Understanding of potential actor conflicts that could be involved during TRA Taoyuan Project's implementation.

Stage II: Theoretical Review What theories and principles could be applied to the design of TRA Taoyuan Project after the conclusion from problem analysis?

- Scenarios from theoretical review of TRA Taoyuan Project.

- Urban/Landscape theories that could be contributed on the integrative approach of TRA Taoyuan Project.

- Case studies with similar approach/spatial

configuration/actor engagement as existing principles.

Stage III: Test Design

How to translate and apply the selected theories on the integrative design approach of TRA Taoyuan **Project?**

- Strategical design framework.
- Selection and analysis of test design site.Design interventions and test design application.

Stage IV: Evaluation and Reflection What could be learned and reflected from the research objective?

- Evaluation of test design and design process.

- Transferrability of the design process in different scales and projects.

1.5 OUTCOME

- Urban strategy and design of TRA Taoyuan Project corridor according to the problem identified from the research.

- Integrative approach on implementation of transportation infrastructure formulated throughout the research and design process.

1.6 SOCIETAL RELEVANCE

The implementation/renewal of transportation infrastructure could bring tremendous adverse impacts to the society, which are proven by the evidence in the thesis. The inconsiderate transportation infrastructure planning practice has resulted several urban issues tightly related to the performance of urban environment, including over-densification of city center development, introduction of industrial activities which interfered urban environment, and unbalanced development due to the physical presence of infrastructure. Moveover, it is inevitably that the implementation of transportation infrastructure projects will always introduce complex actor relationships which further induce serious social conflicts. These conflicts include development-induced replacement and uneven distribution of resource between powerful stakeholders and general public.

The mentioned problems impact social sustainability of an urban environment. Chilean economist Manfred Max-Neef defined social sustainability by the nine human needs to achieve healthy society, which are subsistence, protection, affection, understanding, participation, leisure, creation, identity, and freedom (Hitchcock and Willard, 2009). As the implementation of transportation infrastructure affects both spatial performance of urban environment and actor complexity, it influences on several needs mentioned by Max-Neef: Subsistence as resource distribution, participation as inclusion of citizens in decision making, leisure as basic requirements of a well-performing urban environment, identity as place attachment of city, and freedom as equal right of space and service between involved actors. Therefore, the establishment of transportation infrastructure has it heavy influence with the social context of its located urban environment.

The objective of the thesis therefore addresses on how to integrate transportation infrastructure projects with the actual need of urban environment and trigger urban regeneration of other parts of urban environment, further consolidates social sustainability. The urban design outcome and the design process from the thesis are therefore aimed to demonstrate understanding and probable solution of the addressed urban problems. By utilizing design and presentation via various media as the comprehensive dissemination of the research, it is also hoped to also bring up awareness of people in related urban issues. As the conclusion of the thesis, the urban design and design process should be evaluated on how effective it meets the objective of the thesis.

1.7 METHODOLOGICAL FRAMEWORK

Graduation Studio: Design of Urban Fabrics

The selection of research group for my graduation thesis is "Design of Urban Fabrics." According to the given definition from the research group, urban fabrics refers "both to the physical urban environment (elements, materialisation, form, scales, density, networks), and to its psychological, socio-cultural, ecological, managerial and economical structures" (reference from website "Design of the Urban Fabric: Research Group of the department of Urbanism – Delft University of Technology"). In this research group, urban fabrics is understood through design in two perspective, which are the studying of actual design and its implications, and studying of the design process before actual implementation.

In the thesis, the objective is clearly physical/spatial, which is the design actions to be implemented on the evacuated 18 km railway corridor. With the further development of the thesis, the aim of the design is set to alleviate existing urban problems introduced by transportation infrastructure, as well reconnect urban environment that is fragmented by the establishment of these infrastructure systems. These described problems are manifestation of the dynamic but complex relationship between social, political, economic, ecological structure in physical urban environment. Therefore, corresponding to the theme of the research group, the thesis is about the studying of how the design intervention of the TRA Taoyuan Project could respond and hopefully, solve the existing urban problems.

The understanding of design process of TRA Taoyuan Project is also crucial in this thesis. As the whole project scope of TRA Taoyuan Project is 18 km, it would not be feasible to complete the design of the whole corridor with the given timeframe and resource in one year of thesis work. Therefore, the design is initiated from neighborhood scale, which urban design is applicable. The design process has been constantly review, optimize, and document, then finally translate into design methodology. As the design methodology is conducted, it will become a powerful guideline to be repetitively conducted, in order to complete the other segments of the TRA Taoyuan Project.

Research and Design Methodology

In both Design of Urban Fabrics and Flowscape (graduation studio of Track of Landscape Architecture. TUDelft), the relationship between research and design in this particular thesis could be described in these two approaches: "Research-based design" and "design-based research." Methods to approach the thesis research and design are aligned with these two aspects.

According to Nijhuis and Bobbink (2012), in researchbased design, "research feeds the design process with the ultimate objective to improve the quality of the designed object and increase its credibility." In the thesis project, the designed object is the evacuated corridor once the replacement railway is constructed underground, and the objective of its design is to alleviate existing urban problems and reconnect the opposite sides of railway. Therefore, research is focused on unfolding the specific urban problem presented on the site of TRA Taoyuan Project. First, in the problem analysis, the inventory information from several scales has been analysed and interpreted in order to understand the core of the related urban problems. Conclusions are made in order to identify the next actions to be taken, including the goals to be achieved through the design and the selection of the test design sites where these urban problems have been the most emerging. Once the urban problem is clearly defined via research, the objective of the thesis could therefore be more effectively approached. After the problem based research, the next aspect of research has been theoretical research on understanding of problem and finding of solution. Once the "what to be done" and "how to do" of the design objective is clearly defined, it elevates the quality and credibility of the upcoming design outcome.

On the other aspect, in design-based research, "design (or the process of designing) are used as a vehicle to make spatial problems visual and spatial ('framing') and to generate solutions. (Nijhuis, Bobbink, 2012)" In this thesis, once the problems and their potential solutions are defined, test designs are exercised as spatial translation of these solutions. Options of design have been made and will be evaluated if they meet the objectives set from the analysis. Also, as the thesis proceeded to test design, it also serves as an examination on the whole process of thesis. As the process of design starts to integrate with aspects space, ecology, social, etc., it also reveals the insufficiency in research process, for example, the need of supplementary information or missing arguments. Therefore, in this thesis, research and design complements each other in problem solving and forms a reiterating process.



Fig. 17: Overall research methodology to approach the research objective





The problem analysis is conducted to answer the following three questions: Characteristics of Taoyuan City, urban problems that are induced by the existing railway system, and understanding of potential actor conflicts that could be involved during TRA Taoyuan Project's implementation.

Characteristics of Taoyuan City is reviewed as background studies of the urban environment where TRA Taoyuan Project locates. Utilizing the concept of "Taoyuan as Infrastructure City" as starting point, the city's chacteristics that are related to the establishment of transportation infrastructure will be unfolded. These characteristics will therefore become the prerequisite of further understanding on the existing urban problem. The methods to be applied are mainly literature review, particularly literature from Taiwanese news and social media. Further on, inventory information in various scales will be derived from the characteristics of Taoyuan City. Overlaying of inventory information layers will be analyzed in order to identify the existing urban problems. The scalar approach gives a thorough understanding of existing problems in the urban environment. The methods to be applied are mappings of existing elements and schematized drawings to filter and conclude crucial information.

Beside the analysis of existing urban problems, potential actor conflicts that could be involved in TRA Taoyuan Project will be analyzed, which relates to the interference of project implementation. The methods to be applied are literature review on Taiwanese news media and interviews during site work.

2.1 CHARACTERISTICS OF TAOYUAN CITY

Literature studies on news media suggested that due to establishment of transportation infrastructure, Taoyuan could be named as the "Industrial City," "Immigrant City," and "Identity-less City." During the Ten Major Construction period the location of international airport and oil refinery have been designated in Taoyuan. The location of important transportation infrastructure provided tremendous assets for industrial development. Thus, Taoyuan City is coined as the biggest industrial municipality among all the administrative regions (county, municipality) since one third of Taiwan's manufacturing industries has been located in Taoyuan with the establishment of multiple industrial areas, making it the administrative region with the highest manufacturing industry output for nine years in a row (Introduction, 2016). With the prosperous development of manufacturing industry, it provided abundant job opportunities, further attracts labor forces from Southeast Asian nations or high-tech talents to relocate themselves in Taoyuan. Also with the geographic proximity and convenience of transportation to Taipei Metropolitan, Taoyuan attracts dwellers from the overpriced Taipei and has become the immigrant city of Taiwan. It is proven from the news media that Taoyuan City had the highest social increase rate of 6.25‰ among all the administrative regions in Taiwan (Liberty Times, 2016). However, like many other transportation and immigrant cities (for example, Almere and Schiphol), Taoyuan City has often been referred as without identities. Due to the lack of focus on aspects other than industrial development, and the geographic proximity of the alluring Taipei Metropolitan, Taoyuan City has been in difficulty of its identity. A poll from the biggest bulletin board system of Taiwan has agreed on Taoyuan City as the most boring administrative region of Taiwan, including reasons on its old city images, too many industrial zones, and without attractions for domestic tourists (Lin and Hsieh, 2016).

Fig. 18: Taoyuan as infrastructure city thenewslens.com

Fig. 19: Taoyuan as industrial city flickr.com

Fig. 20: Taoyuan as immigrant city Itn.com.tw

Fig. 21: Taoyuan as identity-less city i.ytimg.com











Fig. 22:

Overview on how to conduct problem analysis on the existing urban problem induced by railway under the scope of TRA Taoyuan Project Author

2.2 METHODOLOGY OF CONDUCTING PROBLEM ANALYSIS

The studies of Taoyuan City's characteristics serve as a preface of the problem analysis. These characteristics are translated into the criteria of selecting crucial layers of information in order to read the problem of how existing railway induced urban problem of Taoyuan.

In order to give a holistic view on the existing problem of Taoyuan City, information of different scales will be reviewed. The scale of overall TRA Taoyuan Project will aim to unfold the structure of the urban environment formed by the implementation of existing railway system. In the TRA Taoyuan Project scale, two aspects are studied: the municipal characteristics will lead to the understanding of city's structure by understanding spatial distribution of different program; the site characteristics, which is adjacent along the existing railway will lead to the understanding of how the present of railway physically influenced the city's spatial characteristics.

Furthermore, district scale is studied in order to understand the problem in the scale that spatial qualities of urban environment are visible. Detailed spatial qualities, for example, typomorpholotical studies to get a grip on socioeconomic development problems and challenges, relationship with other transportation infrastructure, and actors located within the district could therefore be examined.

Schematic conclusions of each scales will be summarized after overlapping layers of respective scales.

2.3.1 OVERALL PROJECT SCALE ANALYSIS: MUNICPAL CHARACTERISTICS

With the three keywords (Industrial, Immigrant, and Identity-less) forming a framework, mappings on the related urban elements will be executed.

Hierarchy of Road Systems – Extension of the transportation infrastructure studies.

Industrial Areas – Indication of the dispersion and density of industrial activities.

Concentration of Commercial Activities –

Understanding of location of commercial activities with infrastructural development; Examination of city identity.

Typo-morphological Identification (New Housings) -Indication of the dispersion and density of "new cities." **Urban Landscape Categorization** – Indication of types and qualities of urban open spaces.

Schools – Basic service.

The deficiencies of the urban environment will be understood via analysis of site in different scales in order to review urban problems existing in the case project thoroughly.



Fig. 23: Transportation infrastructure in Taoyuan urban region

The urban development of Taoyuan urban region goes along with the existing railway line. The two main train stations, Taoyuan and Zhongli station, serve as the node of urban development. Other transportation infrastructure, such as national expressways and main road serve as either constrain of urban development or spine of urban expansion, which will be further elaborated in other maps. National expressways
National route
Main road
Clty road
Streets/Alleys
Main train station
Secondary train station
New train station
Taiwan railway (Project Scope)
Taiwan railway (Other)
Urban region border



Fig. 24: Distribution of Industrial Activities

The convenience of transportation infrastructure in Taoyuan urban region attracts industrial activities to locate themselves. Several industrial zones are located along the existing railway and close to the road systems as well. Smaller scale of industrial activities also congregates along the main transportation infrastructure lines.

- Industrial landuse
- Road system (Include all thickness)
- Main train station
- O Secondary train station
- New train station
 - Taiwan railway (Project Scope)
- Taiwan railway (Other)
- ---- Urban region border



Fig. 25: Distribution of Commercial Activities

In Taiwan, urban environment is usually mixed of commercial activities and residential usage. However, there are still neighborhoods that are classified as "commercial area" which have high concentration of commercial activities. Observed from the map, larger and historical commercial areas are distributed on one side of train stations, with newer commercial concentration distributed in the form of shopping street, farther away from the main commercial areas.

	High concentration on commercial activities
	Road system (Include all thickness)
0	Main train station
0	Secondary train station
	New train station
н	Taiwan railway (Project Scope)
	Taiwan railway (Other)
· — · -	Urban region border


Fig. 26: Distribution of New Housing Typologies

As the historical map of Taoyuan urban region is not available, the expansion history of the city should be understood through typological studies. The housing typologies that are mapped out are the highrise appartments (>5 floors), gated villa communities, and planned development area, which these typologies are developped much later than the built environment of city centre. Therefore, these typologies are sprawled in distant to the main stations, which has already been saturated by built environment.

	Highrise apartments
	Gated community (rowhouse)
	Planned new development plot
	Road system (Include all thickness)
0	Main train station
0	Secondary train station
	New train station
н	Taiwan railway (Project Scope)
	Taiwan railway (Other)
· — · -	Urban region border



Fig. 27: Distribution of Public Open Spaces

Definition of public open spaces on this map are the open spaces that are programmed for public usages, such as parks, sports field, and riverfront. The understanding of open space distribution could become an index on showing the living condition and potential leisure for a neighborhood.

	Park
	Sport venue
	Plaza
	Waterfront
	Road system (Include all thickness)
0	Main train station
0	Secondary train station
	New train station
\vdash	Taiwan railway (Project Scope)
	Taiwan railway (Other)
· · -	Urban region border



Fig. 28: Distribution of Education Services

Education services serve as another index of living condition of a neighborhood. The basic level of education services (elementary, middle, and high schools) are located in close distant to the stations, while higher education (universities) are located in distant to city centre since its campus required much bigger space that could not be fulfilled within densily built city centre. Elementary and secondary schools
Road system (Include all thickness)
Main train station
Secondary train station

University campuses

- New train station
 - Taiwan railway (Project Scope)
- Taiwan railway (Other)
- --- Urban region border

Conclusion

Shown in the schematic conclusion mapping (fig. 18), the overall urban structure of Taoyuan City and its urban problems could be concluded by overlaying and interpreting the maps of the selected urban elements. The earliest urban development radiated from the train stations with high density. Along with the urban development, industrial zones also located themselves with the proximity of transportation facilities. In order to cope the pressure from population increase, new housing developments have been sprawled on the fringe of the original urban development or the filled in the gaps between original urban developments, transportation infrastructure, and designated industrial zones.

