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Master's Thesis

*Investigation of Infrastructure's impacts on
rural communities' values in China —a case
study of Hangzhou Bay Bridge*

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APPROVAL

The thesis attached hereto entitled “Investigation of Infrastructure’s impacts on rural communities’ values in China —a case study of Hangzhou Bay Bridge” prepared and submitted by Chen Haiting in partial fulfillment of the requirements for the degree of Master of Sustainability Science is hereby accepted

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Abbreviation

MDGs	Millennium Development Goals
NGOs	Non-government organizations
CSR	Corporate social responsibility
CCVs	Chinese Cultural Values
CCP	Chinese Communist Party
PRC	People's Republic of China
SST	Social Shaping of Technology
SIA	Social Impact Assessment
PPP	Public-Private Partnerships
PFE	Private Finance Initiative
EDZ	Economic Development Zone
DI	Deviation Index

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ABSCTRACT

According to the *Chinese Rural Infrastructure Construction Report 2009*, both infrastructures for agricultural production and for public services are far from enough. To fulfill the gap between demand and supply, also to realize rapid urbanization and industrialization, more and more attention is being paid to, and more and more investments are flowing into the rural areas for infrastructure construction because time and again it has been emphasized that infrastructure is an important conduit of development. However, the cultural consequences of infrastructure involving changes to the behaviors, beliefs and values of individuals that guide their cognition of themselves and their society are seldom considered by the decision makers when almost all attention is paid to the engineering and cost-benefit analysis. In fact, infrastructure, as an application of technology, is an autonomous system generates cultural consequences through its “chain effects”. That means infrastructures can bring changes to the local community and in order to acclimatize themselves to these changes, communities may have new behaviors and customs. And these new activities may arouse communities’ different awareness about the social phenomena and incubate new ideas. Finally, these changes could go deep enough to shape local communities’ values in certain level.

U.S. National Environmental Policy Act Legislation once introduced social impact assessment (SIA) to judge infrastructures’ social effects in 1969. However, SIA is still not widely adopted in current China. So people, especially the rural communities with low educational background, cannot connect the value evolvement with infrastructures or even cannot realize the changes of their values.

This research aims to uncover the inconspicuous effects of infrastructure on rural communities’ seven specific values: Familism, Gender Inequality, Hard working, Weak civic consciousness, Frugality, Unadventurous in investment and Low environmental awareness. Because rural communities in China shaped by a tradition of four thousand years of history and less affected by the open policy implemented since late 70s, they

are keeping these specific conventional values that unique and distinguish them from urban communities.

Firstly, by reviewing previous literatures and learning existing examples, author summarizes that the infrastructure's impacts on values are following with three main aspects – The expected functions of infrastructure including “developing regional economies”, “assisting working activities”, “spreading knowledge and information”, “expanding communities' social circle” and “enhancing communities' living conditions”; Infrastructure's own characters including “its relationship with environment”, “the operational model”, “the financing model” and “the land use”; And the detail designs of infrastructure. The chain effects after these elements on the specific values are depicted and discussed.

Then, a case study of Hangzhou Bay Bridge was conducted. Even though neither local communities nor official organizations have realized the bridges' cultural consequence, the results of questionnaire survey illustrated that local rural communities' values were certainly changed because of the bridge construction and utilization: the values of “gender inequality”, “hard working” and “unadventurous in investment” were changed greatly while the values of “weak civic consciousness”, “frugality” and “low environmental awareness” are changed a little. And through the afterward individual interviews and observations, some reasons were detected and the role of bridge was clarified.

Based on the analysis of infrastructure's impacts on rural communities' values, new definition leading people to pay attention on infrastructure's cultural consequences is given. Several policy recommendations are also generated for the decision makers.

Key words: infrastructure; cultural consequences; chain effects; communities' values

1. Introduction

1.1 Background

1.1.1 Definitions and Boundaries

1.1.1.1 Definitions and boundaries of infrastructure

Infrastructure, familiar to everyone, is the word often used to describe large-scale public system like power, water supply, roads, public transportation, etc. However, there is still no universally recognized definition and clear boundary of infrastructure. Attempts to define infrastructure have been made by national agencies, provinces and states, municipalities, professional and trade organizations, the financial community, academia and, of course, dictionaries. Here listed some example descriptions:

- *“A network of independent, man-made systems and processes that function collaboratively and synergistically to produce and distribute a continuous flow of essential goods and services.”* (President’s Commission on Critical Infrastructure Protection of United States, Oct, 2007)¹
- *“The substructure or underlying foundation or network used for providing goods and services; especially the basic installations and facilities on which the continuance and growth of a community, State, etc., depend.”* (US Environmental Protection Agency)²
- *“The infrastructure supporting human activities includes complex and interrelated physical, social, ecological, economic, and technological systems.”* (American Society of Civil Engineers, 2009)³
- *“The essential facilities and services that the economic productivity of a community or organization depends on. As a real return asset class, infrastructure includes those assets that are involved in the movement of goods, people, water and energy.”* (Weisdorf, 2007)⁴
- *“The physical components of interrelated systems providing commodities and*

services essential to enable, sustain, or enhance societal living conditions.” (Fulmer, Jeffrey, 2009)⁵

- *“Infrastructure assets are long-lived capital assets that normally are stationary in nature and can be preserved for a significantly greater number of years than most capital assets. Infrastructure assets are often linear and continuous in nature.” (University System on Georgia)⁶*

Summarize these definitions, and combine the practical conditions in China, the infrastructure in this research means **a set of public works which provide reliable goods and services to facilitate human being’s activities in a long-term period**. There are three main characters of this definition: Firstly, no matter owned by government or private sectors, the infrastructures are used by public and accessible to most communities. Then, the function of infrastructure is providing goods and services to support people’s daily lives and assist social activities. Moreover, the infrastructure will be existed for a relative long time from several decades to even several centuries. Its effects including expected ones and unexpected ones are also last in long-term.

1.1.1.2 Definitions and boundaries of value

Values have been described as enduring beliefs that specific modes of conduct or states of existence are socially preferable to their opposites (Rokeach, 1973).⁷ A value system is seen as a relatively permanent perceptual framework that influences an individual’s behaviors (England, 1978).⁸ In this research, **values are considered as enduring beliefs or ideals shared by the members of a culture about what is good or desirable and what is not**.

In 1976, Edward T. Hall developed an iceberg analogy of culture which clearly explained value’s status in the society. (Fig 1-1) The external part of culture is what we can tell easily from the daily life and is the tip of the iceberg including behaviors and customs. The beliefs and attitudes connecting behaviors and values are in the middle of the iceberg. Part of them is conscious but the other part is unconscious. Value, the internal part of culture underlies beliefs and attitudes are below the surface of a society. It is the

underlying and main drive to shape peoples' beliefs and guide their behaviors.

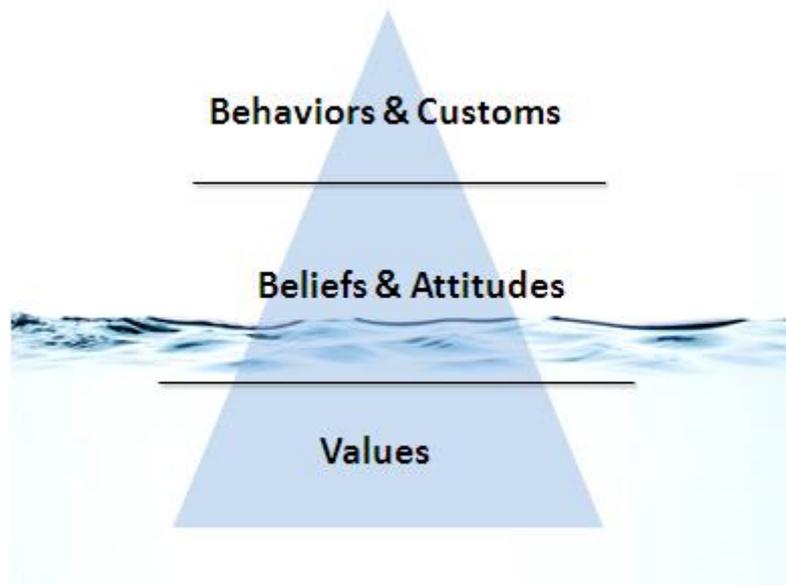


Fig 1- 1: Iceberg analogy of culture

(Source: Beyond Culture, 1976 by Edward T. Hall)

1.1.2 Infrastructures in rural China

According to the World Bank, infrastructure has a central role in the development agenda and is a major contributor to growth, poverty reduction and achievement of the MDGs.⁹ It underpins a country's economic potential – in today's world no country can expect to succeed without a solid infrastructure base.¹⁰ In the third Plenum (Plenary Session) of the 17th Communist Party of China Central Committee, the improvement of rural infrastructure was defined as the main push of rural reform because infrastructure is not only the main supporter to improve residents' lives and increase their incomes in rural areas, but also the foundation of building a new socialist countryside. Following the plans and requirements made by central government, since 2008, China has vigorously adjusted the investment structure and further increased the input to rural infrastructure construction that effectively ameliorated the living conditions and promoted the development in rural areas.