The urban development that has followed solely with the consideration of transportation infrastructure resulted several urban problems. According to news media, the industrial activities in Taoyuan City are not dying as the Asian Silicon Valley Plan will be implemented in Taoyuan to secure its position in industrial production (Pan, 2016). Therefore, inclusion of industrial activities within city life remains as a huge issue in Taoyuan City, as industrial activities have the characteristics of being privatized, dull in appearance, and potentially generating environmental hazard.

The phenomenon of urban sprawl introduced problems to both original city centers which has been developed from the establishment of transportation nodes and the site of urban sprawling itself. Draining of local resources is one of the consequences led by urban sprawl, including driving out local commerce due to attracting consumers to larger, regional malls and restaurants (Bhatta, 2010). Little to no resource would be put into redevelopment of city center, thus the old, overdensified urban environment with little consideration of urban planning from previous era remained. The mapping has proven that urban open spaces and schools align with the sites of urban sprawl, leaving the city center without these services. The site of urban sprawling has also been accused for invading rural green. Because of Taiwan's existing land use control creating a blurred zone of peri-urban area where land use for defining urban, industrial, and agricultural has not been clearly defined, rapid uncontrolled development has occurred in non-urban planned districts and resulted in increased urban sprawl. (Huang, Wang, and Budd, 2009). The uncontrolled development proposed potential threat on deterioration of agricultural land use. Other defects brought urban sprawl include monotization of urban landscape which led to aesthetic impact and lack of identity of Taoyuan City (Bhatta, 2010).



Fig. 29: Schematic diagram of the city structure in Taoyuan.

Urban structure:

Dense urban development grew around train stations, with industrial activities distributed surrounding these developments. New developments have sprawled in peri-urban regions.

Fig. 30: The Federal Tire fire in 2017 caused environmental hazard to Taoyuan City. It is the evidence on the proximity of industrial activities to urban environment is one of the urban problems existing in Taoyuan City. ettoday.net

2.3.2 OVERALL PROJECT SCALE ANALYSIS: MUNICPAL CHARACTERISTICS

The structure of the city and its problems are derived by overlapping maps in municipal scale. However, to go a step further into the socio-spatial characteristic of the urban environment along the site of TRA Taoyuan Project, another scale of analysis should be added beside the overview from municipal scale, since a part of the urban components that are crucial to the Project can only be studied smaller scale.

In order to grasp a better idea on how social components influence the forming of urban spatial characteristics, these mappings will be completed:

-Density of population of urban dweller

-Distribution of low income households

-Immigration rate

-Urban typo-morphological classification of spaces along the railway

-Connectivity of opposite sides of railway



Fig. 31: Distribution of high immigrant movement frequency

In Taoyuan, the main immigrant groups are the domestic workers from southeast Asian nations and commuters who work in Taipei but could not afford its high housing price.



Fig. 32: Distribution of high neighborhood density

Since the measure of the density is based on the population of resident per square kilometer, the density map could therefore be read as an index on potential differentiation of building typologies ar neighborhood types.



Fig. 33: Distribution of low income household

Distribution of low income household is also an important index of understanding the urban environment since it is therefore obvious to spot where the morginalized communities are potentially located.



Fig. 34: Crossings of the railway within the project site

The mapping of crossings of the railway demonstrates the railway as a physical barrier between the communication of the opposite sides of community.



Fig. 35: Studies of typo-morphological studies between the railway and adjacent space along the TRA Taoyuan Underground Railway Project

This typo-morphological studies is more observational on the diversity relationship between the built environment and railway as a barrier. Different combinations of building typologies with open spaces will react differently with the railway.

Conclusion

Overlapped with the conclusion from the municipal scale, the spatial deficiencies in the site scale is concluded (fig. 24).

Spatial deficiency is induced by railway serving as physical barrier. Many studies of cities, for example Frits Palmboom's study of Rotterdam in *Rotterdam, verstedelijkt landschap,* have demonstrated that transportation infrastructure is one of the biggest separator of city due to its physical mass (1987). In the case of Taoyuan City, the railway resulted variances of urban development from the demographic maps of population density and income level. For example, it is observed that the difference between the development of the front and back of both Zhongli and Taoyuan Station has been huge. In both cases, front of train station has been more prosperous due to commercial oriented development, while the back of train station has been mostly neglected in development, yet the neglected back station potentially attracts marginalized user groups such as immigrant workers or low income urban dwellers.

Railway as physical barrier also resulted the scarce connectivity between the opposite sides of the railway, which results inaccessibility for pedestrians and congestions of traffic.

As physically transportation infrastructure also generates unwanted urban environment, for example, noise, vibration, air pollution, patches of land alongside these infrastructure remain underused. Unwanted urban activities will therefore infill these spaces and further creates spaces that are lack of public service and security.

PROBLEM ANALYSIS



Fig. 36: Schematic diagram of oppositional fragmentation presented on site.

Design challenges identified from the fragmentation induced by railway.

Fig. 37: Narrow crossing becomes one of the factors that blocked the permeability between the opposite neighborhoods along the railway. The permeability includes physical accessibily, development opportunity, etc. Author



2.4 DISTRICT SCALE ANALYSIS

The understanding of the urban problems and challenges of the TRA Taoyuan Project will be proceeded to a third scale. The district scale will be introduced as the third scale in order to understand how the previously concluded urban problems manifest themselves spatially. To perform the analysis under segment scale, segment of the TRA Taoyuan Project from existing Zhongli Station to the planned Chung Yuen Christian University (CYCN) station has beene selected since it is the most representative to the concluded urban problems and challenges due to its diverse urban environment.

Following the structure of analysis from the previous two scales, inventory mappings will be conducted and schematic drawing will be

utilized as interpretation of selected information. The

selection of inventory maps are aligned with the research outcome from previous scale.

Resource distribution

- · Road system
- Public transportation
- Commercial area

Demographics

- Concentration of immigrant worker activities

Programs

- Categories of open spaces
- Privatized program



District scale in relation with overall project scope



Fig. 39: Resource distribution: Road System

The understanding of road system in this scale showed a lopsided resource distribution of front and back station as main roads are mostly located on the north side of the railway, as well no permeability in the industrial area.



The lopsided road system further induced the uneven distribution of public transportation route and facilities. The congregation of bus hubs created congestion of vehicular road, which further affects pedestrian accessibility.



Fig. 41: Resource distribution: Commercial area

Commercial area could as well be reviewed as an index of resource distribution. If a side of the railway has prosperous commercial scene, it drains away the investment resource of the other side, inducing contrast of development level.



After site work, the concentration of domestic worker activities is exclusively mapped out since the domestic worker is a hugh component of Taoyuan's population. The station fosters the growing of activities serving for the domestic workers such as exotic supermarket, restaurant, and indoor leisure.

0.15k

0.3km m



Fig. 44: Program: Privatized programs

Alongside of the railway, there are also many privatized programs that are "confidential," meaning that would need a different negotiation mode to include these actors when implementing TRA Taoyuan Project.

Conclusion

By overlaying and interpreting the inventory maps, the spatial problems that are found in the previous scales also manifest in this scale. It demonstrates the centrifugal structure concluded from the municipal scale, which Zhongli station induced the development of overdensified urban environment with unwanted industrial zone located in close proximity to city centre. It also demonstrated that the railway serves as a separator between uneven development of opposite sides of neighborhood. In conclusion, these uneven developments and programs turn the urban environment into "parcels." These "parcels" have their own assets and problems, yet they are also distinctly blocked by crisscrossing transportation infrastructure, particularly the railway.



Furthermore, how the railway becomes the separator between different "parcels" is further defined. According to Richard Sennett's work *Quant* (), boundary is a limit of a guarded territory, while border is the active zone where the different groups exchange. In present situation, the railway act as a "boundary" which separate the parcels. After the implementation, the evacuated corridor will become a "border" where parcels have the opportunity to exchange. In order to facilitate the most ideal exchange between the "parcels" after the implementation of TRA Taoyuan Project, the "boundary" condition should be understood in advance. Each "boundary" condition will be further themed for easier understanding of their characteristics.



Fig. 46: Thematization of the segments

Railway as "Dam" - Zhongli District Centre

Zhongli Station serves as the gate not only for commuters, but also resources for urban development. However, uneven distribution of resource caused the overdensification of the front station, which the performance of urban environment including pedestrian connectivity and open spaces is compromised. Yet, the uneven distribution also caused the underdevelopment of back station. Underused spaces, shabby structures, marginalized groups such as low income dwellers and immigrant workers concentrate here.



Railway as "Wall" - Residential communities

Slightly away from the station (~400m), the urban program changed from commercial driven to more residential based. The railway blocks two communities with distinct differences: while the northern Deyi Community is purely residential with good asset of waterfront and tranquility, it is segregated from the southern Zhengyi Community where prosperous

commercial-residential mixed scene is observed. Vice versa, Zhengyi Community does not have asset of green open space nor good pedestrian environment. Once the corridor is open up, the increased permeability in between two community might alternate the characteristics of the two communities.



Railway as "Hourglass" - Vibrant community and underused industrial site

While the southern site of the railway has prosperous commercial activities due to the proximity of CYCU, around 18 hectare of underused spaces on the northern side is neglected from the vibrancy due to its lack of permeability to the CYCU community and existing (but also moving) Federal Tire factory. The massive underused space becomes the unsafe space of the neighborhood due to lack of maintenance and human activities.



Railway as "Facade" - CYCU campus and Zhongli Industrial Zone

On the opposite sides of the planned CYCU station are the Zhongli Industrial Zone on north and CYCU campus on south. While CYCU campus provides great leisure asset for the neighborhood, the confidential programs such as barrack and factories repel human activities to happen on the other side. The opening of CYCU station and evacuation of the corridor will face the difficulty to utilize these confidential programs.



2.5 POTENTIAL ACTOR CONFLICTS THAT COULD BE INVOLVED DURING TRA TAOYUAN PROJECT'S IMPLEMENTATION

The analysis summarizes the actor groups who will participate in the desicion making, as well as who is sharing the existing and future service. Understanding the participants will therefore assist on achieving the research objective, which is to integrate transportation infrastructure projects from the considerations of urban environment and influenced actors.

Besides summary of involved actors, relationships between these actors are also crucial to be unfolded. As Cuenya stated (2006), while large urban projects generate great benefits, its spatial reorganization drastically alters local decisions, finances, and changing the position occupied by urban actors. Therefore, potential actors to be benefitted and potential actors that might conflict with one another will mostly occur in TRA Taoyuan Project. Therefore, benefits and conflicts between these actors are drawn out. The unfolding analysis of actor relationship aligns with the research line from problem field, which suggested the vulnerability of transportation infrastructure implementation.

The analysis is conducted accordingly to the segments classified from the spatial analysis. The segment scale of analysis stated that diverse characteristics exist within different urban "patches." It suggested that the involved actors will also differ from segment to segment. Therefore, the analysis has to be conducted within each segment respectively in order to grasp the diverse and complex nature of how TRA Taoyuan Project affects its involved actors.

Fig. 50,51: Diagrams of possible actor conflicts along the segment "Dam"

"Dam" - Zhongli District Centre

- This segment presents diverse actor groups due to its proximity to Zhongli station. The actors include regular city dweller, commercial worker, immigrant worker, and commuters. Besides the TRA Taoyuan Project, other planned urban projects are MRT Airport Line extension and redevelopment of station area.

- (Applicable to other segments) The construction of TRA Taoyuan Project will impact all the regular users, but the services provided after the construction benefits the regular users in return.

- While the redevelopment plan and increased services

create new opportunities for certain actor groups, the marginalized actor groups will potentially be repelled due to gentrification.





Benefitting Conflicting

61

"Wall" - Residential communities

- This segment has much simplier actor groups presented, without any other new urban projects to be established.

- However, potential new development could still

be introduced after the completion of TRA Taoyuan Project. Potential gentrification would alternate the existing established characteristics of both communities.



"Hourglass" - Vibrant community an underused industrial site

- This segment presents two types of industrial actors, while YKK zip factory will remain on present site, Federal Tire factory has planned to relocate.

- The moving of industrial activity will enhance the

NATIONAL MUNICIPALITY DEVELOPERS PRIVATE INDUSTRIES LOCAL RESIDENTS WORKERS STAYING MOVING TRΛ OPEN SPACE HOUSING NEW DEVELOPMENT DESIGNER OTHER INDUSTRIAL COMMERCIAL OTHER CONSTRUCTION **OPPORTUNITIES** /PLANNER SERVICES RESIDENTS 1 Fig. 53: Benefitting

Diagrams of possible actor conflicts along the segment "Hourglass"

existing site condition, while the staying of industrial activity will remain bothersome to the neighborhood.

Conflicting

"Facade" - CYCU campus and Zhongli Industrial Zone

- An extreme spectrum of actor groups are presented in this segment, including: CYCU actors, industrial owners and workers, and military barrack. CYCU station is also planned to be implemented in this segment.

- The addition of new services from TRA Taoyuan

Project would enhance the existing quality of urban environment. Yet, it remains unknown how the implementation of new CYCU station should arrange it with the adjacency to confidential programs such as industrial zone and military barrack.



Fig. 54 Diagrams of possible actor conflicts along the segment "Facade"

Conclusion of Problem Analysis

Conclusions of the problem analysis supports the need of an integrative approach on implementation of transportation infrastructure. The understanding of the project site, which are understanding the characteristics of Taoyuan City and the existing urban problems in different scales, revealed the consequences of implementation of transportation infrastructure without the consideration of the urban environment. Additionally, analysis of the actor complexity involved with TRA Taoyuan Project unfolded the potential danger of implementation without criticizing the current approach.

The analysis on the existing urban problems also gives clearer definition the research objective. The goals of urban regeneration to be integrated and triggered by TRA Taoyuan Project are "alleviating existing and potential problems in urban environment that are related to TRA Taoyuan Project" and "reconnecting disconnected urban environment." As problem analysis demonstrated the urban problems exist in diverse aspects, the alleviation and reconnection actions should be initiated in various aspects of an urban environment as well, particularly spatial, social, economic, and environmental.

Fig. 55 Diagrams of conclusion on the chapter of problem analysis images.google.com author





OVERDENSIFIED BUILT ENVIRONMENT



UNBALANCED RESOURCING



UNDERUSED/ UNSATISFACTORY SPACES



ACTOR CONFLICT





RETURN PEDESTRIAN CONNECTIONS



DIVERSE URBAN LANDSCAPE



CONNECT WITH OTHER URBAN PROJECTS



CITY'S IDENTITY & BELONGINGNESS





The problem analysis is conducted to answer the following three questions: Characteristics of Taoyuan City, urban problems that are induced by the existing railway system, and understanding of potential actor conflicts that could be involved during TRA Taoyuan Project's implementation.

Characteristics of Taoyuan City is reviewed as background studies of the urban environment where TRA Taoyuan Project locates. Utilizing the concept of "Taoyuan as Infrastructure City" as starting point, the city's chacteristics that are related to the establishment of transportation infrastructure will be unfolded. These characteristics will therefore become the prerequisite of further understanding on the existing urban problem. The methods to be applied are mainly literature review, particularly literature from Taiwanese news and social media. Further on, inventory information in various scales will be derived from the characteristics of Taoyuan City. Overlaying of inventory information layers will be analyzed in order to identify the existing urban problems. The scalar approach gives a thorough understanding of existing problems in the urban environment. The methods to be applied are mappings of existing elements and schematized drawings to filter and conclude crucial information.

Beside the analysis of existing urban problems, potential actor conflicts that could be involved in TRA Taoyuan Project will be analyzed, which relates to the interference of project implementation. The methods to be applied are literature review on Taiwanese news media and interviews during site work.

3.1 SCENARIOS OF TRA TAOYUAN PROJECT

The scenario prediction will focus on the 'vulnerability' of TRA Taoyuan Project. Vulnerability refers to flaws of planning processes, social strive, political changes and the lack of a robust spatial planning framework in Taiwan that guarantee continuity to spatial planning processes in the country.

Since the interest on understanding vulnerabilities from socio-political forces during project implementation is a huge and extensive topic, the scope of review on theories should be narrowed down in order to understand the topic more efficiently. Context of TRA Taoyuan Railway Underground Project will be translated into criteria on the theory selections. Theories related the socio-political vulnerabilities on project implementation will be selected based on their relevance with TRA Taoyuan Project. The review will be conducted in two methods: literature review from academic reference, and related case studies in order to understand how these theories have impacted the project implementation in reality.

The outcome of theory testing and applications would be translated into future scenarios of the project. In order to demonstrate the theoretical review, mappings of these scenarios on the project scope of TRA Taoyuan Project will be applied. Eventually, scenario prediction will become the criteria for selection of design theories and formulation of design strategy.



Construction of TRA Taoyuan Project temporary station Itn.com.tw

CRITERIA ON SELECTION OF THEORIES

- Scale of urban project

According to Cuenya, large urban project can have favorable or unfavorable effects and impacts depending on different actors, which will have potential to be instigated into conflicts in between directly affected actors (2006). Therefore, the selection will approach the theories that are applicable to larger scale urban projects, with complex relationships of power and rights created by conflicts between different actor group.

- Types of project implementation

Different types of project implementation process will have different sociopolitical vulnerabilities associated with them. In the Underground Railway project, the project financing, planning, contracting, and operation are determined only by public sector, which is Ministry of Transportation and Communications of Taiwan.

- Democratic system of government

Taiwan is a country with democratic system of government, which governance party is constantly changing after elections. More specific, Taiwan could be seen as a two-party system of government since candidates from only two parties, Chinese Nationalist Party (KMT) and Democratic Progressive Party (DPP), have been elected since the start of presidential election from 1996. Therefore, theories regarding to the impact of party alternation on project implementation will be focused (fig. 44).

Theoretical Review

Financing on infrastructure projects

Different types of financing on infrastructure projects will determine a project's implementation process heavily. In order to alleviate the heavy fiscal pressure from the construction of infrastructural projects that demands enormous budget, private participation in infrastructure (PPI) has been an emerging trend mode of infrastructural projects, since it is attractive due to the operational failure of public sectors such as dissatisfaction with the quality and reliability of service, inefficiencies, and corruption of public sector operator (Annez, 2006). Nonetheless, a total privatization of infrastructure would not be applicable due to the criteria set from previous chapter, since the Railway Underground Project is a segment of the national railway system that is publicly operated by the Taiwan Railway Administration (TRA), under Ministry of Transportation and Communications (CECI, 2015).

As a compromise on the financing between public sector and privatization, public-private partnership could be a more feasible and flexible approach for the Underground Railway Project. Build-operate-transfer (BOT), which is a common form of public-private partnership in Taiwan, alleviates the project proponent's financial pressure by encouraging private entity to take responsibility on financing, design, construction, and operation of a facility within the time period agreed on a concession (Public-Private-Partnership, 2016). The form of partnership attracts private investors by the revenue generated from the project in the time period of concession. It could be an applicable form of financing for the Underground Railway Project, for example, the development of individual stations or the ground-level corridor after railway has been evacuated could be applied with BOT in order to relieve parts of the financing for the project. Precedent cases of TRA Nangang and Songshan stations have proved that BOT is a feasible approach under the TRA-operated system (Peng, 2007). However, BOT has its risk to fail with inconsiderate implementation. The construction of Taoyuan Airport MRT in Taiwan has suffered from the failed implementation of BOT. The misestimation on the ability of private entity to take up the construction financially and lack of power on land acquisition have led to the inability to completion, eventually led to the breach of concession and a severe delay from its designated completion date (Impeachment, 2015). Furthermore, public opinions have been negative toward BOT mode due to private financial investors' deviated focus on profit making than provide public services, for example, abusing the power from public sectors such as snatching low cost land for private development, and compromise on the public service for commercial profit making such as decreasing footprint ratio for public service for maximizing commercial usage (Chan, 2015).

Flaws of planning process and public strifes

Flawed project implementation without the consideration of involved actors will further lead to public strifes, eventually interfere with the completion of project. According to Cervero, among different type of infrastructure, transportation has the strongest power in shaping the city, which affects on the location, intensity, composition, and value of land use and urban activities in an urban development (2001). Therefore, it could be said that infrastructure projects, like the case study project introduced, are inevitably entangled with complex relationship among vast amount of involved actors. Furthermore, large urban projects generate great benefits, but at the same time its spatial reorganization especially servicing for capital drastically alters local decisions, finances, and changing the position occupied by urban actors (Cuenya, 2006). Consequently, large urban projects would prone to provide benefits for private investors and capital and further marginalize the weaker actor groups whom conflict with. One of the consequences generated by marginalization is development-induced displacement and resettlement, a commonly seen phenomenon which displacement of communities were requested due to land acquisition for large scale urban projects (Stanley, 2004).

As a trend, social participation and communicative planning have been taken into much more consideration for achieving social sustainability. Social sustainability, according to the model from Western Australia Council of Social Services, has principles including equity, diversity, quality of life, inter-connectedness, and democracy/governance (2002). Social engagement during the implementation process of large scale urban projects seems to be a great fashion to achieve equity of every involved actors, diversity of expressions, and democracy. Yet, many of the social involvement processes have been political manoeuvre only to avoid the accusation of favoritism on particular actor groups.



Taipei Bus Station as an example of compromising public service to commercialization i.ytimg.com

Albrechts warned that bureaucratic execution of citizen involving strategies, rather than the ones motivated by politicians' or citizens' initiatives will degenerate into deformed democracy, particularly if the invitation to participate is not widely accepted, and further concluded power equalisation does not come automatically with participation (2003). Elaborated by Arnstein, level of participation could be classified from actual engagement of citizen power (citizen control, delegated power, partnership), to tokenism of participation (placation, consultation, informing), to "nonparticipation", the delusion of participation (therapy, manipulation) (1969). Taking another ongoing TRA Railway Underground Project in Tainan City as example, a public strife from the to-be-displaced neighborhood has severely impacted the schedule of construction, since Tainan Municipality has not informed the neighborhood about displacement until actual construction, as well Ministry of the Interior restrict only 10 local resident representatives

to attend the public review conference (Chu, 2016). As conclusion, the flawed planning process of a project that marginalized specific actor groups could become vulnerability that eventually take toll on the project's implementation process.

Externalities from political changes

The implementation of large scale urban projects are vulnerable to externalities from the change of governmental regime. Under a country of two-party system, large scale urban projects often become victims of the conflicts between the two major political parties. As theory suggests, in many cases the two-party system promotes partisanship instead of compromise in between parties ("The Two Party System", 2012). The inability to compromise on decision made from the other party forced the delay or even suspension of ongoing projects that has been carried out from the previous regime.



Protest on Dapu Incident pnn.pts.org.tw
Addition to the partisanship promoted from the twoparty system, it is stated that frequent alternation in the party of the governor leads to political instability and fiscal performance, which would lead to hasty decision making of governors during their regime (Calcagno and Escaleras, 2006). A rushed decision making process would potentially harm a project's thorough consideration on several aspects, including planning for long term visions and fiscal performance. The lack of consideration process will further create vulnerabilities prone to the theories such as aggregating popular discontent, which have been referred in the previous sub-chapter.

One of the most hotly debated case regarding to these theories is the Taipei Dome for 2017 Universiade. The construction has been suspended since the newly elected Taipei major government in 2014, leading by Major of Taipei city Wen-Je Ko, claimed the construction has been under the suspect of corruption, breached the contract due to delay of construction period, and failed the safety regulation that would lead to soil subsidence (Controversies around Taipei Dome, 2016). As a result, the project has been ceased since May 2015, with only foundation work and partially its structure completed. The fundamental reason of the suspension is due to the charrette of the project implementation process from the previous regime of KMT. Many of the inconsiderate aspects regarding to the construction, for example, passing the safety regulation with obvious flaw in design and soil subsidence, has been passed through due to the limited time frame for the project construction. Partisanship has therefore come in to further interfere the project implementation by the newly elected Major Ko when his government refused to restart the Dome's construction due to the inconsideration in the construction.



Postponement of Taipei Dome due to change of major udn.com.tw

Application of Theories on TRA Taoyuan Project

The review on theories of socio-political vulnerabilities during the implementation of a large scale urban project will be concluded by applying the theories onto the Railway Underground Project. Future scenarios of the project will be envisioned as the outcome of the application.

Reducing the scope of project due to financing

One of the Railway Underground Project's biggest concern on implementation is its enormous expenditure. Out the 96.4 billion overall expenditure expected, only 53.9 billion will be covered by national budget, and the rest of 42.5 billion will be on the duty of municipality, which is a drastic threefold increase on the expected municipal expenditure from the elevated system (10.8 billion) (Hsu, 2016). The actual project expenditure is expected to even higher with operational cost and potential unexpected adjustment or delay on the construction has occurred.

Applied with the theories reviewed regarding to the financing of large scale urban projects, two scenarios are predicted to solve the finance shortage of the project. On construction perspective, actual construction site would have been shortened to reduce expenditure. The





surrounding land use of the Railway Underground Project that has less emergency of redevelopment would have been eliminated from going underground. For example, from the northeastern end, the scope of the project might be pushed until close to the centre of Taoyuan station, as the adjacent land use is mostly underdeveloped land and industrial zone. From the southwestern end, the scope of the project could be pushed closer to Zhongli station as well, as the adjacent land use is rural area and low density residential complexes. The rural segment between Neile and Taoyuan might also be compromised if the grading of the construction allows. On operational perspective, the planned stations and on-ground corridor would be established by the mode of BOT in order to cut down the expenditure of the stations from construction to certain period of operation. As conclusion, taking the consideration of finance shortage, compromise of construction scope and privatization of specific

components of the project would have happened.

Sites vulnerable to civil conflicts

Sections of the project scope are prone to have potential on stirring public strife due to involvement of displacement. Referring back to the history of Railway Underground Project, the construction of previous version, which was the elevated system railway, was expected to be completed in 2017. Yet, it was severely delayed due to the neighborhood's formation of an alliance, opposing on elevated system due to land acquisition and potential noise from elevated system, and therefore, preferring on underground system (Chiu, 2014). The protest from the neighborhood alliance has eventually delayed the construction of the previous elevated railway plan.

However, it is not guaranteed that the neighborhood



Fig. 61 Scenario II: Possible scope of privatization and commercialization

alliance would be satisfied with the current plan of Railway Underground Project. Referring back to the Tainan Railway Underground Project, the construction a railway underground system would still require land acquisition and further lead to development-induced displacement. It is predicted that there would be more possibility that similar displacement issue could happen again in the densely built neighborhood. If the compensation plan is not well-received by these neighborhoods, these segments of the project scopes will be delayed while other segments might have already been completed.

Potential risk on change of governmental regime

As mentioned, party alternation in two-party system country could have huge impact on a large scale urban project's implementation. In fact, the adjustment from elevated to underground system in the Railway Underground Project has also been the result of party alternation. With the new major Wen Tsang Cheng's succession, he overthrown the ongoing (but severely delayed) construction by supporting the neighborhood alliance's preference on underground system. Hereby, theories will be tested to predict if the plan would be overthrown again within the project's implementation.

The progress of the Railway Underground Project and the recent political tendency should be examined. In terms of the progress of the project implementation, news media has reported that the evaluation report of Railway Underground Project has been approved by the Ministry of Transportation and Communications, which confirms the project's surety to be carried out. It is the evidence of the speed-up of current government's process in order to secure the project on potential future party alternation. Referring to the political tendency, the





satisfaction rate of 59.9% and low dissatisfaction rate of 20.8% reflected major Cheng's high popularity (Chien, 2016). It is expected that he would take over another 4-year regime by the satisfaction rate he has for now. Therefore, if the implementation goes uneventfully with the support of the neighborhood alliance, the project will at least get implemented in his expected regime of 6 years (the remaining 2-year of his first regime + potential re-elected 4-year for second regime), which would be make it too progressed and controversial to overthrow even if another party alternation occurs in the future. As a conclusion, the drastic change of project implementation, particularly the return of the previous elevation plan, would have rather small chance to occur after the examination by theories.





Eric Chu (mayor term 2002-2010) Elevating with 60 m corridor





Chih-Yang Wu (mayor term 2011-2014) Elevating with 25 m corridor





Wen-Tsan Cheng (mayor term 2015-now) Underground with 23 m corridor +8.3 billion NTD of budget

Fig. 63 Illustration on change of political regime leads to change of options in TRA Taoyuan Project blogspot.com epochtimes.com.tw twtog.org.tw TRA Taoyuan Project construction package

3.2 URBAN/LANDSCAPE DESIGN THEORIES THAT SUPPORTS RESEARCH OBJECTIVE

Utilizing the conclusion of problem analysis and scenario prediction as criteria, design theories will be selected. With a thorough knowledge of related theories, it will become effective tools to select applicable methods or interventions to approach the research and design objective.

The review of urban and landscape design theories will be divided into two parts. The first part will elaborate on the "potential" of urban open space or urban landscape. Since the research objective is to demonstrate the integrative approach of transportation infrastructure renewal by the design of the evacuated corridor of TRA Taoyuan Project, it is important to understand what urban landscape and open space could mean to urban environment.

The second part of review will contribute to "how" to design urban landscape and open space in order to tackle the problems identified from site analysis. The selected theories from the second part will become powerful tool to generate design interventions in the later design process.