In 2009, 49% financial budget was devoted in rural infrastructure including water supply, electricity access, traffic, energy supply, housing, education and health care:¹¹

(1) Water supply: Central government invested 20.2 billion Yuan providing safe drinking water to 6069 households.

(2) Electricity access: Central government invested 13.2 billion Yuan to promote the grid construction in western rural areas where there was no electricity access before. 329 thousands households, totally 1.251 million people became able to use electrical equipments due to the new 263,000 km electric power circuits. On the other hand, the government also provided financial and technical support to develop local production for local consumption. Solar PV and small hydro were more and more popular in rural areas.

(3) Traffic: Central government invested 17 billion Yuan to strengthen the road construction in rural areas, especially in western region. Within just one year, new built and repaired roads were reaching to 380,000 km. At the end of 2009, 92.67% towns were accessible by asphalt concrete pavements and 91.11% administrative villages were accessible by roads.

(4) Energy supply: Central government invested 8 billion Yuan help 3.33 million households build biomass pools, adding investments from local governments and private sectors, totally 5 million households had been using biogas in their daily lives. At the same time, 1579 large and medium scale biogas plants were constructed to provide 48700 energy supply service branches.

(5) Housing: Central government invested 1.7 billion Yuan to support the renovation of 247 thousands dilapidated buildings in rural area and 6.6 billion Yuan to help 260 thousands households of nomads settle down.

(6) Education: Central government invested 50 billion Yuan launching a project to ensure school buildings' safety. About 375 thousands schools with 2.17 million buildings were examined and among them, more than 2400 schools were ordered to renovate their buildings. On the other hand, central government invested 20 billion Yuan for teaching and experimental equipments which could improve the efficiency of education.

(7) Health Care: Having unified planning and target key points, central government invested 15.5 billion Yuan to support construction of 986 county-level hospitals and 2.5 billion to 3549 town-level hospitals.

Not only the governments are interested in infrastructure construction in rural areas, NGOs are also the key stakeholders taking part in it actively: China Youth Development Foundation has launched the famous Hope Project that seeks to aid schools in urgent need of being rebuilt or modernized in rural areas.¹² The Amity Foundation, a Christian group working to promote education, social services and rural development, are cooperating with many infrastructure projects helping rural residents build water pumping stations and biogas systems to improve living standards.¹³ The Guangcai Program of which the mission is aiding the poor and achieving the common prosperity donated great funds to road construction in western rural regions.¹⁴ China Villagehelp Project is working on building information-based network and promoting informatization in rural areas.¹⁵

Besides the governments and NGOs, more and more private sectors are participating in rural infrastructure projects for their corporate social responsibility (CSR) and potential financial return.

Even though various circles are working on rural infrastructure construction, there are still many deficiencies which can be reasoned from two perspectives. From the supply side, because the decision of strengthening rural infrastructure was just made in recent years, many projects are facing problems: immature management, technical blocks and short of funds, resources and time. From the demand side, 900 million rural populations have generated huge demands of goods and services that could not be satisfied by the existing infrastructures. The improvements of rural residents' living conditions and booming of rural industries propose big challenges and great pressures on rural infrastructures. What's worse, in the near future, a lot of aging infrastructures are going to be out of commission and therefore, the gap between demands and supplies may become even bigger. Obviously, to complete rural reform and meet the requirements of rural development, there is still a long way to go and accelerate the speed of

infrastructure constructions in Chinese rural areas is an inevitable trend. As a result, more and more attention will be paid to, more and more investments will flow into the rural areas for infrastructure construction.

1.1.3 Rural communities’ specific values in China

Two most widely used models for analyzing cultural values are Kluckhohn and Strodtbeck’s (1961) five dimensions¹⁶ and Hofstede’s (1984) Value Survey Model (VSM).¹⁷ However, both models have narrow scope and could not be used as a true representation of a national culture. In 1987, Chinese Culture Collection conducted a survey by an alternative method and developed a list of 40 key values.¹⁸ In 2000, these values were re-examined and fully amended to produce a new list of 71 Chinese Culture Values (CCVs) by Ying Fan¹⁹

Rural residents, shaped by a tradition of four thousand years of history and less affected by Chinese open policy implemented since late 70s, have not been invaded by the western culture and are keeping the conventional values that unique and distinguish them from urban residents.

Consulting and summarizing these 71 values, 7 values that deeply rooted in Chinese rural populations are proposed in this research and grouped into four categories: domestic, social, economic and environmental.(Table 1-1)

	Domestic	Social	Economic	Environmental
Values	<ul style="list-style-type: none"> ● Familism ● Gender inequality 	<ul style="list-style-type: none"> ● Hard working ● Weak civic consciousness 	<ul style="list-style-type: none"> ● Frugality ● Unadventurous in investment 	<ul style="list-style-type: none"> ● Low environmental awareness

Table 1- 1: Specific rural values in China

1.1.3.1 Familism

Evolved from Confucianism, which formed the foundation of Chinese cultural tradition and still provides the basis for the norms of Chinese interpersonal behavior (Pye, 1972),

familism that emphasizes commitment to the family as a unit takes important status of Chinese traditional values. It covers the characters “filial piety”, “loyalty to superiors” and “solidarity” mentioned in CCVs. Here listed several evidences from Chinese social experts prove rural communities’ familism.

- There are 80% young couples are living with their parents in rural areas, compared only one third in urban areas. (Feng Xiaotian,2010)²⁰
- According to the population census in 2000, 48.92% aged population, much more than in urban areas, were supported by their families in rural areas ... Besides the financial support, taking care of old parents and accompanying them are also emphasized more in rural areas. (Bi Keying, Zeng Ruiming and Liang Ruiming, 2011)²¹
- Divorce rate has positive correlation with the percentage of urban population. (Meng Qiuli, 2000)²²

These evidences from different perspectives are supporting that rural communities treasure their close family tie very much.

1.1.3.2 Gender inequality

Even though not mentioned in CCVs, gender inequality is considered to be a tough problem in Chinese society, especially in rural areas. Since new China was founded and along with the growth of China’s economy and the overall progress of its society, women are being given more guarantees of enjoyment of equal rights and opportunities with men. However, values that have been coming along with people thousands of years are difficult to change, especially in rural areas where the new concepts and policies are seldom touched. Until now, the old three obedience – to father before marriage, to husband after marriage, and to son after the death of husband are still widely agreed among rural residents who were socialized and institutionalized to think and believe that women were inferior to men and that their sole concern is the family. (Wu Qing, 2005, Woman’s World)

Here listed some data from other researches proving the gender inequality in current rural China:

- With a strong preference for male offspring, in China, the rate of the population between boy and girl in 1981 was 108, in 2000 it was 117 and in 2005 the figure went up to 120, which far surpassed the internationally acknowledged maximum warning line of 107. The rate in rural areas is higher than the national average level.²³
- Rural women's labor was demanded though often at substantially lower wages than those earned by men employed in the same sector. (Denise Hare, 1999)²⁴
- Fewer girls than boys are enrolled in basic education in China today, especially in poor and national minority areas. More than 70% of school dropouts are girls. And more than 70% of China's million semiliterate or illiterate people are women.²⁵
- In rural China, the primary responsibility of women are still bearing and rearing children and doing housework.²⁶

1.1.3.3 Hard working

In China, hard working is considered to be glorious and applauded by both the traditional culture and CCP. With the development of rural industry, many farmers have a new identity – worker. They have to work in factories on weekdays and do farming in their spare time. According to an investigation by People's Bank of China, 85% rural residents have longer working time than the national standard – 167 hours per month. Besides the long working time, hard working also covers the working attitudes of persistence and commitment.

1.1.3.4 Weak civic consciousness

Different from western countries, in Chinese tradition, rural population have been considered as subjects rather than citizens. It means all the rural residents are not the object of the country but the members who have to obey the supreme ruler. Also, the

civic education exercised after the establishment of PRC was not systematic and communities know little about their duties and rights. Moreover, under the Household-responsibility system that household is the unit responsible for its profits and losses, rural communities have little social communications with people out of families. Hence, weak civic consciousness is another character of rural residents in China.