Potential of Urban Open Space

Landscape Urbanism

The ultimate goal of TRA Taoyuan Project is to return the corridor previously occupied by railway to urban environment. Also, due to the structure load, above the corridor site could not be built with heavy structures. This thesis design is therefore focused on potential urban landscape interventions, as Victor Gruen concluded: "Landscape is not the "natural environment" per se, as in untouched wilderness, but to those regions where human occupation has shaped the land and its natural processes in an intimate and reciprocal way" (Corner).

In order to utilize the potential of landscape interventions to achieve the objectives set from the problem analysis, landscape urbanism is introduced as the base of the design theory in this thesis. Landscape urbanism emphasizes that instead of architecture, landscape should be the main intervention to solve urban problems. Landscape architect and theorist James Corner claimed that "landscape, in the form of parks, greenways, street trees, esplanades, and gardens is generally seen to provide both salve and respite from the deleterious effects of urbanization," from the undesirable effects of congestion, pollution, and other social stress induced from the "high-density building, transportation infrastructure, and revenue-producing development" urban environment (Corner). In the case of TRA Taoyuan Project, as the railway corridor will be evacuated after its underground construction, the

corridor space will be returned to public, open space usage. Therefore, landscape, compared to built forms, are the "ability to shift scales, to locate urban fabrics in their regional and biotic contexts, and to design relationships between dynamic environmental processes and urban form" (Corner). Since landscape has the characteristics to accommodate different scales, different forms, and ongoing environmental processes, the thesis will utilize landscape intervention's potential to reconnect the urban fragmentations and alleviate stress in urban environment.

Urban Open Space/Landscape as "Public Realm"

As the problem analysis chapter concluded, complicated relationships between the actors are involved in the TRA Taoyuan Project. Interventions should not only fulfill the need of the urgent, but also take care of every involved actors' benefit. Hereby, social theories related to spaces are therefore introduced to utilize urban open space as a common ground of interest of all actors.

First, in order to understand the relationship between social aspect in urban environment and physical space, the concept of public realm should be introduced. Carmona (2010) has elaborated that "the public realm has 'physical' (space) and 'social' (activity) dimensions," which is understood here "to mean the spaces and settings - publicly or privately owned - that support or facilitate public life and social interaction," which includes external public space such as public squares, streets, highways, parks, parking lots; internal public space such as such as libraries, museums, town halls, public transport facilities; and external and internal quasi-public space such as university campuses, sports grounds, restaurants, cinemas, shopping malls. Carmona (2010) further claimed that the functions of



Fig. 64: Example project on landscape intervention facilitating urban development Author public realm are ideally forum for political action and representation, 'neutral' or common ground for social interaction, intermingling, and communication, and as a stage for social learning, personal development, and information exchange (Loukaitou-Sideris and Banerjee, 1998, p. 175). Especially aiming toward the goal of "social interaction and intermingling," it is necessary to redesign the TRA Taoyuan Project as public spaces which contains also social dimensions of the neighborhood.

Furthermore, characteristics and importance of "public space" are to be defined. As famous urbanists like Jane Jacobs, Richard Sennett, Lyn Lofland, and Nicholas Fyfe accredited, public space is "considered to be at the core of the urban experience; the parts of the city in which everybody can come together to meet, to communicate, and to conduct business, or just to enjoy the sound and sight of urban area, be anonymous in

the crowd" (Yucesoy). Yucesoy elaborated that public space is not a sole container of people, activities, and social relations, but a social construct that is perceived, used, and experienced each time and place by its users, which is a lived space for people through a set of complex social relations. Furthermore, urban public spaces should be seen as network of spaces, for example, a variety of associations and attachment between various scales of urban public spaces, instead of only be viewed as independent entities (Yucesoy). A good public space can furthermore enhance the cohesion of communities. Supported by the work of Holland, Clark, Katz, and Peace(2007), public spaces allow different groups of people, including different ethnic, age, and socioeconomic groups to meet on ostensibly neutral ground in planned and unplanned ways, to allow interactions with the differences and the spaces itself. Their work further contributes to design principles that could facilitate good usage and interactions in public



Fig. 65 (Diagram): Public realm as container of social activity and physical space Fig. 66 (Photo): Train station as public realm for Indonesian workers to gather for their leisure time

img.ltn.com

Fig. 67 (Photo): Night market in Taiwan as public realm where the street (physical space) contains exchange of socio-ecomonic activities images.google.com

space.

Therefore, the corridor of TRA Taoyuan Project should not only be merely a landscape intervention, but also possess the ability to be constantly utilized and reconstructed by its actors and provide connections between different public spaces.

Theories that Contribute to the Design of Urban Landscape and Open Spaces

Third Place Theory

In the case of Taoyuan City, one of the problem analyzed from the site is the lack of open public spaces. Therefore, new potential of public open spaces should be reconsidered in the design intervention consideration. According to Oldenburg's work (2001), third places are informal gathering places in which people gather between home and work. Characteristics of third places are further described as 1. neutral ground where people potentially gather 2. places where individuals may freely come and leave, without anyone required to play host, 3. Places we all could feel like at home and comfortable (Oldenburg).

In order to facilitate third place's potential as a social place, principles from Oldenburg (2001) further address the making of a good third place: 1. Third place is typically plain, where it is more likely "not to impress the uninitiated. 2. Third place should resemble to the psychological quality of comfort and support, similar to home. 3. Third places should provide the best and fullest service where people could visit alone in anytime of the day with assurances that acquaintances will be there. In TRA Taoyuan Project, the corridor would follow the design principle from the theory of third place in order to assure the making of successful social space.

Everyday Public Space

Besides intentionally created "third places," public spaces that are used as everyday services also have emerging potential as a social space. According to the work of Yucesoy (), new public places have emerged as transient spaces for traffic, communication, and consumption, which lead to a different conception and relationship between the public space and urban life. These spaces counted as new categories of "public spaces" since they are used for common purpose for many people, but at the same time safety concerns and privatization could also potentially exclude, displace, and marginalize particular social groups (Yucesoy).



In the term of "everyday public space," the 'everyday' simply describes "the lived experience shared by urban residents, the banal and ordinary routes, such as commuting, working, relaxing, moving through city streets and sidewalks, shopping, buying and eating food, and running households (Yucesoy)." Though considered as the services and amenities, Yucesoy (2006) described the potential of everyday urban spaces as their influence on the everyday life and urban public space is manifold: "They not only influence the organization of daily activities, but also the patterns of use and appropriation of urban public spaces......The daily life routines involve people in more or less constant face-to-face interaction with others and thus make up the bulk of social activities...In sum, urban public spaces are important constituents of everyday lives of urban inhabitants. Whether unnoticed or consciously appropriated in a broader frame of spatial practices, the everyday uses and experiences of urban public spaces, provide a dynamic perspective of looking at the different spatial experiences of diversity of groups." In this sense, everyday public space inspired to utilize spaces for daily activities of commuting or consuming as potential landscape interventions to create new dynamics in urban open spaces.

Exclusiveness of Open Space

However, public spaces might also lead to consequences of repelling certain actor groups. Therefore, a series of theoretical review on inclusiveness and exclusiveness on public space design is conducted in order to facilitate the making of better public space or avoid the mistakes of unwanted consequences.

Exclusions in open spaces are contributed by the conflicts from complicated actor relationships. Urban





public space becomes an arena in which power relations and actor groups compete with each other, since diversity and difference are represented in the urban public spaces with different usage from different groups (Yucesoy). Carmona (2010) further elaborates that some strategies are made to exclude particular individuals or social groups, which can be practised through spatial design strategies. The work of Holland, Clark, Katz, and Peace(2007) further stated that besides accessibility to the public space, other aspects of public space design could become barriers to certain user groups, including location of the public space, the provision or lack of facilities such as furniture, and occupancy of specific individuals or groups. In the end, as the aftermath of power conflict, segregation compromises the public realm's function of "social learning, person development and information exchange" (Carmona).

Open Space Design with Social Processes

As the TRA Taoyuan Project has an ongoing construction process that will definitely impact the surrounding neighborhood, design strategies to deal with the process should be sought. As the continuation of the review on landscape urbanism, Corner (2014)accented landscape's "ability to shift scales, to locate urban fabrics in their regional and biotic contexts, and to design relationships between dynamic environmental processes and urban form." Important keywords of "scale," "urban fabrics," and "dynamic environmental processes," the theory further address landscape intervention's potential to accommodate urban issues on various of scales, forms, and time.

Furthermore, one of the provisional themes of landscape urbanism is processes over time. According to Corner(2014), ever-changing urban environment should also be seen as "dynamic environmental processes" since the process of urbanization including capital accumulation, deregulation, globalization, environmental protection, etc., are significant for the shaping of urban relationships. Therefore, it is crucial to seek for and construct dialectical understanding on how these urban processes relates to spatial form, and further develop "a space-time ecology that treats all forces and agents working in the urban field and considers them as continuous networks of inter-relationships" (Corner). Therefore, besides the spatial interventions from the evacuated corridor, in order to deal with the TRA Taoyuan Project comprehensively, urban process related to the construction should definitely be taken consideration of.

Creating Spatial Potential in Open Space Design

The theories regarding to the "how much should urban designers 'design'" are also reviewed. As the recurring theory of Carmona's definition of public realm and public space (2010), it is "difficult to conceive of 'space' without social content and, equally, to conceive of society without a spatial component," Fig. 69: Potential of an everyday space for social activities in the example of Filipino worker's Sunday picnic on the footbridge of Central, Hong Kong images.google.com

Fig. 70: Anti-homeless spikes as exclusive urban design intervention images.google.com therefore, the relationship is best described as a continuous two-way process in which people create and recreate spaces while at the same time being influenced by the spaces in various ways" (Carmona). Furthermore, defined by Yucesoy (2006), the meaning of public space is constantly redefined by reorganization and reinterpretation of the public space by different users. Carmona concluded this viewpoint on urban design as creating more "place potential," which indicates to manipulation of probabilities of certain actions and behaviors happening, instead of determination of human actions

and behavior. Eventually, the role of design will be inevitably limited but important in delivering particular social goals (Carmona). Therefore, these theories suggest the spatial intervention should be kept low-key in order to allow the users to create and recreate their own public space.

Urban Acupuncture

Supported by the theory of urban acupuncture, localized and community interventions are favored when constrained budgets and offering a retreat to urban dwellers (Kaye, 2011). Furthermore, according to the work from Ruin Academy, an independent, interdisciplinary research center in Taiwan, urban acupuncture is aimed to produce small scale but socially catalytic interventions into a city's urban fabric (Harrison, 2013). As the ultimate goal, it is hoped to create synthesis in between these small urban acupuncture interventions, and form large, systematic strategy in order to alleviate the existing or potential urban problems from the conflict between inconsiderate infrastructure implementation and the society.

Fig. 70: The characteristics of a tradition temple in Taiwan, which provides a templefront open space, create spatial condition for economic and social activities to grow freely flickr.com

Fig. 71: Urban farming as one of the common practice of urban acupuncture guangzhouaward.com





3.3 CASE STUDIES AND SELECTED PRINCIPLES

Infrastructure Renewal Project with Similar Approach

".....No town or city is immune from either the external forces that dictate the need to adapt, or the internal pressures that are present within urban areas and which can precipitate growth or decline.

Urban regeneration is an outcome of the interplay between these many sources of influence and, more importantly, it is also a response to the opportunities and challenges which are presented by urban degeneration in a particular place at a specific moment in time." (Roberts and Skyes, 2000)

The definition of urban regeneration elaborates its ability and necessity to solve urban issues with the consideration of the complexity of urban environment. The definition further facilitates the thesis' standpoint on elevating an infrastructure renewal project into urban regeneration opportunities that counteracts urban problems that were induced by previous faulted urban planning practices.

Supported with the case project studied below, it is therefore known that large scale infrastructure renewal projects have potential to be tackled with integrated approach with other aspects within urban environment, including environmental sustainability, economic development, and the focus of the thesis, social context to their located sites. These case projects will become powerful references in future stage of urban design and strategy making.

The Big Dig, Boston, United States

"Replacing the six-lane elevated highway with an eight-to-ten-lane underground expressway directly beneath the existing road, culminating at its northern limit in a 14-lane, two-bridge crossing of the Charles River. After the underground highway opened to traffic, the crumbling elevated was demolished and in its place is open space and eventually modest development.....Along with improving mobility in downtown Boston, the Project reconnected neighborhoods severed by the old elevated highway, and improved the quality of life in the city beyond the limited confines of the new expressway." (Massachusetts Department of Transportation Highway Division, 2016)

The Fibercity, Tokyo, Japan

"The Fiber City recognizes that existing structure must not be destroyed recklessly but instead a way needs to be found to re-use them in practical ways......The GREEN WEB is one example, designed to instill new life and meaning into old Metropolitan Highway, a portion of which is currently

Fig. 72: The Big Dig cityworksinc.files.wordpress.com

Fig. 73: Plan of Fibercity onnoffmagazine.files.wordpress.com

Fig. 74: Cheongyechong cityclock.org

being talked about in the context of removal." (Ohno Laboratory, The University of Tokyo, 2005)

Cheonggyechong, Seoul, Korea

"By demolishing an elevated freeway and uncovering a section of the historic Cheonggyecheon Stream, the Cheonggyecheon Restoration Project created both ecological and recreational opportunities along a 3.6-mile corridor in the center of Seoul. The project has proven catalytic, spurring economic growth and development in an area of Seoul that had languished over the last several decades." (Landscape Performance Series)



Urban Project with Similar Actor Complexity

According to the analysis, a variety of actors are involved in the project scope of TRA Taoyuan Project. Therefore, diverse examples of how urban projects deal with the actors involved should be examined, in order to extract their principles and create comprehensive strategy accordingly. With the understanding of the relationship between the making of urban projects and involved actors, it could in fact become a strong tool to enhance feasibility of the implementation.

Highline, New York, United States

"Friends of the High Line raises 98% of the High Line's annual budget.....Owned by the City of New York, the High Line is a public park maintained, operated, and programmed by Friends of the High Line, in partnership with the New York City Department of Parks & Recreation."

"In 1999, Friends of the High Line is founded by Joshua David and Robert Hammond, residents of the High Line neighborhood, to advocate for the High Line's preservation and reuse as public open space......In 2002-2003, the planning framework for the High Line's preservation and reuse begins. A study done by Friends of the High Line finds that the High Line project is economically rational, and leads to an open ideas competition: Designing the High Line....On March–September 2004, Friends of the High Line and the City of New York conduct a process to select a design team for the High Line. The selected team is James Corner Field Operations, a landscape architecture firm, Diller Scofidio + Renfro, and Piet Oudolf, planting designer." ("About the High Line | Friends of the High Line," 2017).

Highline demonstrates how bottom up NGO could be formed and involved in the process of decision making of large scale transportation infrastructure renewal project.