In this research, rural communities' weak civic consciousness concludes four aspects:

i. Lack of understanding about their subjective status:

Accord with "contentedness with one's position in life" and "fatalism" that listed among CCVs, rural residents would not like to take the initiative to strive for their own rights given by the constitution. The reasons are that in one hand, rural residents can not realize themselves as the object of country and have little knowledge about their rights due to less education about politics, law and democracy, on the other hand, the planned economic system in the past few decades killed the opportunities for rural residents to develop awareness about themselves.

ii. Less participation in public activities

As CCVs mentioned that Chinese have characters of "prudence", "non-competition", "being conservative" and "keeping oneself disinterested and pure", rural residents would not like to pay extra efforts to activities that not related their lives directly. In an investigation of 43 villages, only 5.5% rural residents attended the village election of their own wills.²⁷

iii. Low awareness about democracy

Here democracy means every people can express their views freely without the impacts of age, gender, income, occupation and social status. Democracy in China is still in initial phase and a large number of rural residents deem that society is controlled by leaders and take the hierarchy as granted. When facing unfair treatment, most rural residents would choose keeping silent.

iv. Low awareness about regulations and contracts

Chinese traditional cultures always advocate "governing by leaders instead of by law", so when facing the conflicts between authorities and laws, a lot of rural residents will stand

by authorities. Not only authorities, even relationship, customs and profits will override regulations and contracts sometimes.

1.1.3.5 Frugality

Frugality is an evident character in rural China discussed by many financial organizations and researchers. Accord with most researches, the data from China Statistical Yearbook shows the consumption level in rural areas is much lower than in urban areas. (Fig 1-2)

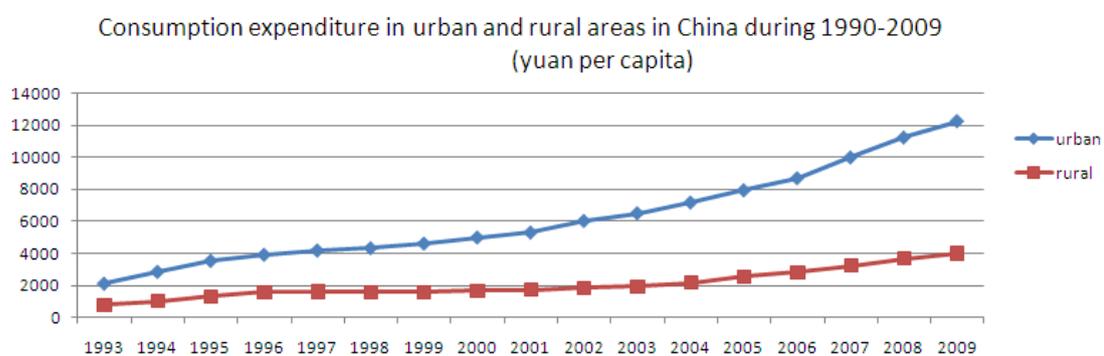


Fig 1- 2: Comparison of consumption expenditure between urban and rural areas

Besides the low income and inconvenient access to goods and services, imperfect welfare system is also an important factor constraining rural communities' consumption. Rural residents who always take a long range view have to prepare something preventing from the potential disease or disasters in future because they could not get reliable welfare as urban residents have. According to a survey report of consumer attitudes published by the Economist Intelligence Unit, among the half of the rural respondents who do not own a refrigerator, only 40% plan to buy one, and a third of those see it as a distant purchase. The report also found the concerns about healthcare, education and retirement continue to restrain rural residents' consumption.

1.1.3.6 Unadventurous in investment

In this research, investments refer to expenditures which may bring financial return

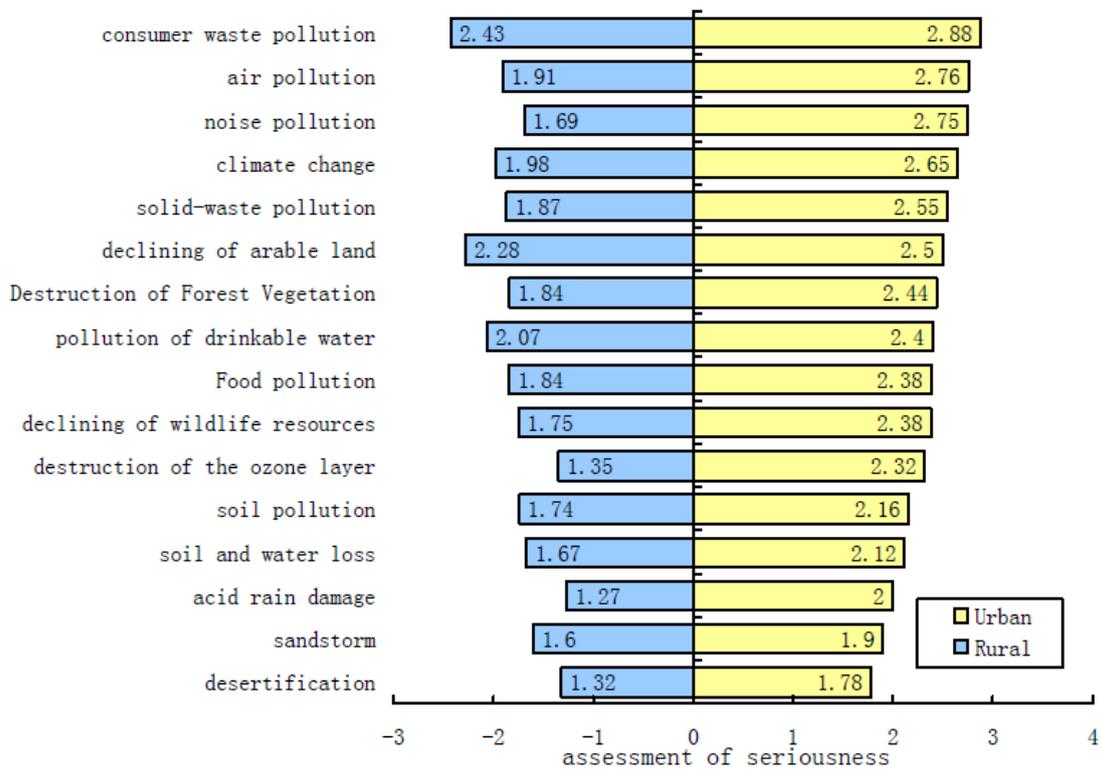
directly, for example, buy financial products such as stock and public debt, extra consumables for rent or resale, tools for improving efficiency and benefits. Other expenditures with non-financial return such as education, healthcare are not inclusive.

Without enough initial capitals or access to the ways of investment, most rural residents have no investing actions. Toward these unknown new things, rural residents always feel anxious and keep away from them. According to an investigation conducted by People's Bank of China in 2007, even though 80% of responders in rural areas have heard about financial products, most of them didn't know details and had never bought any.

1.1.3.7 Low environmental awareness

Affected by the idea "harmony between man and nature", most Chinese consider themselves are integrated into the nature and seldom think about the interaction within the whole system. In a 2002 Internet poll of Chinese citizens by the *People's Daily*, the environment ranked tenth as a concern behind other social issues. In a 2005 survey conducted by the State Environmental Protection Administration, less than 20% of the population was actively engaged in any environmental initiative. Lacking of environmental publicity and education, rural communities' environmental awareness is even lower than the national average level.²⁸ The 2007 China General Public Environmental Survey sponsored by China Environmental Awareness Program compared urban and rural communities' awareness of pollution and participation of environmental protection. Fig 1-3 shows in general urban responders think specific types of environmental pollutions are more serious problems than rural responders. The survey also said that most rural residents regarded themselves as victims of pollution, rather than active instigators of environmental protection. As far as environmental awareness is concerned, 50% of rural responders have not heard any concepts related to environmental protection. However, it's not their fault because rural residents lack effective ways to get information about environmental protection as the relevant newspaper, public welfare ads, short messages and handouts all spread in urban areas. In terms of action of protecting the environment, apart from saving water, electricity and planting trees, all the other actions promoted in China relate to urban life, i.e. not using