Minsheng Community, Taipei, Taiwan

During the late 60s, Minsheng Community was appointed to be established as a demonstrative community of the concept of "Garden City." It is a successful case on how to engage residents in community making. For example, greenery of the community and renovation of the back alleys are initiated and maintained by the community committee. The community also engages its residents by activating outdoor activities, which utilize the community open spaces for festivals, lectures, or concerts. It demonstrates the potential on gathering local actors and forming a robust community engagement. (Community Development Associations of Mingshen Community, Songshan District, Taipei City)

Fig. 72: Highline media.timeout.com

Fig. 73: Mingshen Community i.ytimg.com

Fig. 74: Zhonghe Myanmar Street 198.55.121.21

Zhonghe Myanmar Street, New Taipei City, Taiwan

Zhonghe Myanmar Street used to be a community with high concentration of ethnically-Chinese Burmese immigrant, since it was located on the brim of metropolitan Taipei with lower living cost. Due to the concentration, informal market selling nostalgic food of Myanmar started to congregate. The market therefore attracted more and more immigrants to open their business in close proximity. The market has expanded to seven times larger from two decades ago. The Burmese association further introduced their festivals to the community and transformed their immigrant community into successful touristic attraction and city characteristic (Appledaily, 2006).







The design chapter serves as the conclusion from the previous chapters. The design process is utilized to experiment how spatial interventions could be transformed as solutions of the urban problems analyzed. These spatial interventions will be derived by the theories and principles reviewed previously. The design and its process should be chereographed, documented, and examined in order to achieve the objective of this thesis.

The design process are broken down into several stages. First, strategical design framework will be formulated in order to provide an alternative approach to implement transportation infrastructure according to the research objective. The strategy will further serve as guideline for design actions during the application of design interventions with regard to solve the existing urban problems. Method expected to be used is interpretation of scenario studies and principles from the theoretical framework.

Before the actual application of design interventions, the test design site will be selected. The test site will be selected based on if it embodies the urban problems identified, as well if it could execute the strategical design framework and demonstrate its potential explicitly. Method used for the selection of test site is through the selection of information from previously conducted mapping and analysis.

The test design will start to be operated after the planning of strategical design framework and the understanding of test design site. Design interventions will be selected by the theories that support the research objective. The selected inerventions will be further arranged according to the site conditions and goals. Method planned to be used are reviewing of theories and case studies and three dimensional modelling.

4.1 DESIGN STRATEGY

Scenarios predicted from the theoretical review chapter is not only used for guiding the theories to be reviewed, but also will be further interpreted and translated into ideas for design strategy. In the scenario studies, three potential scenarios of TRA Taoyuan Project are predicted, which are: fiscal shortage leading to shortening of project scope, privatization and commercialization of TRA Taoyuan Project leading to compromise of public service, and high possibility of actor conflict leading to delay of project. Strategy is therefore aiming on how to considerate all three of the possibilities and minimize the impacts that could be brought to TRA Taoyuan Project and its located urban environment. It has two goals in regards to "minimising the impact." First, the strategy should still achieve considerable effect on the regeneration of its urban reveneration, even if the reduction of project scope or postponement of project completion had happened. Second, the strategy should aim to share the services provided from TRA Taoyuan Project with all involved actors in order to reduce potential of public strife or marginalization of certain actor groups.

Therefore, the strategy for designing TRA Taoyuan Project is phasing. From the review on Corner's work, social process should be taken consideration of and actually involved in the design of urban environment (2014). In the thesis, the implementation of TRA Taoyuan Project, along with other anticipated urban projects or other urban changes are considered as the "social processes." These process should be interweaved into, or even be seen as oppotrunities of the implementation of TRA Taoyuan Project. Therefore, phasing approach is chosen as the strategy to fulfill the research objective of integrating transportation infrastructure implementation with other urban regeneration opportunities. "Preperation actions," which means urban regeneration actions induced by the construction of TRA Taoyuan Project or other urban changes, should start to take places. With the preparation action, alleviation of urban problems will still be achieved even if potential delay of implementation or shortening of project scope occurs. These preparation actions are also meant to be the stepstones in order to benefit and maximize the effect of actual intervention on the corridor of TRA Taoyuan Project. At the end, the phasing strategy, which combines preparation actions and the actual intervention are aimed to achieve synergy on fulfilling desired goals of the site, as well reaching the research objective of integrative approach of transportation infrastructure implementation with small scale urban regeneration.

Fig. 75: Diagram illustrating how the predicted scenarios inspired the design strategy of phasing. The phasing strategy suggests preparation actions during the construction phase of urban projects, hopefully creating synergy after the completion of the urban projects



4.2 SELECTION AND ANALYSIS OF DESIGN SITE

The segment of "Dam,' which is Zhongli station and the centre of Zhongli District, has been selected as the test design site. Several reasons contributed to this decision. First, demonstrated in the problem analysis, Zhongli station gathered diverse actor groups. This characteristic made it a suitable testing ground to examine the theories ondesign of inclusive open spaces. The spatial urban problems are also relatively straightforward in this selected site, which are the unbalanced development of urban environment between front and back station and unsatisfactory connectivity of both the commercial neighborhood and the two sides of the station. Lastly, the concentration of resources is located here. Train station, several bus terminals, and vibrant commercial scene can also be utilized as resource to enhance the feasibility of the design.

Another series of analysis will be conducted specifically on this site. The analysis will be initiated according to the structure from the problem analysis chapter, which inventory mappings will be overlapped and interpreted to identify exact problem. The analysis will be demonstrated by the method of SWOT analysis, which the strength and weakness of existing urban environment, also opportunity and threat that TRA Taoyuan Project would potentially bring to the urban environment will be mapped out. A step further from the SWOT analysis, goals will be extracted and mapped out. The goal maps will become a tool on explicitly demonstrating what has to be achieved by the strategy and design interventions.



Fig. 76: "Dam" selected as test design segment

Fig. 77: Methodology on conducting site analysis of test design site

Fig. 78, 79, 80, 81, 82, 83: Revisiting analysis from district scale: Road Hierarchy Public Bus Commercial Area Activities of Immigrant Workers Public Open Space Privatized Open Spaces







4.2.1 SWOT ANALYSIS OF DESIGN SITE

SWOT Analysis: Strength

The strength of the selected test design site is mainly about its concentration of resources. Located in front of Zhongli Station is Zhongping Commercial District, where high density of shops congregates here due to the attractiveness of train station. The commercial district becomes a focal point of Zhongli where diverse commercial activities attract urban dwellers to come and gather for leisure, including clothing shops that targets young student groups, diverse choice of catering from mobile stalls providing fast food for commuters to restaurants for friends or family gathering. The advantage also attracts commercial activities that target mainly at immigrant workers, since Taoyuan is stated to have the high concentration of immigrant worker populations. The commercial services are mostly restaurants, grocery shops, and human resource agencies. However, these immigrant worker commercial activites located distant away from the Zhongping Commercial District and congregate more at the less used part of the neighborhood, particularly alongside the underground tunnel, besides railway, or at the much less vibrant back station.

Another concentrated resource is mobility nodes. Not only Zhongli Station serves as one of the main entrance of the urban environment, several bus terminal and stations are located closely to the station. These mobility points also becomes important force on inducing development of the site.

Fig. 84 (Map): Rich resource from prosperous commercial activities

Fig. 85 (Map): Rich resource from concentration of transportation nodes

Fig. 86, 87, 88, 89 (Photo): Site photos showing prosperous commercial activities around the station, hustle-bustle scene of train station during commuting time, and bus terminal Author













SWOT Analysis: Weakness

However, the proximity of the neighborhood to the station also induces problems in multiple aspects. Corresponding to the analysis from project scale in the chapter of problem analysis, connectivity between the opposite sides of the train station is weak. Both for pedestrian and vehicles they could only pass through two tunnels in order to reach the other site of the station. These connections are also in unsatisfactory condition. As for pedestrian tunnels they are perceived as "unsafe" due to dim lighting and occupation of homeless people.

The development of the front and back station is also lopsided. Due to lack of connectivity and earlier development, the urban environment of front station is overdensified by the density of commercial activities, commuters, and vehicles, therefore created unhealthy urban environment. As resources are drained to the front station, back station remained little developped. As consequence, relatively squalid entitied such as metal plate houses, old buildings, underused spaces, and unpleasant streetscapes are observed here.

The two weaknesses linked to the third weakness: bad pedestrian environment. With the overdensified commercial activities, heavy traffic, and failure to include pedestrian walkways contributed to the unfriendly pedestrian environment. Other deficiencies of pedestrian connectivity includes disconnectivity of waterfront and constant construction site from the other urban project such as MRT Airport Line extension.



Fig. 90 (Map): Scarce connectivities between opposite sides of the station

Fig. 91 (Map): Commercial activities create overdensified built environment and visiting population

Fig. 92 (Map): Locations of bad pedestrian connectivity

Fig. 93, 94, 95, 96 (Photo): Pedestrian tunnel under bad condition, overcrowded front station contrast with underused back station, frequent bus creating bad pedestrian environment. Author













SWOT Analysis: Opportunity

Opportunities to the urban environment will be introduced by TRA Taoyuan Project. With the physical barrier of railway transferred to underground, the connectivity of opposite sides of the station will be returned back to ground level. Congestion previously induced by the incapability of tunnels will be alleviated. Moreover, the corridor after the completion of TRA Taoyuan Project enhances the pedestrain permeability on site.

The renovation of the station also provides huge potential to new development opportunities. The reconstructed station could be dedicated to the making of new city image, which would trigger more investment opportunities. The corridor released from the occupation of railway will also have same effect to the urban environment.

Fig. 97 (Map): Connectivity returned to ground level by TRA Taoyuan Project

Fig. 98 (Map): New station as development opportunity

Fig. 99, 100, 101 (Photos): Renewal of Zhongli station will happen, close down of Yuanhua Road Tunnel Author











SWOT Analysis: Threat

However, the construction of TRA Taoyuan Project will impact the existing urban environment hugely. The construction itself will bring huge interference to the neighborhood's daily life, for example, noise from the construction or closedown of roads. The construction of TRA Taoyuan Project will also induce demolishment of existing buildings and replacement of urban dwellers alongsite the project scope.

Furthermore, while the completed TRA Taoyuan Project and reconstructed Zhongli Station could induce new development opportunities to the existing neighborhoods, these new developments have high potential to also induce gentrification. The gentrification would impact on the more marginalized users and further repel them from their current location by increase of land price or implementation of redevelopment plans. In this site, the commercial services targeting to immigrant workers are prone to the side effect of new development.

Fig. 102 (Map): Construction will relocate existing building adjacent to construction site

Fig. 103 (Map): Potential gentrification repelling certain actor groups

Fig. 104, 105, 106 (Photos): Repelled immigrant worker activities due to construction, existing construction of MRT Airport line extension Author











4.2.2 DESIGN BRIEFS FOR THE TEST DESIGN SITE

The SWOT analysis provided insight on what has to be done in order to utilize site potential while solve existing or upcoming urban problems. To further make explicit on these potentials and problems on the site, goals for the design intervention to be achieved are concluded. Aligning with the problems analyzed in previous chapters, the goals will be layered into spatial, economic, social, and environmental.

Spatial Briefs for the Test Design Site

1. Reconnect pedestrian connectivity between front/ back station via open space

The corridor from TRA Taoyuan Project is aimed to return the previously occupied spaces from railway and

Zhongli Station back for public open space. Therefore, the opposite sides of the station could therefore communicate much more freely.

2. Improve pedestrian accessibility of urban dwellers along the project

Not only the pedestrian connectivity between the opposite sides of the station should be improved, but also it should be improved in the direction aligning with the railway. The corridor is also aimed to alleviate the existing poor condition of pedestrian connectivity by providing an alternative, continuous route.



Economic Briefs for the Test Design Site

1. Create commercial spine by improving pedestrian connectivity and introducing new programs between commercial zone of front station and the Qingyun University commercial zone

As site analysis suggested, there is a lopsided contrast between the commercial development of front and back station neighborhood. While the front station is suffocated from the overdensified commercial activities and traffic, the back station remained marginalized and underused. The two sides of the station neighborhood should be balanced. However, for commercial activities it is not feasible to relocate the existing activities to the much less attractive back station. Neither it is necessary to implement more commercial activities on back station. Therefore, a commercial spine connecting the front station and Qingyun University commercial zone souther from the station is suggested. Utilizing the regained connectivity between these two commercial zones, it will mutually benefit the existing commercial scenes. The different programs added on the spine would provide alternative breath of urban experience from the hustle bustle front station. The spine is also aimed to provide new development opportunity to revitalize the urban environment back station.

2. Concentrate existing scattered bus terminals

Most of the public bus terminals are located front station, inducing congestion of traffic. Relocating and concentrating them will alleviate the existing congestion happening on front station.



Social Briefs for the Test Design Site

1. Include multiple users in the using and making of open space, especially immigrant workers

According to the theories reviewed, open spaces should be inclusive to the usage of diverse actor groups. Therefore, a variety of spatial conditions should be provided in order to facilitate the usage and sharing of open spaces to fulfill different actors' need, instead of repelling them from the rights to use the open spaces. In this site, the actors particularly have to possibility to be marginalized are the immigrant worker groups. With the potential new development they could be sacrificed by the result of gentrification. Therefore, the design intervention should not only include all the existing users on site, but also emphasize their values to the city so they will stand robustly with the potential

gentrification.

2. Connect urban dwellers with their city by placemaking

By providing diverse actors the opportunity to use and share the open space, some potential characteristics of the spaces could be provoked. These spaces could therefore be transformed into new character of Taoyuan City, further builds up the city's identity.



Environmental Briefs for the Test Design Site

1. Relieve urban stress from densily built environment and further provide diverse urban landscape experiences

Besides the main aspects focused on the research, which are spatial, economic, and social elements of the neighborhoods, additional values could be added with the consideration of the TRA Taoyuan Corridor as urban green retreat. As the site locates in the centre of the city, the densities of commercial activities, built environment, and commuters are extremely high. WIth the produced noise, air pollution, and psychological stress, the urban stress level is also extreme. Therefore, the corridor is aimed to become a retreat of the overdensified urban environment.

2. Connect with existing open space assets and further

serve as guide to them

The corridor should also connect the existing open spaces such as parks and riverfront by increasing their connectivity from the station and commercial zones. The connection is hoped to introduce the concept of urban open spaces as leisure back to the overdensified urban environment.



4.3 TEST DESIGN APPLICATION

The selection of design intervention will be conducted hand in hand with the theoretical review and goals for the design to achieve. The theories and case studies served as the knowledge on what intervention to be selected for meeting the goal formulated from site analysis. The selected design interventions will be further translated on the test design site according to its spatial configurations, and site programs. Options of test design will be given in order to explore the different possibilities in terms of the arrangement of interventions according to the site condition and goals.

4.3.1 PHASING: PREPARATION ACTIONS

According to the formulated strategical design framework, the implementation action starts with the preparation actions before the actual design implementation of the interventions on the corridor. In the actual implementation of this phase, the anticipated urban projects and predicted urban changes are considered to activate urban regeneration action. These actions and changes include:

- Construction of temporary Zhongli Station to cope with TRA Taoyuan Project's construction

- Closedown of the Yuanhua Road Tunnel due to the construction of MRT Airport Line extension project.

- Alternative routing and widening of Zhonghe Road Tunnel to alleviate the demolishment of Yuanhua Road Tunnel.

- Completion of MRT extension, TRA Taoyuan Project, and reconstruction of Zhongli train station.

Consequence from the construction, which is displacement of existing structure and dweller on project site, is also taken into consideration.

Fig. 121 (Diagram): Phase of Preparation Actions

Fig. 122 (Map): Expected urban project along the segment


60m

120



Reconnect waterfront

As Yuanhua Road Tunnel will be closed down due to construction of MRT Station from Airport Line extension project, alternative routing must be sought to alleviate traffic problem. Zhonghe Road Tunnel will therefore be widened. Accompanied with the widening construction, extension of riverfront promenade could also be simultaneously activated, as the existing promenade is currently blocked by the presence of railway. The implementation of the waterfront reconnection should be conducted by the municipal government as it required the collaboration of Water Resource Agency in Ministry of Economy, Construction and Planning Agency in Ministry of Interior, engineering and design consultant.

After the construction of TRA Taoyuan Project is completed, the corridor will be opened as public space, which connects the waterfront system to the Zhongli Station and city centre. This connection could potentially become the new green-blue corridor of Zhongli city, providing additional value to the city such as ecological rehabilitation or relief of urban stress.

Actor:



Municipal government

Fig. 123 (Map): Indication of urban projects and suggested actions

> Fig. 124: Site view maps.google.com

Fig. 125: Construction phase perspective



Fig. 126: Perspective after the constructions are completed





Reactivate abandoned buildings

As Zhonghe Road Tunnel will be utilized as alternative routing for the closedown of Yuanhua Road Tunnel, the other parts of Zhonghe Road should as well be widened to accommodate the increased traffic. Widening of Zhonghe Road will be constructed alongside with the demolition of structures on the project scope of TRA Taoyuan Project.

The programs to be demolished, which are mainly servicing the Thai and Filipino immigrant workers, will be relocated in the renovation of abandoned building on the other side of the Zhonghe Road. The renovated building could be developed into complex building for immigrant workers with facilities like market, restaurants, and offices for related issues.

After the completion of TRA Taoyuan Project, the part of the corridor adjacent to the immigrant worker complex could also become an open space where exotic market and festival ground could take place. The roadside and corridor could also be activated by the exotic commercial activities, which could eventually transformed into Taoyuan's distinguishing identity.

Since the complex building is renovated instead of constructed, it takes less resource and involved less with regulations. Therefore, renovation could be done either by government or by bottom up approach, for example, labor union of immigrant workers. At the same time, labor union should pay effort on the maintenance of open space as return to the provided asset.



Municipal government

Associations of Immigrant Workers

Fig. 127 (Map): Indication of urban projects and suggested actions

> Fig. 128: Site view maps.google.com

Fig. 129: Construction phase perspective



TEST DESIGN

Fig. 130: Perspective after the constructions are completed

)

-

in the states

TEST DESIGN





Reactivate abandoned bus terminal buildings

As the existing bus terminals create congestion of the traffic and deficiency of pedestrian connectivity, as well the construction of TRA Taoyuan Project would potentially induce more congestion, they are suggested to be redistributed in order to guarantee both better pedestrian environment and traffic flow. These terminals with close proximity to the railway could be relocated to the back station first. The remaining buildings of the bus terminal can be transformed into new developments such as new commercial building, exhibition spaces, or semi-open markets. These new developments could potentially diffuse the density of the front station by creating sub-focal points of the city. The relocation of bus terminals also guarantee enhancement of the pedestrian connectivity.

After the construction of TRA Taoyuan Project is completed, the streetscape would therefore transformed into a view corridor and connectivity to the other side of station.

Similar to the complex building for immigrant workers, these terminals will be renovated. Therefore, renovation could be sponsored by either government, enterprise investments, or smaller entreprenuer, depending on the expected programs to be implemented.

Actor:



Municipal government

Non-governmental organization

Entrepreneur

Fig. 131 (Map): Indication of urban projects and suggested actions

> Fig. 132: Site view maps.google.com

Fig. 133: Construction phase perspective





Fig. 134: Perspective after the constructions are completed





Accessibility return to ground level

The temporary Zhongli Station is planned to be established on the backside of the station. The form of the station is suggested to include a public footbridge to ensure connectivity during the construction of TRA Taoyuan Project. As previously mentioned, the relocation of bus terminals should be integrated with the temporary stations, as the footbridge will provide compensational connectivity from their previous locations. The temporary train station and the relocation of bus terminals will be expected to trigger redevelopment of the back station.

After the completion of TRA Taoyuan Project, the temporary station could be transformed into other programs. The connectivity returned to ground floor will further be transformed into the commercial spine which was set up as one of the design brief.

Relocation of bus terminal, compared to redistribution of commercial activities, is more feasible since these bus lines are owned by central or municipal governments. These transportation nodes also have potential to trigger development of back station, derived by the analysis done regarding the relationship between transportation infrastructure and urban development.

Actors



Municipal government



Entrepreneur

Fig. 135 (Map): Indication of urban projects and suggested actions

> Fig. 136: Site view maps.google.com

Fig. 137: Construction phase perspective







Fig. 138: Perspective after the constructions are completed

















ACCESSIBILITY RETURNED TO GROUND LEVEL



INTEGRATED STATION



MULTINATIONAL PARK

2020

2025+

Fig. 139:

The relationship between the expected urban projects and the suggested urban regeneration actions is summarized by the timeline diagram. The timeframe of the implementation is located along the timeline. It is unfeasible to state exactly the time which actions should take place since they are mostly bottom up approach and also with the consideration of potential delay of expected urban projects, but the sequence of each project and suggested actions are mapped. Furthermore, the expected completion of urban project could serve as the time goal which the actions should be taken place before the completion.

4.3.2 DESIGN INTERVENTION OF TRA TAOYUAN PROJECT CORRIDOR

After initiative projects of urban regeneration as preparation actions, the design of the TRA Taoyuan Project corridor will be conducted. The design intervention that would be implemented on the site of TRA Taoyuan Project are selected from the theoretical review on open space design. The selected interventions will be applied to the site according to the design brief concluded from the site analysis.

Integrative Station with Bus Terminal

As determined in the preparation action, bus terminals will be redistributed in order to achieve the rebalance of the development on the front and back station. Once the temporary train station finished its service timespam, the bus terminals need to be relocated. Therefore, integrated bus terminal that contains all the previously scattered bus terminal should be established upon the reconstructed underground Zhongli train station and newly established MRT station. Utilizing integrated bus terminal as main intervention is supported by the theory of everyday public space, which transportation spaces are considered as the new potential of open space. By establishing the integrated bus terminal, it also alleviates the congestion of traffic between buses and pedestrian since currently the bus terminals are scattered on small streets. After calculation of total footprint needed to integrate all the previously scattered bus terminals, three formal prototypes of the terminal are developed. Option 1 suggested feasibility, therefore, both bus parking and lobby are located on ground. In order not to cut off connectivity of the corridor, the terminal is stretched in length and located on one side of the corridor. Option 2 suggested smallest facility footprint. The terminal will therefore be vertically erected. The parking will be inserted above ground floor, while ground floor remains permeable. The building height could be varied according to planned usage. Option 3 suggested pedestrian connectivity of the corridor. A landscape



bridge will be established to connect the corridor, while terminal facilities located underneath it. This option has the most potential as a "landmark."

Creating Spatial Condition

Taking Carmona's statement, urban design is about creating more "place potential," which manipulates the probabilities of certain actions and behaviors happening, instead of determines human actions and behaviour. Therefore, urban design is to create spatial condition to let actions and behavior to happen, instead of designate fixed programs and expect users to perform exact actions.

The interventions made according to principle are therefore simple spatial conditions without designated usage, but could "manipulate" anticipated activities from users. For example, in order to guide directionality of human flow or activities, wayfinding spatial conditions could be formed by creating connectivity with form of open spaces, alignment of structures, differentiate of paving patterns, or create topography. Focal points could also be manipulated by addition of landmark, relationship between structure and open space, and creation of viewpoint from height difference.

EVERYDAY PUBLIC SPACE



Prototypes of Test Design Options

With two types of intervention derived: integrated bus terminal and spatial conditions, prototypes of test design options are created in order to explore and test how different composition and volume could be arranged on the site. Three options have been formed from the variation of the integrated bus terminal.

Option 1: Mosaic Pattern (Fig. 142)

Following the feasibility scheme of the bus terminal, the corridor will be divided up due to the terminal's longitudinal configuration. Therefore, spaces with variations of width will be created. These various scales of spaces could provide different spatial qualities within the corridor.

Option 2: Micro-segments (Fig. 143)

To minimize the building footprint, the terminal will be formed vertically. The form of the terminal inspired the corridor to be divided into micro-segments. These micro-segments will be differed spatially and programmatically. Anticipated usage and spatial conditions to be applied on each micro-segments will be dependent on adjacent neighborhood.

Option 3: Urban Topography (Fig. 144)

In this option, a landscape bridge on top of the terminal will be constructed in order to form integrity and continuity of the corridor. Therefore, the overall arrangement of spatial quality will also be integral and continuous. In this option, height differences can be manipulated in order to achieve desired spatial qualities.



Interventions from Other Open Space Making Theories

Open Space Design with Social Process + Creating Spatial Conditions in Open Space Design + Urban Acupuncture As already reviewed for strategical design framework, social processes including moving of users or shifting of social structure should be considered in the design process. In practice, it could be integrated with bottomup approaches such as urban acupuncture, to provide opportunities for self-made, small scale, low cost (and sometimes temporary) interventions. Manipulating spatial conditions could also foster bottom-up entrepreneurial or demonstrative opportunities, further integrates into opportunities of placemaking.



Event Space

Fig. 145: Selections of interventions

Interventions from Other Open Space Making Theories

Open Space Design with Social Process + Creating Spatial Conditions in Open Space Design + Urban Acupuncture



Utilities Provided for Selforganized Events

As already reviewed for strategical design framework, social processes including moving of users or shifting of social structure should be considered in the design process. In practice, it could be integrated with bottomup approaches such as urban acupuncture, to provide opportunities for self-made, small scale, low cost (and sometimes temporary) interventions. Manipulating spatial conditions could also foster bottom-up entrepreneurial or demonstrative opportunities, further integrates into opportunities of placemaking.



Providing Various Open Space Experience

Fig. 146: Selections of interventions



Plant Species to Form Nostalgia





Shading Structures

Water Feature

Renovation of

Abandoned House

TEST DESIGN

4.3.3 OPTION I: MOSAIC PATTERN

101 101

101

1 **

.

(TA) (TA

her i h

- Con

Sec : State

17 · 1915 - 191

F

Ð 0

A

(1) (1)

v 4

** *

**

T.JI

27

1 1

Fig. 147: Final Design of Option I: Mosaic Patterns

Lot a a x

E

T

tor tor





Option I: Mosaic Pattern

Since in this option, the integrative station pursues feasibility, all the bus terminal facilities are located on the ground level. The footprint of the station will therefore become the most out of all 3 of the options. In order not to block the accessibility of the corridor, the form of the station is stretched and aligned in order to allow accessibility on one side of the corridor.

With the stretched typology of integrative station, the open spaces on the corridor is therefore divided in different sizes and forms. Furthermore, the formal language could be extended by the implementation of pavilion corridor, which subdivide the sites into different configurations and qualities of spaces. The subdivided open space therefore possesses a spectrum of qualities that could be programmed into different usage. For example, large, continuous shapes could be programmed as event spaces that allows different users to gather and utilize the space freely. The larger spaces could allow events such as public gathering, markets, concerts, which allows different users to express their needs of open spaces. Smaller division of open spaces could be more designed with different intervention to achieve more specific spatial qualities. Monuments or feature gardens could become a focal point or wayfinding intervention that could guide to desired outcome which the design brief has set. The spaces formed by built structures and pavilions could also form a more retreat, enclosed spaces for smaller scale gathering or more passive activities.





Fig. 149: The linear feature garden is implemented as one of the wayfinding interventions. The directionality of the linear feature garden serve as the indicator of the connectivity between front and back station.



Fig. 150: The smaller division of the space by the integrative station will have more distinguished spatial quality from the bigger divisions. These smaller divisions could be designed as an enclosed, quiet gathering place for station visitors.



Fig. 151: The pavilion corridor and existing built structure could together form an enclosed courtyard. Combined with the ground floor program of the existing built structure, which are mostly for immigrant worker's commercial activities, the courtyard could be programmed as outdoor dining area for exotic cuisine.



Fig. 152: The divisions of spaces could provide different outdoor experiences simultaneously. While the more opened spaces are celebrating their international events, the more enclosed spaces still remain its tranquility for passive activities.









1:1,000





1:2,000



Fig. 153: Long section of Option I Fig. 154, 155, 156: Consecutive sections of Option I Fig. 157: Section indication plan 4.3.4 OPTION II: MICRO-SEGMENTS

17 22

The Jone?

a a

(TA) (TA

....

1

0

B

(I) (I)

(E.) (E.)

8

11 · 111 · 11

F

T.JI

** *

4.0

Fig. 158: Final Design of Option II: Micro-segments





Option II: Micro-segments

The integrative station, in order to lessen its required footprint, has its facilities going vertical levels. In order to allow accessibility, the ground floor of the station should be left as an open public plaza.

In Option II, the division of space goes according to the form of the integrative station. Each segment will have its distinct program. The programs are assigned to its adjacent neighborhoods, inspired to the segmentation and thematization of the corridor from problem analysis. For example, the spaces that are adjacent to the integrative station would be used as station plaze, welcoming the commuters' arrival to Zhongli Station.

Lands and roads that were previously blocked by the railway and station will be reconnected. These reconnections serve as the distinction between each micro-segments. With the segments moving farther from the station and commercially vibrant neighborhood, its micro-segment program gradually transformed to more passive, enclosed program, eventually transferred to the residential segment (out of test design site context).




Fig. 160: The space remains open and hard-paved for the micro-segments that are next to the stations. The ground floor plaza of the station serve as a framing of view on the features on these open plazas.



Fig. 161: Farther away from the station, the lesser the openness the micro-segment would be. The urban park with feature landscape elements are located at the micro-segments between newly implemented immigrant complex and commercial residential mixed community.



Urban Courtyard

Fig. 162: At the micro-segment where it is closer to residential communities, more enclosed spaces are implemented. The enclosed space could become a retreat from the hustle bustle urban environment.