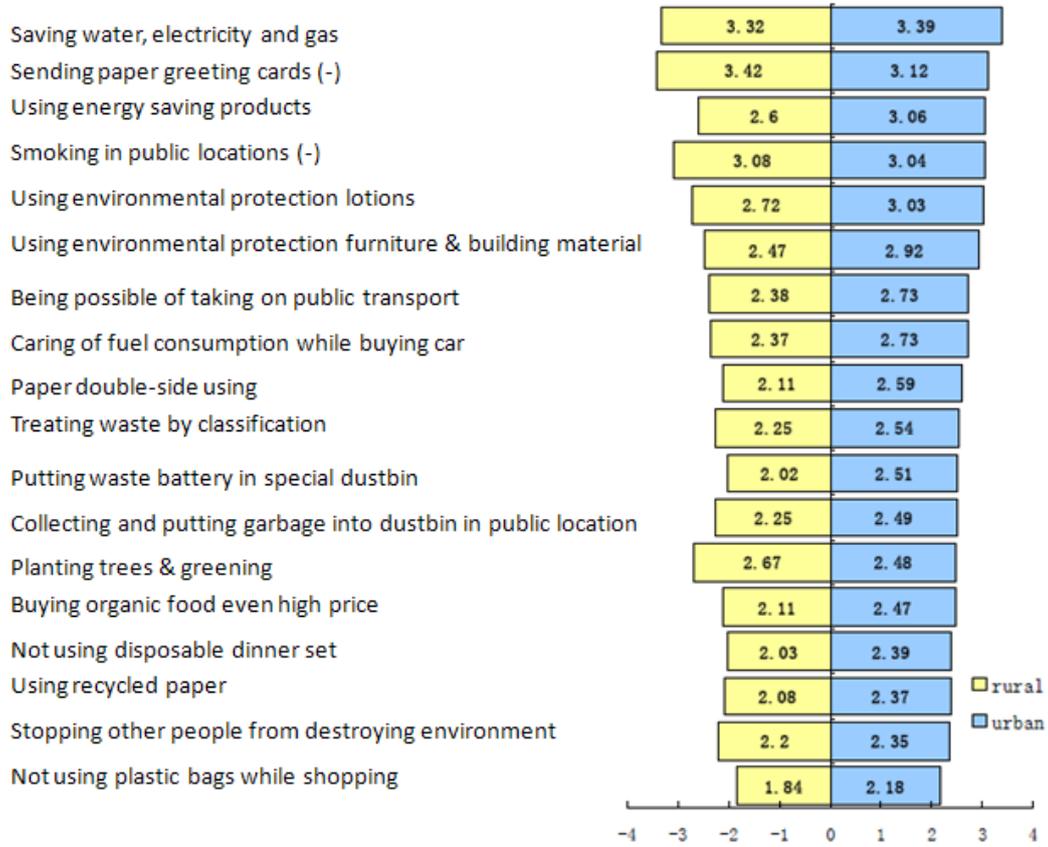
plastic bags while shopping and sorting garbage into different classes. As a result, 19.2% of all rural responders have not participated in any environment-related activities, a much higher percentage than for urban resident. Fig 1-4 shows the environmental protection participation in urban and rural areas and obviously, the rural responders have deficiencies in protecting environment.



Value: 4=very seriously; 3=quite seriously; 2=not so seriously; 1=no problem

Fig 1- 3: Assessment on Seriousness of Specific Environmental Pollution by Urban and Rural Responders

(Source: 2007 China General Public Environmental Survey)



Values: 4=always participate; 3=participate at times; 2=seldom participate; 1=never participate

Fig 1- 4: Environmental Protection Participation in Urban and Rural Areas

(Source: 2007 China General Public Environmental Survey)

1.2 Literature Review

During the last two centuries, many philosophies of technology have been concerned with the impacts of technology on society.

Technological determinism is a theory which presumes that technology drives the development of social structure and cultural values. It rests on the assumption that technologies have an autonomous functional logic that can be explained without reference to society.²⁹ Since mid-20th century, technological determinism has no longer been considered as an accurate view of the way in which we interact with technology. There are many critical opinions emphasizing that technology, not simply causes social impact, operates and also is operated in a complex social field. (Murphie and Potts)³⁰ No matter approve of or opposite to technological determinism, the unite viewpoint is that technology can generate social and cultural consequences. Merritt Roe Smith considered that technology is a key governing force in society and social progress is driven by technological innovation.³¹ Claude Fischer, a professor of sociology, characterized the most prominent form of technological determinism as “billiard ball” approaches, in which technology is seen as an external force introduced into a social situation, producing a series of ricochet effects.³² Feenberg argued that what human beings are and will become is decided in the shape of our tools no less than in the action of statesmen and political movements. The design of technology is thus an ontological decision fraught with political consequences.³³

Some scholars, with differing concerns and intellectual traditions, find a meeting point in the Social Shaping of Technology (SST) project. They are united by an insistence that the ‘black-box’ of technology must be opened.³⁴ Thus, technologies’ secondary effects, both positive and negative, are proposed. Different from most discussions are focusing the effects on economic development and environment, Landon Winner proposed that machines, structures and systems can be accurately judged not only for their contributions to efficiency and productivity and their positive and negative environmental side effects, but also for the ways in which they can embody specific forms of power and authority.³⁵ He took the thought of Ellul, Mumford, and Marcuse

that a technology has unpredicted consequences in addition to its designed purposes and made their collective insights into the basis for a theory of technological politics.³⁶

As applications of technologies, infrastructures' secondary effects were included in many researches: Some viewed the infrastructure from economic perspective, i.e. Luis Serven and Cesar Calderon provide an empirical evaluation of the impact of infrastructure development on economic growth and income distribution.³⁷ Some viewed them from environmental perspective, i.e. Dr. Jean-Paul Rodrigue and Dr. Claude Comtois talked about the environmental impacts of transport.³⁸ And some others viewed them from political perspective, i.e. Daniel Boorstin illustrated that television played important role in disbanding armies, cashiering presidents and creating a whole new democratic world.³⁹

Following the theory of secondary effect, Professor Takayuki Minato proposed the concept of chain effects of infrastructure. As he described, an infrastructure development project, similar to other technology applications, generates initial impacts, which can be either positive or negative. Some impacts requires certain kinds of solution and the solution, being itself an application of technology, may then generate further impacts, either expected or unexpected.⁴⁰

In current China, the only official method to judge infrastructures' social effects is social impact assessment (SIA). SIA was formalized with the introduction of the U.S. National Environmental Policy Act Legislation of 1969 and is normally undertaken within the relevant national environmental policy framework.⁴¹ It is capable of effectively improving social equity, enhancing social inclusion and mitigating detrimental social outcomes. Seeing this opportunity, many mainland Chinese academics are advocating the use of SIA in assisting development decisions.^{42,43,44} However, implementation of SIA in China has not yet been as widely as EIA not only because of the complexity of social problems, but also the unique historical, structural, cultural and practical barriers to participatory planning in the country.⁴⁵ Actually, social and cultural consequences are seldom concerned and estimated before the decision of infrastructure is made. Even for those exceptions which did SIA, the concept of "chain effects" was not included. For

example, the SIA of China West-East Gas Pipeline Project only focused on the direct effects such as what changes will the project bring to local stakeholders and indirect effects just follows closely such as what will local stakeholders behave to suit these changes.⁴⁶ Without going further, the real social impact could not be uncovered completely.

1.3 Research Objectives

To satisfy communities' demands of safe water, convenient traffic, energy and information, infrastructure constructions in rural China are speeding up. At the same time, their social impacts are regulating rural communities' lives imperceptibly. As the growing concerns about rural infrastructure are mostly focusing on engineering and financing, these social impacts which are secondary to the designed function are paid little attention. However, according to the theories of "chain effects" and "culture iceberg model", the changes in behaviors caused by infrastructures could bring different beliefs and values to people. It means that the infrastructure could generate impacts on social cultural system, especially the communities' values indirectly.

The investigation about infrastructures' chain effects on rural communities' values are urgent and important under current conditions. The reasons are as follows: First, the values represent what is most essential for human life and accomplishment. Communities' values are the determinants shaping people's behaviors and activities which guide the direction of social development. China such a developing country with most rural populations in the world is still during the stage of urbanization. Rural communities' values could layout the developing track and dominate how China will be in the coming future. On the other hand, culture including values is placed alongside environmental, economic, and social dimensions – the four pillars considered necessary for long-term sustainability.⁴⁷ In current society, development is no longer the simple growth-oriented industrialization, sustainable development, which is to strike a balance between competing and conflicting interests, becomes the mainstream of development. Communities' values shape what they mean by development and determine how people act to solve the conflicts in the world. So any impacts on rural communities' values should be treated seriously. Second, infrastructures are public works accessible for most communities and its effects can reach to a wide spectrum of people. These people working in different fields of the society – governments, schools, medium, NGOs, etc, and will spread out their new ideas and attitudes more widely. Third, infrastructures have quite long life-span: according to Stephane Hallegatte, the lifetime of water

management infrastructure is up to 200 years, of energy production and distribution infrastructure is up to 80 years, of transportations infrastructure and natural disaster protections are 50 to 200 years.⁴⁸ In such a long run, infrastructures' potential impacts will be felt for decades, even for centuries and endure over many generations. Fourth, infrastructures are not easy to cancel or remove at low cost. As well as the infrastructure, the changes of communities' values are also difficult to reverse again. That's why we have to be cautious before making any decisions about infrastructures. Fifth, the infrastructure construction in rural China is keeping an increase trend. In the near future more and more infrastructures will be carried out to transfer rural communities' lives and values.

Considering its importance, this study aims to arouse different stakeholders' awareness of the relationship between infrastructures and communities' values and make suggestions for infrastructure constructions with the consideration of chain effects. The three concrete objectives are:

- Clarify the role of infrastructures playing in cultural evolvement in rural China.
- Redefine the infrastructure in rural China by adding its function of changing social culture.
- Give some suggestions to the coming rural infrastructure projects in China.

2. Theoretic Analysis of Infrastructures' Impacts on Rural Communities' Values

As social impact assessment has not yet been adopted in China, infrastructure's impacts on rural communities' values, which are secondary to the intended function, are seldom concerned or discussed.

Based on the observations of several precedents, it is no doubt that infrastructures play certain roles in rural values' evolvement. The distributions of impacts can be divided into three aspects – caused by expected functions, caused by infrastructure itself and caused by detail design.

2.1 Impacts caused by expected functions

Viewed functionally, infrastructure facilitates the production of goods and services. Besides these designed functions, many following effects such as economic development are always concerned and discussed. However, most studies and researches stop here without going further. Actually, according to the chain effects theory, following these direct and indirect functions cultural impacts involving changes to the behaviors, beliefs and values of individuals that guide their cognition of themselves and their society are passing through some inconspicuous ways. To clarify the mechanism of these impacts, this study summarizes and classifies 5 main functions of infrastructure: **develop regional economies**, **assist working activities**, **spread knowledge and information**, **expand communities' social circle** and **enhance communities' living conditions**, and then aiming each function, the theoretic analysis are given by relational graph. The red words mean the functions, the blue ones mean the specific values and the black ones mean the inconspicuous ways. The arrow with "+" means positive effect such as promoting and increasing while the arrow with "-" means negative effect such as weakening and reducing.

2.1.1 The function of developing regional economies:

The positive correlation between infrastructures and economic development has been well proved by many researchers through different perspectives: Some focused infrastructures' positive effects on productivity. (Munnell,1990; Fox and Smith, 1990; Hulten and Schwab,1991; Carlino,1993)⁴⁹ Some gave justifications that infrastructures could create jobs to stimulate economic development. (John Maynard Keynes, 1936)⁵⁰ Some others deemed that investment in infrastructure is part of the public capital accumulation required for economic development. (Kevin T. Duffy-Deno, Randall W. Eberts, 1989)⁵¹

The impacts following economic development are shown as Figure 2-1:

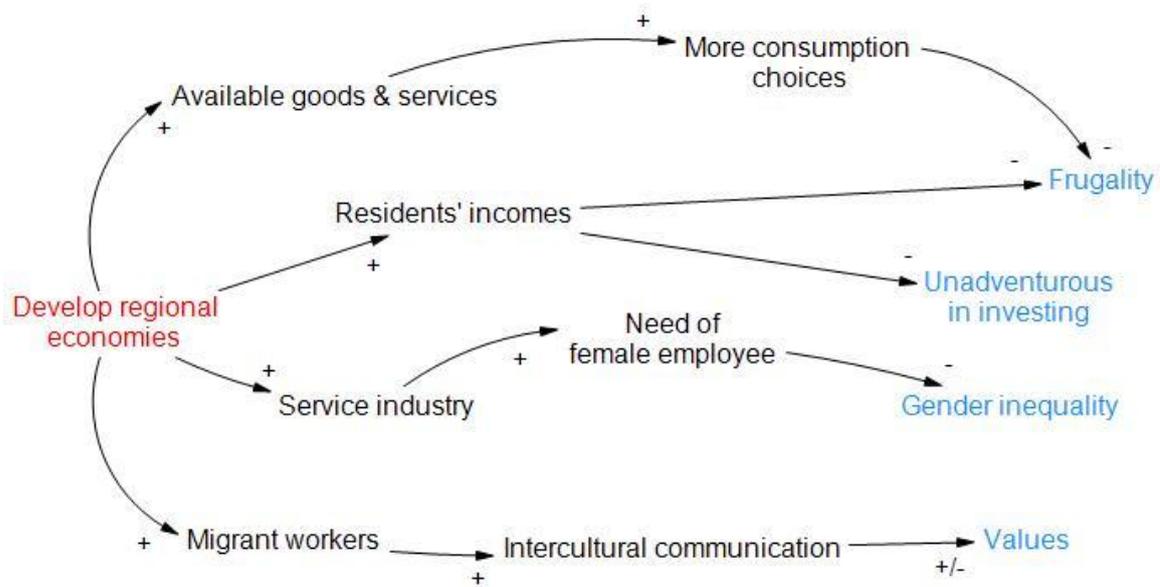


Fig 2- 1: Distributions of impacts on rural communities' values (1)

Growing productivity increases the supply of various goods and services. Consequently, there will be more consumption choices for consumers. On the other hand, household's purchasing power is improved by the increased incomes coming with the development of regional economies. These two changes stimulate the consumption behaviors of rural

residents and weaken their values of frugality. Also, with the increased incomes, some residents may have more than enough money to meet their current needs. To make full use of these spare money, investment would be a good choice and adopted by the rural communities.

Another character of economic development is the emergence and boom of service industries,⁵² in which women have more advantages – carefulness, patience and gentleness. As a result, women’s status is enhanced due to more important roles in employments and more earnings in families.

What’s more, the developed regional economies attract more migrant workers having different cultural background to stay with local people. Through the intercultural communications between them, local rural communities’ values will be invaded by the different values and be affected to a certain extent.

2.1.2 The function of assisting working activities:

It is no doubt that infrastructures are playing an important role in assisting working activities. Take grid as an example, the electricity sending to factories and households make the electrical equipments available for heavy works once done by human beings.

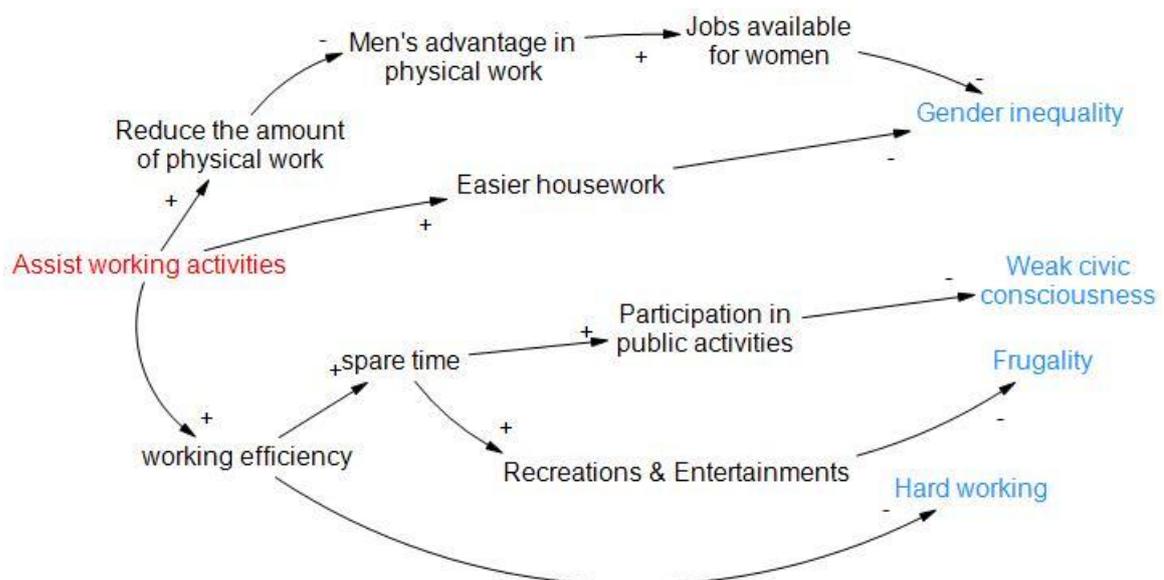


Fig 2- 2: Distributions of impacts on rural communities’ values (2)

Fig 2-2 helps us look further beyond this function:

Firstly, the reduction of physical work not only emancipates the women from tedious housework, but also provides access to more jobs for women because the labor force is not the determinant any more. Thus, the sexual discrimination and unequal treatment between male and female will be diminished gradually.