1:2,000



Fig. 164: Long section of Option I Fig. 165, 166, 167: Consecutive sections of Option I Fig. 168: Section indication plan

4.3.5 OPTION III: MICRO-SEGMENTSPATTERN

mm

10

TT (T)

0

1

1 · 18 - 18

K

s.,

ALC: N

(1) (1)

8

-

-

13

Fig. 169: Final Design of Option II: Micro-segments

1





Option III: Urban Topography

In order to guarantee thorough connectivity of the corridor, as well provide the maximum surface of open space to the highly densed urban environment, the form of landscape bridge is formed for the integrative station. The ground level is programmed as both the lobby for integrative bus terminal and parking for the buses, while the second floor allows circulation connecting in the direction of the corridor and oppositional neighborhoods.

With the idea of thorough connectivity, the landscape form are also designed according to provide unity and connectivity. The corridor would not be dissected into different segments, while different spatial qualities still can be manipulated by the width of pavings or greenery, or the implementation of corridor pavilion. The formal language itself serve as a directionality guiding to the other segments.

The height difference creates distinct experience from the previous two options. Spaces are divided into different scales by height difference, yet the height difference still provide the visual connectivity, which could become viewpoints for events happening on ground level.

The architecture itself also have additional value on creating the city's new tourist hotspot, further generate new identity of the city.







Fig. 171: Combination spaces is the design concept introduced by the height difference. The difference of height creates different physical space, yet visually they are connected. So either different events could happen simultaneously or big event could happen on ground floor when second floor could still enjoy it visually.



Fig. 172: The landscape bridge allows connectivity of both oppositional neighborhood and in corridor direction. It also creates unique architectural value which visitors could enjoy view from different horizon.



Fig. 173: Entrance garden could be decorated with tropical plantations, triggering a welcoming and nolstalgic atmosphere for the immigrant workers.











1:1,000





1:2,000



Fig. 175: Long section of Option I Fig. 176, 177, 178: Consecutive sections of Option I Fig. 179: Section indication plan





The evaluation chapter serves as the conclusion of the thesis in three aspects:

1. formulating an evaluation method to examine if the design options meet the set parameter from previous problem analysis.

re-conducting the research and design process of the thesis in different scales of TRA Taoyuan project.
 adapting the research and design process of the thesis into a potential approach of working transportation infrastructure implementation in practice.
 reflecting if the research methodology, design process, and design outcome meets the research objective of integrative approach of transportation infrastructure implementation.

Evaluation of test design will be conducted to reflect on how three design options operate in order to achieve the design briefs on site, which the design briefs are the conclusion of the problem analysis in design site scale. Since respectively three options have different spatial configuration and arrangement of interventions, these differences will also lead to divergence in performance. Therefore, comparisons on the divergences in performance will be demonstrated and compared. The method to perform the evaluation is by demonstrating and comparing the performance respectively to the site goals with elaborations and illustrations. An evaluation matrix will be conducted not only for the urban designer to compare, but also potentially become a tool to involve actors by presenting to the decision makers.

Transferrability of the design process and strategy will also be evaluated. In problem analysis, the urban problems have been tackled in three scale. However, actual design actions have only been tested in the neighborhood scale. Therefore, in this chapter, particularly the potential transferrability of the design strategy and process on larger scales will be tested and reflected. In order to test the transferrability, the research and design process from the thesis will be duplicated in brief on different scales. The conclusion of the transferrability exercise should provide insight on what methods could be perform in different scales and what the variables in the research and design process are.

Lastly, as an urban designer, we are not obligated to directly make law for the implementation process. However, it is our responsibility to not only become expertise on design suggestions for the better urban environment, but also process manager that adapt the research and design outcome into an approach. According to Lawren Haprin's theory on "score" of landscape design, it is significant to document, describe processes, and further make transparent of the whole design process (1969). Therefore, the adapted acadamic research and design process from this thesis is hoped to become a powerful suggestion on the optimized implementation approach.



5.1 EVALUATION ON TEST DESIGN

Evaluation on Options: Spatial Briefs

- Reconnect pedestrian connectivity between front/back station via open space

- Improve pedestrian accessibility of urban dwellers along the project

In Option 1, the connectivity will be hindered due to all the facilities will be on ground level, therefore stretches the required service footprint. Building mass of the terminal could be designed with apature opened on needed locations. However, the bus parking lot would still hinder the connectivity.

Since Option 3 is inspired by the concept of connectivity and integrity of urban landscape, it guarantees the best pedestrian connectivity out of the three options. The connectivity on the direction of TRA Taoyuan Project is the strongest due to the implementation of landscape bridge. The elevated bridge could also be extended in oppositional direction, further create a seperate layer of pedestrian from the heavy traffic on ground level.

Evaluation on Options: Economic Goal

- Balance resource distribution and focal points between front and back station

- Include other urban projects to create synergy in commercial development

All three options aimed to return a less traffic density, pedestrian friendly urban environment by the intervention of integrative bus terminal. The narrow streets incapable for buses will be relieved after relocating and integrating of scattered bus terminals. Released spaces from scattered bus terminals could be developed as new focal points of the city centre with better pedestrian connectivity.

The vertical structure of the bus terminal in Option 2 is designated for commercial tower. Therefore, the terminal itself becomes the economic intervention itself. In Option 1, the building mass could have similar potential. The form of bus terminal in Option 3 provides the least volume for commercial development. Yet, its landmark value is the highest out of the three options, which could potential generate touristic revenue for the neighborhood.

However, introducing of new commercial opportunities would potentially lead to gentrification, which repels the weaker actor groups on site.

Fig. 183, 184, 185: Evaluation on the how the options meeting the economic brief

0.1km



Evaluation on Options: Social + Environmental Goals

Include multiple users in the using and making of open space, especially immigrant workers
Connect urban dwellers with their city by placemaking
Relieve urban stress from densily built environment and further provide diverse urban landscape experiences
Connect with existing open space assets and further serve as guide to them

Evaluations of social and environmental goals are combined as their core concept is to provide (diverse experience of) urban open spaces, derived from the theories reviewed regarding urban open spaces.

All three options have their own design considerations on providing diverse and connected sequence of open spaces. Option 1 utilized the footprint of integrative bus terminal to divide the scales of open spaces. Option 2 formed the segments according to adjacent neighborhood, which spatial quality of each microsegments diversifies from one another. Even though Option 3 is aimed to provide a continuous pedestrian experience, unique spatial conditions will be designed with its height difference. The connectivities between these different spatial conditions are all guaranteed, and they are further extended to existing assets of parks and riverfront promenade.

> Fig. 186, 187, 188: Evaluation on the how the options meeting the social + environmental brief Fig. 189: Evaluation matrix Fig. 190: Model as a tool to demonstrate to public



Presentation and Evaluation Matrix

Potential evaluation should not be made only for designers to elaborate the advantages of each options, but also be involved with actual actors in order to assist on their desicion making. Evaluation matrix is made for the decision makers to understand the design considerations behind each options. Drawing will be made explicit to become the tool of elaborate design considerations. The matrix will also become a tool to select which options or spatial conditions are desired. An option could be selected after understanding its advantage in all three aspects. If feasible, a new option could also be made with the combination of desired operation from different options.

As urban designers, we are equipped with the knowledge of what the optimized options as the solutions of existing urban problems. Therefore, the presentation of options could also become an powerful tool that could accent and guide the audiences to the preferred options.



5.2 EXAMINING TRANSFERRABILITY OF METHODOLOGY

Transferrability from Neighborhood Scale to District Scale

In order to examine its transferrability, the methodology on the design of neighborhood test design site will be conducted in brief. In ther problem analysis, the segments have already been studied and "thematized," which provided the fundamental concept on their respective potentials. Following the strategical design framework, the impacts that are caused by the construction of TRA Taoyuan Projects and establishment of anticipated urban projects are all taken into consideration. By replicating the design methodology briefly according to the knowledge of each segments, the open space programs, applied interventions, and desired interaction with adjacent urban environment on respective segments could therefore be primarily determined.



Fig. 191:

Research-Design process chart for Urban Stitches Fig. 192, 193: Examinination of transferrability by reconducting the research-

design process: utilizing the upcoming urban projects and further combining them with programming of segments





Commercial Axis Transportation Node



Community Garden Urban View Corridor



University Boulevard Creative Base

Global Garden

Transferrability from Neighborhood Scale to Municipal Scale

The bottom-up approach initiated from the neighborhood scale might not be applicable to the whole 18-kilometer project scope of TRA Taoyuan Project. Therefore, parameter of certain methods should be changed in order to adapt to different scale. One suggestion is the segmentation and thematization of the site could be varied. Criteria for thematization of each segments in the district scale studies should be translated into the dissection of the whole 18-kilometer project scope, which is typo-morphology classification and spatial distributions of actors to get a grip on socioeconomic development problems and challenges from empirical evidence. Therefore, applied to the urban environment of TRA Taoyuan Project, the built environment which has complicated typo-morphology classification or actor conflicts would have more segment units, while the industrial zone or agricultural landuse would have more homogenous segments.

The scale of other urban projects that are to be integrated should also be considered. Ongoing urban projects in municipal scale, such as addition lines of MRT system, redevelopment of urban spaces, and anticipated expansion of the city should all be interweaved with one another and further trigger redevelopment opportunities.

Fig. 194:

Research-Design process chart for Urban Stitches Fig. 195:

New parameter of typomorphological classifications: The criteria for thematization and segmentation of the site could have different parameter in larger scale, more homogenous landuse such as agricultural and industrial landuse could be thematized as larger segments, while within the dense urban environment the segmentation dissects the site more frequently

Fig. 196:

Ongoing urban projects in the scale of overall TRA Taoyuan Project





5.3 POTENTIAL ADAPTATION OF RESEARCH-DESIGN PROCESS TO PRACTICE

The academic research-design process could be adapted to feasible practice approach by suggesting actions in each stage of the process. Following is the example actions that could be implemented throughout the researchdesign approaches. The research and analysis on the existing urban problem which an implementation of transportation infrastructure could encounter should be publicized. The publicizing of the urban issues would enhance the public awareness of ongoing urban project, further increase the interest of participation. The criteria for thematization of project sites could be translated into new landuse regulation. The landuse regulation could suggest the design of open space program according to the typomorphological classification and actor analysis of adjacent urban environment. In order to project the scenario prediction and phasing strategy, the establishment of multi-actor platform which every actor expresses their consideration and future actions should be implemented. To grasp a thorough understanding on social studies of urban environment, integrative workshops with multiple actors could be conducted. Lastly, the presentation of design options could be voted by all the involved actors. In general, the approach aims to reach the higher level of citizen participation in transportation infrastructure implementation, according to Sherry Arnstein's work "A ladder of citizen participation" (1969).

We, urbanists, are also involved actors. Therefore, it is necessary that the detailization of the approach adaptation should be further carried out by communication with other disciplines, for example, government planners, lawmakers, engineer, and other involved actors , further meets the research objective of integrative implementation approach of transportation infrastructure.



Fig. 197: Diagram of A Ladder of Citizen Participation Sherry Arnstein Fig. 198 Adapting the research-design process with practice actions



5. CONCLUSION

The research objective of the thesis is to elevate TRA Taoyuan Project into an opportunity to integrate and trigger desired urban regeneration actions of its located urban environment. While it becomes a national trend of Taiwan to upgrade the existing transportation with innovative technologies, the trend have also drained away the attention and resource that should be aim to regenerate the existing degrading urban environment. Furthermore, historical and current practice of transportation infrastructure implementation has been proven to be detached from the consideration of urban environment. As evidences, vast amount of urban problem, for example, overdensification of station area, separation and inaccessibility of the opposite sides of the railway, unequal resource distribution among different neighborhoods, are all induced by the inconsideration of transportation infrastructure implementation. In the conclusion, four crucial outcomes that are achieved throughout the research and design process of the thesis in order to approach this research objective will be summarized.

The scenarios of TRA Taoyuan Project are predicted by the understanding of potential vulnerabilities, which refer to flaws of planning process and socio-political interference. Concluded from theoretical review, predicted scenarios have been reduction of project scope, privatization and compromise of public service, and postponement due to actor conflict. The scenarios served as crucial stepstone to the stage of theoretical review and design strategy. Theories and case studies are selected to be reviewed as principles to accommodate and alleviate the impacts predicted in respective scenarios. Design strategy of TRA Taoyuan Project is also aimed to integrate the consideration of potential impact predicted in these scenarios.

A strategical design framework is formulated after the scenario prediction and related theoretical review. The strategical design framework suggests to approach the design of TRA Taoyuan Project even before the completion of design intervention on the corridor. Urban regeneration actions should already be initiated in order to alleviate, or even utilize, the impact of construction consequences that will be brought to the urban environment. These regeneration actions during the construction phase should also be synergized with design interventions that will be implemented on the TRA Taoyuan Project corridor.

Test design options are formulated as the spatial intervention on the corridor of TRA Taoyuan Project. The outcomes are the variation on the combination and arrangement of the spatial interventions derived from theoretical review. The sequence of spatial interventions will be translated on the site according to the design goals that are aimed to activate the potential of the site, as well to alleviate the crucial problems on the site. Eventually, three options are designed with the variation of composition, volume, and programs.

Evaluations as the conclusion of the thesis to reflect if the research methodology, design process, and design outcome meets the research objective of integrative approach of transportation infrastructure implementation. Evaluation of test design are conducted to reflect on how three design options operate in order to achieve the design goals on site. Transferrability of the design process and strategy will also be evaluated. As actual design actions have only been tested in the neighborhood scale, it is crucial to demonstrate the potential transferrability of the design strategy and process on larger scales.

As a general final remark, in the process of approaching the research objective, it is not only about the effectiveness of each step, for example, a splendid design outcome or comprehensive planning strategy, but more about how these steps chereograph into together while also constantly support, review, and complement one another, following the reiterative methodology of combination of "research-based design" and "designbased research."

REFLECTION

Research Objective and Evaluation

To elevate a transportation infrastructure project into

an opportunity to integrate and trigger desired urban regeneration actions of its located urban environment is a huge topic that could cover all dimensions within an urban environment. Therefore, the introduction of TRA Taoyuan Project is introduced to serve as the case study in order to set criteria on what theories and aspects of urban problems to be reviewed.

Derived from the research on problem field and problem analysis, the problems identified and theories reviewed are mainly on socio-spatial and socio-political aspects. The outcome therefore has been guided to the strategy on how to trigger urban regeneration by considering the social process of urban project implementation, and design of a social-inclusive corridor where every actors enjoy the right to get connected and utilize the space.

With the direction of the thesis formulated into the more social aspect, I was drawn into the dilemma on how to evaluate the effectiveness or correctedness design outcome and design process. Unlike connectivity issues that could be examined by SpaceSyntax, or climate/ water management/pollution issues that could be quantified and simulated by related theories or tools, the evaluation of social issues remain specifically subjective to the actual users of the urban environment. Therefore, during the process of formulating evaluation regarding if my design outcomes could meet the research objective, I have been doubtful on the effectiveness of evaluation that is determined and performed by designer. Eventually, instead of formulating evaluation that gives defined preference on the options, an evaluation method is created that allows the actors who are indeed involved in the project to choose their most desired options.