Secondly, the improved working efficiency reduces workload for rural residents, which provides them more spare time to take part in recreational and public activities. These activities increase the consumption expenditures of households and may change consuming habits. Additionally, attending public activities will help rural communities realize their status, rights and duties in the society.

Thirdly, the hard working spirit will be abandoned when the machines are replacing human beings to complete the grunt work.

2.1.3 The function of spreading knowledge and information:

Several infrastructures such as telecommunication and schools can strengthen rural communities' ability to access to knowledge and information and spread out their own ideas.

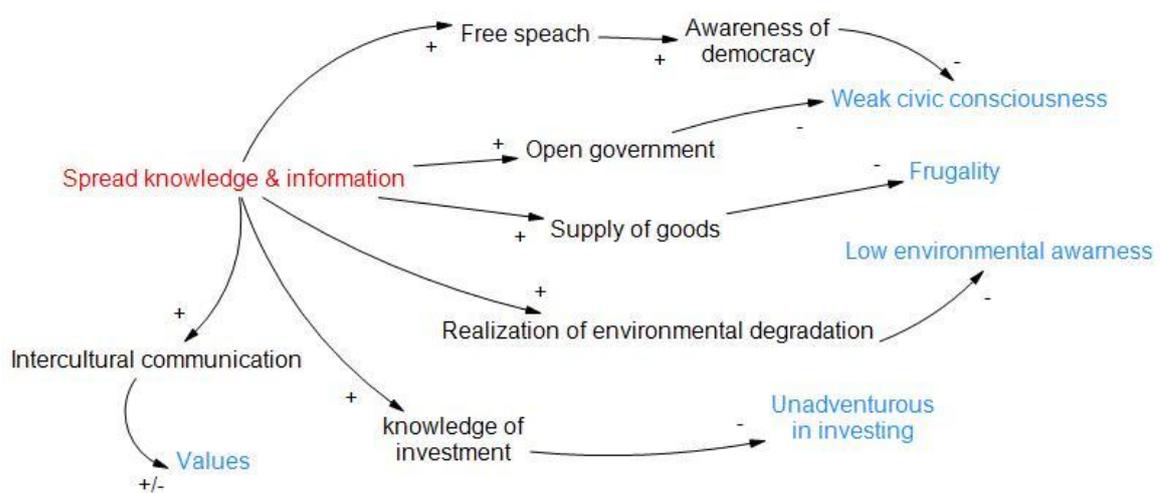


Fig 2- 3: Distributions of impacts on rural communities' values (3)

Above Fig 2-3 shows the ways in which this function could affect rural communities' values.

Obviously, the infrastructures create a platform such as internet for intercultural communication between different communities, and through these interactions rural values could be affected by others who hold different ones.

Meanwhile, the infrastructures which enable many-to-many people interaction can promote free speech in the society. I.e. anyone who believes they have something important to say can publish it on the internet. Also, the spread of information supports open government which makes government more open, innovative, and responsive and encourages the public participation and engagement in political issues. All these could accelerate the process of democratization.

Infrastructures also have equally significant impact on rural residents' awareness of environment. By introducing environmental degradation and protection through TV, radio and the Internet, and enhancing the environmental education for the young generation, more and more rural residents would realize the importance of good environment and throw themselves into the green activities.

Moreover, relating to economic values, the knowledge of investment and the information about goods sale could change residents' decision on how to expend the money. I.e. Internet shortens the distance between communities and markets, and convenient online shopping and online stock trading would become possible for rural residents. As a result, rural communities' frugal and unadventurous values could be changed.

2.1.4 The function of expanding communities' social circle

Infrastructures that supports social interactions enlarges rural communities' views and helps them explore new interests. For example, convenient traffic makes it possible for rural residents go out of town and involved in the world they have never known. The

following impacts are depicted in Fig 2-4.

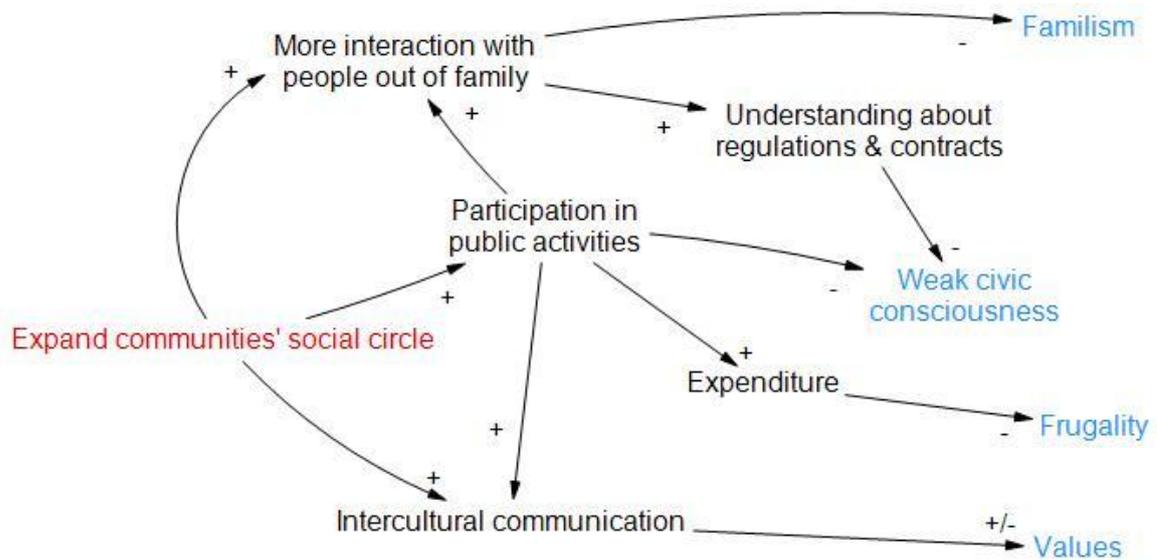


Fig 2- 4: Distributions of impacts on rural communities' values (4)

In an expanded social circle, rural residents have more interactions with people out of family. As less time and attention would be paid to family and its members, the value of familism may disappear gradually. In addition to this, people are going to be seized of the regulations and contracts when get along with others. And with more participation in public activities, rural residents' civic consciousness is ameliorated.

Another impact coming up with the expanded social circle is the intercultural communication, which is also mentioned from other perspective. As explained above, the intercultural communications make the different values to be assimilated into the local culture and change local communities' values.

2.1.5 The function of enhancing communities' living conditions

Water, energy, transport, adequate housing, education and healthcare provided by infrastructures are sources and drivers to improve rural communities' living conditions.

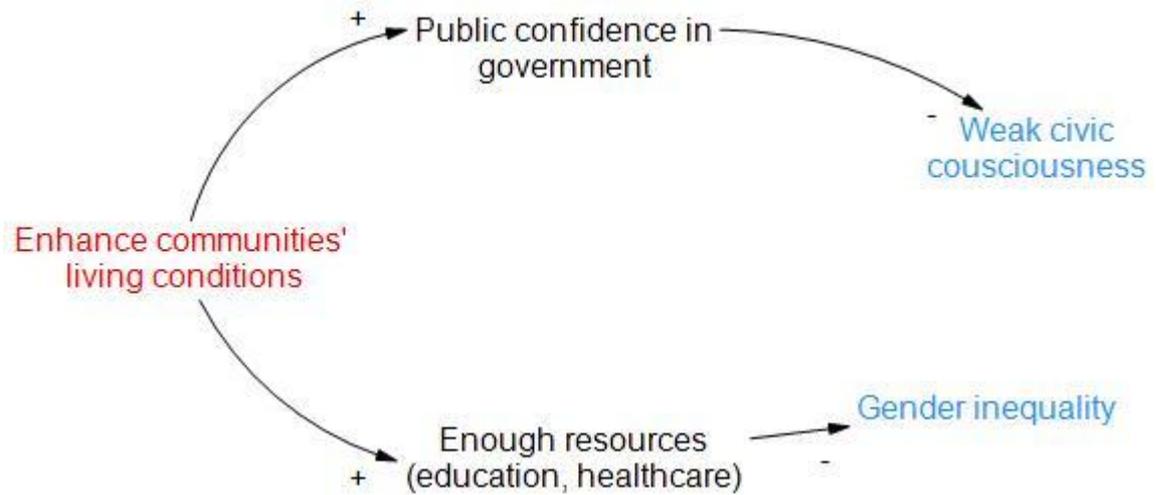


Fig 2- 5: Distributions of impacts on rural communities' values (5)

From Fig 2-5, the main two consequences of better living conditions are pointed out: more public confidence in government and enough resources for every resident. Rural communities' trusts on government promote them to cooperate with the official organizations and perform the obligation as a citizen. As a result, their civic consciousness will be improved. On the other hand, increased resources for education and healthcare can guarantee that more and more women could enjoy equal rights as men. And this will contribute to gender equality in rural areas where women are less satisfied by the legal rights because of resources shortage.

2.2 impacts caused by infrastructure itself

Not only the expected functions, but also the characters of infrastructure itself play important roles in distributing impacts on communities' values. These characters include: the relationship with environment, the operational model, the financing model and the land use of the infrastructures.

2.2.1 The relationship with environment:

Infrastructures, as artificial works, inevitably generate effects on environments: well-designed infrastructure can have positive impacts on the environment, while some others have a dark side leading to environmental degradation: constructed wetlands could restore the ecological system; But fossil fuel energy generation and transportation create emissions that contribute to acid rain locally and global warming; Hydropower and irrigation can lead to flooding and water pollution; Roads can lead to erosion, deforestation, and biodiversity loss.

Both positive and negative impacts could arouse residents' awareness about environmental knowledge and protection. Here are the examples: the biomass pools for rural households popularize the concept of green energy.⁵³ During the process of usage, a lot of environmental protections are made virtually by the rural communities: To collect organic materials, rural residents stop burning straw and clean up the animal waste; to make use of the residue, synthetic fertilizers are replaced. Thus, the environmental awareness is improved with the usage of biomass pool. Besides the positive effects, the negative effects also could enhance rural communities' environmental awareness. The coal mines discharge a mass of pollutants during the mining and transporting to local environment. And these pollutions would attract rural communities' attention and enhance their environmental awareness. I.e. rural residents in Dashan Town, Guizhou Province were suffered from the intolerable water pollution. To protect their rights, in 2009, the rural residents began to ask the governments for

help and appealed supporting on the internet. Even though this problem has not been solved, whatever the results are, rural communities' awareness about environment and rights are improved through those activities.

2.2.2 The operational model

All the operational models can be divided into two kinds: one is system-centered, immensely powerful, but inherently unstable, the other man-centered, relatively weak, but resourceful and durable.⁵⁴

These two could generate different impacts on communities' values of democracy. The famous example is the comparison between nuclear power and solar energy. Even though both of them are clean energy, their cultural consequences are different. The nuclear power plant requires its social environments to be structured and all the workers to be in charge strictly in much the same sense that an automobile requires wheels in order to move. However, solar energy is more compatible with a democratic, egalitarian society because it can be built in a disaggregated, widely distributed manner and be managed by individuals or local communities effectively. In this view, solar energy is desirable not only for its economic and environmental benefit, but also for the salutary institutions it is likely to permit in other areas of public life.⁵⁵

The rural communities with low awareness about democracy and equality are more impressionable by infrastructures' operational models. The system-centered infrastructures such as big dams would make the communities be the slaves of machines and ignore their own desires, while the man-centered infrastructures could bring more freedom to rural communities and allow them to manage and control their own lives.

2.2.3 The financing model

Because of the big gap between the increasing infrastructure investment demand and the limited government budget, more and more private sectors are encouraged to be

involved into the infrastructure constructions and maintenances. Due to the potential returns and supporting policy, the financing model PPP (Public-Private Partnerships) and PFI (Private Finance Initiative) are becoming popular in rural areas. I.e. rural communities in Yidu County, Hubei Province collected funds of 7.72 million Yuan from individuals to repair 9715 small-scale irrigation works.⁵⁶

The infrastructures which include private capitals give a good example of investment to rural communities. Most existing models for rural infrastructure financing are that the government launches infrastructures bonds and collects idle capitals from individuals. In this case, buying infrastructures bonds can be considered as an invest choices and stimulate the investing actions. On the other hand, in some PFI (Private Finance Initiative) models, investors also have the ownership of the infrastructures. In that case, rural communities have the authority to manage the infrastructures that will promote their public activities and help them to realize their social status. So apart from the change of investment value, their civic consciousness could be improved.

2.2.4 The Land Use of Infrastructures

The change of land use is unavoidable when large-scale infrastructures are constructed. In rural China, most infrastructures are built on the agricultural and residential areas not only for the cheaper compensations, but also because these two can provide larger areas. It is no doubt that the lost of territories because of the infrastructure constructions will deliver impacts on rural communities' values.⁵⁷

If the infrastructure is built on the agricultural area, due to the expropriation of arable lands, the rural communities would lose their original way they depended on for existence and they have to change their behaviors to suit the new lives. These changes could embed impacts on their values: for example, because most rural residents have low educational attainment and lack of special skills, it is very difficult for them to find new jobs. Without available jobs or stable income, rural residents' values of frugality would be enhanced.

If the infrastructure is built on the residential area, the rural residents have to resettle in

compact mansions or apartments. In that case, the previous common big families in rural areas are divided into small ones and the close family tie would be loosened. Besides this, the new habitats would lead to new lifestyles and habits that may change rural communities' beliefs and values.

2.3 impacts caused by detail designs

In the accustomed way of looking at infrastructures, detail designs and their cultural consequences are seldom concerned. However, tiny component contains seeds to make big difference. No matter deliberately or inadvertently designed, details could generate a particular social effect. Some researches on technologies and politics tried to demonstrate how seemingly innocuous design features in mass transit systems, water projects, and industrial machinery actually mask social choices of profound significance. (Langdon Winner, Historian David Noble) The famous example is the overpasses on Long Island, New York. With the low height, the overpasses prevented the poor population, who normally used the high public transit, passing beneath them. As a result, the discriminatory effect was generated that only the middle and upper classes having private vehicles could use the parkways beneath the overpasses to reach the beach for recreation.

Even after an infrastructure construction is approved, important controversies can remain with respect to detail design, such as the height of transmission tower and the fee of utilization. And because of these specific features in the design, the same infrastructures may generate different impacts on values. Compared to the common trash cans, the one with several different boxes to accept sorted garbage would have significant push to promote the recycling and increase people's environmental awareness. The route of a highway passing by a place of interests would provide an access to recreational area and encourage people's consumption activities which would change their values about frugality. The universal design of buildings, products and environments would remind the whole communities to take care of others, especially the disabled people, and make their civic awareness grow.

From such examples, we could get a general conclusion that the some detail designs of infrastructures may also change communities' values and deserve people's attention, even though they have a range of flexibility and difficult to summarize.

3 Case Study

3.1 Overview



Fig 3- 1: Location of the Hangzhou Bay Bridge

Hangzhou Bay Bridge is a long highway bridge across Hangzhou Bay which located in eastern coast region of China (marked by the circle on Fig 3-1). The bridge connects Haiyan, a county in Jiaxing Municipality and Cixi, a local-level city that is a part of Ningbo Municipality and it shortens the travel distance between Shanghai and Ningbo from 400km to 280km. In 1993, it was first proposed that construct a connection between Shanghai and Ningbo. Because of the engineering problems, the project design was changed many times and finally the experts transferred the northern start from Shanghai to Haiyan County.⁵⁸ Until 2003, the plan was finally approved by the central government. After more than 5 years' hard construction, the bridge was completed on June 14th, 2007 and opened to public use on May 1st, 2008.

The study area is Haiyan County (marked in orange in Fig 3-2), where has undergone great changes since some experts suggested to start the bridge from here. In 1995, the rural industry began to boom because many companies including state-owned enterprises, joint ventures and private sectors were attracted to set up factories here due to the potential convenient logistics. Right following the approval of the bridge project, the local government set about resettling residents who was living dispersedly in the construction area and building a new economic development zone (EDZ) around there. Combined with the previous Haiyan Economic Development Zone, the industrial clusters covering electronics, construction material, textile and machinery had been formed. Came up with the economic development, the pollutions caused by industry arouse local residents' attentions and in 2004, to improve the environmental condition, the EDZ began to optimize its economic structure and focus on developing high tech industries with low environmental impacts . On the other hand, totally 2366 households relocated their houses because of the bridge construction and all of them had to face new challenges and experience many changes in their lives. After the bridge started open to public, the service industries such as restaurants and hotels was stimulated by the sharply increased passengers.⁵⁹



Fig 3- 2: The study area– Haiyan County

As well as provided convenient traffic, the bridge construction and utilization brought great changes to local rural communities' lives. This case study aim to answer two questions: first, whether rural communities' values have been changed because of the bridge? If the answer is yes, then what kind of roles did the bridge play in changing rural communities' values?