Transferrability of the Methodology on Bigger Scale

Since the methodology is formed based on the smallest scale (neighborhood), it remains the most effective when it is performed in the same scale. In order to test the transferrability on the methodology working towards the integrative approach on transportation infrastructure renewal project, application of the methodology on larger scale is operated. During the testing process, constraint on of the methodology is discovered. The bottom-up approach has its limitation when encountering larger scale urban problem. In the problem analysis, structural problems on municipal scale, particularly transportation induced overdensification, proximity of industrial area to city centre, and urban sprawl of new towns could not be effectively solved with bottom up approaches.

Design-Research Relationship

The relationship between research and design in this particular thesis could be described as the combination of "Research-based design" and "design-based research." Therefore, in this thesis, research and design complements each other in problem solving and forms a reiterating process.

The downfall of the approach is the difficulty of completion in the given timeframe of a year on the thesis. In the thesis, a huge part of the time is contributed to the build-up of the research-design process. Adding upon the completions of graduation course deliverable, this reiterating reasoning procedure compromised the time and effort that the methodology could be re-conducted on different sites, scales, or projects in order to examine its transferrability.

- "About the High Line | Friends of the High Line." The High Line. N.p., n.d. Web. 14 May 2017.
- AFP. "Taiwan Urban-renewal Program Derided as Political Ploy." The Manila Times. N.p., 27 July 2007. Web.
- Albrechts, Louis. "Planning and power: towards an emancipatory planning approach." Environment and Planning C: Government and Policy 21.6 (2003): 905-24. Web.
- Arnstein, Sherry R. "A Ladder Of Citizen Participation." Journal of the American Institute of Planners 35.4 (1969): 216-24. Web.
- Annez, Patricia Clarke. "Urban Infrastructure Finance From Private Operators : What Have We Learned From Recent Experience ?" Policy Research Working Papers (2006): n. pag. Web.
- Biggs, Michael, and Daniela Buchler. "Eight criteria for practice-based research in the creative and cultural industries." Art, Design & Communication in Higher Education 7.1 (2008): 5-18. Web.
- Bhatta, Basudeb. "Chapter 2. Causes and Consequences of Urban Growth and Sprawl." Analysis of urban growth and sprawl from remote sensing data. Heidelberg: Springer, 2010. 17-36. Print.
- Bramley, Glen., S Power and Nicola Dempsey. What is 'Social Sustainability', and how do our existing urban forms perform in nurturing it? UK Planning Research Conference, UCL, April 2006.
- Brooks, Douglas H., and Jayant Menon. Infrastructure and Trade in Asia. Cheltenham, Glos, UK: Edward Elgar, 2008. Print.
- Burgess, Rod. TECHNOLOGICAL DETERMINISM AND URBAN FRAGMENTATION: A CRITICAL ANALYSIS. School of the Built Environment, n.d. Oxford: Oxford Brookes U, 2005.

- Calcagno, Peter T., and Monica Escaleras. "Party Alternation, Divided Government, and Fiscal Performance within US States." Economics of Governance 8.2 (2006): 111-28. Web.
- Carmona, Matthew. Public places, urban spaces: the dimensions of urban design. Milton Keynes UK: Lightning Source UK. Ltd, 2010. Print.
- CECI Engineering Consultants, Inc. 臺鐵都會區捷運 化桃園段高架化建設計畫 改採地下化可行性研 究報告) (TRA Feasibility Report on Transition of Elevated Railway Project to Underground Project in Taoyuan Urban Area). Rep. Taoyuan: Department of Transportation, 2015. Web.
- Cervero, Robert. "Integration of Urban Transport and Urban Planning." The challenge of urban government: policies and practices. By Richard E. Stren. Ed. Mila Freire. Washington, D.C.: World Bank, 2001. N. pag. Print.
- Chan, Thomas Shun-Kuei. " 台 灣 BOT 的 問 題 出 在哪裡? (The problem of BOT operation under Taiwan)." Taiwan Environment Information Centre. Taiwan Environment Information Centre, 3 Feb. 2015. Web.
- Chang, Ying-Hwa. Urban Policy, Globalization and Urban Development in Taiwan: Comments on Taiwan Social Gazette - Volume on Urban Development. Thesis. Research Center for Humanities and Social Sciences, n.d. N.p.: Academia Sinica, 2007. Print.
- "Cheonggyecheon Stream Restoration Project." Landscape Performance Series. N.p., 2015. Web. 14 Nov. 2016.
- Chien, Jung-fong. " 六都首長滿意度調查 花媽奪冠、 柯 P 墊底. (Satisfaction survey on the performance of majors in 6 main Taiwanese cities" The Liberty Times Online. The Liberty Times, 20 Dec. 2016. Web.

- Chiu, Yi-tung. " 台鐵高架工程動起來>桃園臨時站 明年春節啟用 (Temporary TRA Taoyuan Station will be brought to use in 2015)." News Section of Taiwan Realty All Rights Reserved. The Liberty Times, 27 Mar. 2014. Web.
- Chu, Shu-Chuan. " 台南鐵路地下化告訴你,政府為什麼習慣強徵民地? (Introduction of land acquisition: The case of TRA Tainan Underground Railway Project)." Web log post. 端傳媒 Initium Media. Initium Media, 7 Sept. 2016. Web.
- Corner, James, and Alison Bick Hirsch. The Landscape Imagination: Collected essays of James Corner, 1990-2010. New York: Princeton Architectural Press, 2014. Print.
- Cuenya, B.E, and P. Drewe. Large Urban Projects and Social Actors: Forces Supporting and Opposing the Production. Thesis. Thesis / Dissertation ETD, 2006. N.p.: n.p., n.d. Print.
- Douglas, I. Peri-urban ecosystems and societies transitional zones and contrasting values. In: McGregor, D., Simon, D., Thompson, D. (Eds.), Peri-Urban Interface: Approaches to Sustainable Natural and Human Resource Use. Earthscan Publications Ltd., 2006. London, UK, pp. 18–29.
- Elkington, John. "Enter the Triple Bottom Line." The Triple Bottom Line, Does It All Add Up?: Assessing the Sustainability of Business and CSR. By Adrian Henriques and Julie Richardson. London: Earthscan, 2004. N. pag. Print.
- "FIBERCITY." FIBERCITY. Ohno Laboratory, the University of Tokyo, n.d. Web. 14 Nov. 2016.
- Glasson, John, and Graham Wood. "Urban Regeneration and Impact Assessment for Social Sustainability." Impact Assessment and Project Appraisal 27.4 (2009): 283-90. Web.

- Hall, Tim and Phil Hubbard. The entrepreneurial city and the new urban politics. The Entrepreneurial City (1998). John Wiley and Sons, West Sussex, England. pp. 1-26.
- Halprin, Lawrence, Lawrence Halprin, and Lawrence Halprin. The RSVP cycles: creative processes in the human environment. New York: Braziller, 1981. Print.
- Harrison, Ariane Lourie. Architectural theories of the environment: posthuman territory. New York, NY: Routledge, Taylor & Francis Group, 2013. Print.
- Hitchcock, Darcy, and Marsha Willard. The business guide to sustainability: Practical strategies and tools for organizations. London: Earthscan, 2009. Print.
- Holland, Caroline. Social interactions in urban public places. York: Joseph Rowntree Foundation, 2007. Print.
- Hsu, Tzu Ching. " 桃園鐵路地下化案 送行政院核 定 (TRA Taoyuan Underground Railway Project has been sent to Execution Yuan for Review)." UDN Online. United Daily News Co., Ltd., 27 Dec. 2016. Web.
- Huang, Shu-Li, Szu-Hua Wang, and William W. Budd. "Sprawl in Taipei's Peri-urban Zone: Responses to Spatial Planning and Implications for Adapting Global Environmental Change." Landscape and Urban Planning 90.1-2 (2009): 20-32. Web.
- Hung, Jui-chin, and Yu-huang Feng. "〈南部〉《鐵路 地下化拆遷》比照北捷? 市府:待研究 (Land Acquisition of TRA Tainan Underground Project Will Refer to the Case of Taipei MRT? Minicipality: To Be Decided)." Liberty Times Net. The Liberty Times, 9 Nov. 2012. Web.
- James, Paul. Urban Sustainability in Theory and Practice: Circles of Sustainability. Abingdon, Oxon: Routledge, 2015. Print.

- Kaye, Leon. "Could cities' problems be solved by urban acupuncture?" Web log post. Guardian sustainable business. The Guardian, 21 July 2011. Web.
- Lin, Chung-Cheng, and Derek Hsieh. " 食物貴景點 少!桃園遭點名「最無聊縣市」(Taoyuan Elected as "Most Boring City")." Chinatimes.com. China Times Group, 3 May 2016. Web.
- Liu, Paul K. C., and An-Chi Tung. "Urban Development in Taiwan: Retrospect and Prospect." Journal of Population Studies 26 (2003): 1-25. Center for Population and Gender Studies. Web.
- Liu, Yao-Hua. 台灣都市發展史 (Urban Development History of Taiwan). Thesis. Feng Chia University, n.d. Taichung: Department of Urban Planning and Spatial Information, 2004. Print.
- Luo, Zhen, and Benla Kuang. "大埔強拆周年》歷史 不能忘記 大埔事件公庫全紀錄 (Anniversary of Dapu Incident)." Weblog post. Civilmedia@Taiwan. N.p., 18 July 2014. Web.
- Moudon, A. V. "A Catholic Approach to Organizing What Urban Designers Should Know." Journal of Planning Literature 6.4 (1992): 331-49. Web.
- Nijhuis, Steffen, Daniel Jauslin, and Frank Van Der Hoeven. Flowscapes: Designing Infrastructure as Landscape. Delft: TU Delft in Cooperation with Delft Infrastructures & Mobility Initiative, 2015. Print.
- Nijhuis, Steffen, and Inge Bobbink. "Design-related research in landscape architecture." J. of Design Research 10.4 (2012): 239. Web.
- Oldenburg, Ray. Celebrating the third place: inspiring stories about the "great good places" at the heart of our communities. New York: Marlowe & Co., 2001. Print.
- Pan, Tsu-yu. "亞洲矽谷執行中心花落桃園 11 月 啟動 (Asian Silicon Valley is Decided to be Located

in Taoyuan, Plan Starting in November)." UDN Online. United Daily News Co., Ltd., 7 Oct. 2016. Web.

- Peng, Chun-Bi. " 潤泰拿下台鐵南港、松山兩車站 BOT 開發 (Ruentex Group win the BOT concession of TRA Nangang and Songshan Station)." Epoch Times, 14 May 2007. Web.
- "Project Background." The Big Dig. Massachusetts Department of Transportation Highway Division, n.d. Web. 14 Nov. 2016.
- PUBLIC-PRIVATE-PARTNERSHIP IN INFRASTRUCTURE RESOURCE CENTER. "Concessions, Build-Operate-Transfer (BOT) and Design-Build-Operate (DBO) Projects." Public private partnership. WorldBank Group, 13 July 2016. Web. 31 Dec. 2016.
- Railway Reconstruction Bureau. "交通部鐵路改建工程局 計畫介紹 (Project Introduction from Railway Reconstruction Bureau Ministry of Transportation and Communications)." 交通部鐵路改建工程局 計畫介紹. N.p., 19 Feb. 2015. Web. 15 Nov. 2016.
- "Research introduction." Design of the Urban Fabric. N.p., n.d. Web. 09 May 2017.
- Read, Stephen. (2009). Another Form: From the "Informational" to the "Infrastructural" City. Footprint Delft School of Design Journal, Metropolitan Form, 5-22.
- "RichardSennett.com." Quant Richard Sennett. N.p., n.d. Web. 14 May 2017.
- Roberts, Peter W., and Hugh Sykes. Urban regeneration: a handbook. London: SAGE, 2000. Print.
- Rogerson, Robert J. "Quality of Life and City Competitiveness." Urban Studies 36.5 (1999): 969-85. Web.

- Stanley, Jason. Development-induced displacement and resettlement . Oxford: Refugee Studies Centre, U of Oxford, 2004. Forced Immigration Online. University of Oxford, 2004. Web.
- "Sustainable." Merriam-Webster.com. Merriam-Webster, n.d. Web. 14 Nov. 2016.
- "The Two-Party System Boundless Open Textbook." Boundless. Boundless, 21 Dec. 2012. Web. 31 Dec. 2016.
- Tseng, Shu-Cheng. " 臺灣的都市 (Cities of Taiwan)." Taiwan Studies over the Internet. Academia Sinica, Aug. 1999. Web. 15 Nov. 2016.
- WACOSS Model of Social Sustainability. West Perth: Western Australian Council of Social Service Inc, 2002. Western Australian Council of Social Service Inc. 2002. Web.
- Yeh, Wan-An. "十大建設 (Ten Major Construction Projects)." China Encyclopedia Online. Chinese Culture University, n.d. Web.
- Yücesoy, Eda Ünlü. Everyday urban public space: Turkish immigrant women's perspective. Amsterdam: Het Spinius, 2006. Print.
- 蘋果日報 (Appledaily). "中和緬甸街 異國風濃 華 僑聚落變身觀光街." 蘋果日報. N.p., 03 Nov. 2006. Web. 14 May 2017.
- "大台中新風潮: 重大工程停擺 (Trend in Metropolitan Taichung: The Cessation of Large Scale Constructions)." Web log post. Heretic Blog. N.p., 1 Aug. 2011. Web.
- " 台 北 大 巨 蛋 爭 議 多 (Controversies around Taipei Dome)." Yahoo! Taiwan News. Yahoo! Taiwan, 2016. Web.

- " 台北市松山區民生社區發展協會. (Community Development Associations of Mingshen Community, Songshan District, Taipei City) N.p., n.d. Web. 14 May 2017.
- "機場捷運 BOT 案怠於救濟 致政府權益受損 監察院通過彈劾交通部前部長林陵三、高鐵局前局長何煖軒 (The Impeachment of Ling-san Lin, Minister of Ministry of Transportation and Communications, and Nuan-shuan Ho, Deputy of Director of Taiwan High Speed Railway due to Airport MRT BOT controversy)." Announcement from the Control Yuan, Republic of China (Taiwan). The Control Yuan, Republic of China (Taiwan), 5 Feb. 2015. Web. 31 Dec. 2016.
- "中南部人口負成長 桃園市人口激增 (Drastic growth of immigration rate in Taoyuan City, while decline in Central and South Taiwan)." Liberty Times Net. The Liberty Times, 24 July 2016. Web.
- " 產 業 園 區 現 況 介 紹 (Introduction of Taoyuan Industry Zones)." Business News. Department of Economic Development, Taoyuan, 23 Dec. 2016. Web.
- " 鳴齁,好地下化,不做嗎? 5 分鐘看懂「桃園 鐵路地下化」(Summary of TRA Taoyuan Railway Underground Project)." Web log post. 全面真軍 Fight for Real. N.p., 4 Sept. 2015. Web.