3.2 Methodology

Documents review, observation, questionnaire survey and individual interview were main methods to investigate the changes of rural communities' values and what kind of role did the bridge play.

3.2.1 Documents review and observation

In order to get an overview to direct the following observation, survey and interview, some official reports and profiles were reviewed before the field trip. Those documents include *Haiyan Yearbook from 1993 to 2010*, *Environmental Impact Assessment Report of north terminal of Hangzhou Bay Bridge*, *Development Report of Haiyan EDZ* and some other official profile.

During the field trip, the observation was conducted along with the survey and interview. The purpose was to gain more information from the real situations and interviewees' body language in addition to the documents and words.

3.2.2 Questionnaire survey

3.2.2.1 Questionnaire design

Aiming rural communities' typical values mentioned in the background part, questionnaire with five parts was prepared. First part contains demographic questions about participants' age, gender, occupation, education background and address. They can be used to correlate performance and satisfaction with the test system among different groups of responders. Left four parts are respectively investigating communities' domestic, social, economic and environmental values through both objective and subjective questions. In objective parts, responders were asked to complete the multiple choice questions (MCQs) to describe their current lives and behaviors. And in subjective parts, statements that describe how people look toward the

social phenomena and what will people do in a certain scenario are given and the responders need to choose a number from 1 to 5 to represent their agreement or disagreement with the statement. Higher scores refer to higher levels agree with the statement provided. ('1' represents 'Strongly disagree'; '5' represents 'strongly agree')

3.2.2.2 Sampling and Data Collection

The questionnaire survey was carried out in Jiaying City (pink area in Fig 3-2) from 15th March to 10th April, 2011. Totally 100 questionnaires were distributed by simple random sampling and because the survey was conducted face-to face, all of them were returned and were valuable to use in the analysis.

According to responders' living address, they are divided into two groups – experimental sample and control sample. The experimental sample contains 51 residents in Haiyan County, where is the northern bridge approach located. And the control sample includes 49 residents in other counties around Haiyan County. All these counties in Jiaying City have similar economic conditions, share similar natural environment and resources, hold similar history and cultures. Therefore, this study is based on the hypothesis that all the counties in Jiaying City are the common rural areas, their communities' values were almost same before the bridge project was proposed and the current differences between experimental and control samples are the changes brought by the bridge.

3.2.2.3 Data Analysis

To answer the first question "whether rural communities' values have changed", the answers for subjective questions were analyzed primarily.

For those statements which accord with the typical rural values, the answer (a number from 1 to 5) is given a score same as itself. For example, the statement "I would like to spend spare time with my family" meets the requirements of familism, so the answer "5" which means strongly agree gets 5 points, and the answer "1" which means strongly disagree gets only 1 point. Reversely, for those statements against the typical rural values, the scores for the answers were also overturned. For example, the statement "Expenditure on entertainment is necessary" expresses a departure from the value of

frugality and the answer “1” could get 5 points while answer “5” only gets 1 point. Higher average score for the questions about one certain value means that the responder has fewer changes in this traditional value. To show the differences between two samples, the deviation index (DI) was calculated according the equation below:

$$DI = \frac{|AS_e - AS_c|}{AS_c} \times 100$$

AS_e —average score for all responders in experimental sample

AS_c —average score for all responders in control sample.

To clarify the bridge’s role in value changing, objective answers were also examined. They reflect what kinds of changes have the bridge brought and explained why rural communities’ value change in some level.

3.2.3 Individual Interviews

Interview, an interactional method of collecting information about social world by asking people to discuss their lives, experiences and perceptions (Holstein and Gubrum, 1997),⁶⁰ is an important method in this research to gather detailed attitudinal and experiential information from responders and elicit the unconscious knowledge about the bridge and reasons for value changes.

The list of people that had been interviewed under formal condition can be seen in table 3-1.

Table 3- 1: List of formal interviewees

The Stakeholders	The Interviewees
Government	Project Coordinator
	Chief of EDZ
Companies in EDZ	Self-employed people
	Migrant workers
Local communities	51 participants in experimental sample

3.3 Results

3.3.1 Results of documents review

Among the collected documents, almost 70% are focusing on the bridge's impacts on economic development. It is not difficult to understand that in China such a developing country, economic development is the most important symbol of local progress. The convenient traffic condition brought by the bridge stimulates the prosperity of Haiyan EDZ: By the end of 2010, more than 150 large scale enterprises settled in EDZ and the gross output has achieved 10 billion Yuan. Benefited from the rapid economic development, rural communities' annual income reached to 14,111 Yuan, much higher than the national level 4896 Yuan. (Haiyan Yearbook 2010)

The social issues about the bridge are also mentioned in many profiles. However, most of them are the policies and countermeasures about resettlement and compensation. Disappointedly, there is no information about bridge's cultural consequences.

3.3.2 Results of questionnaire survey

4.3.2.1 Demographic results

The demographic attributes of target samples are recorded as follow:

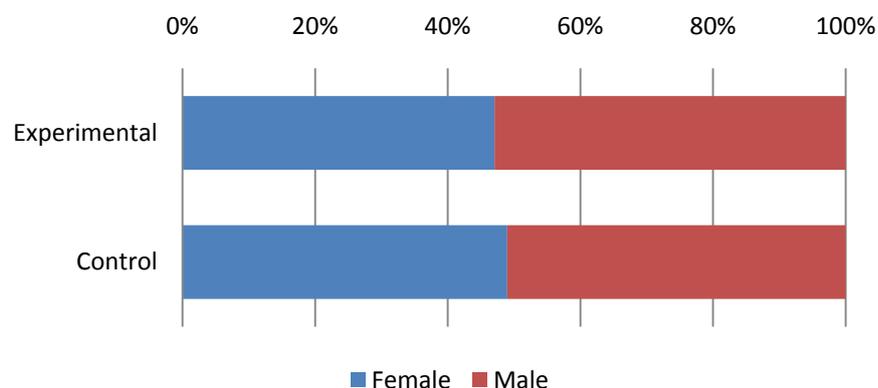


Fig 3- 3: Gender Information of Participants

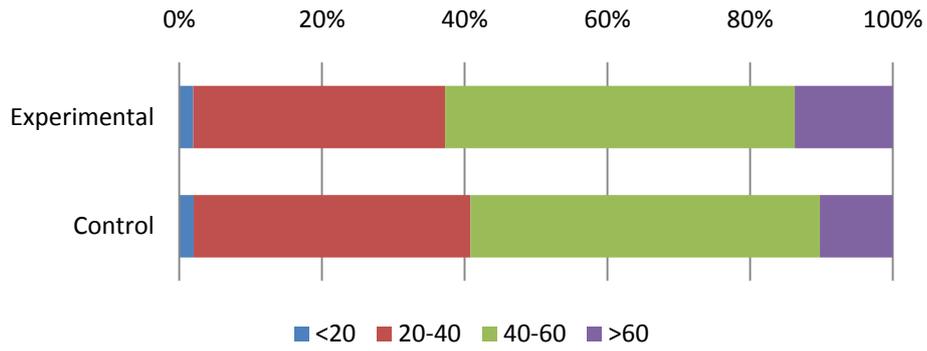


Fig 3- 4: Age Information of Participants

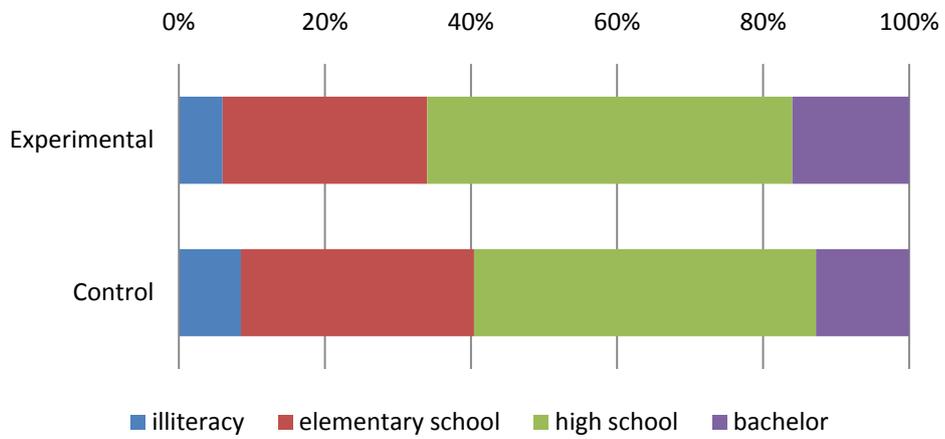


Fig 3- 5: Educational Information of Participants

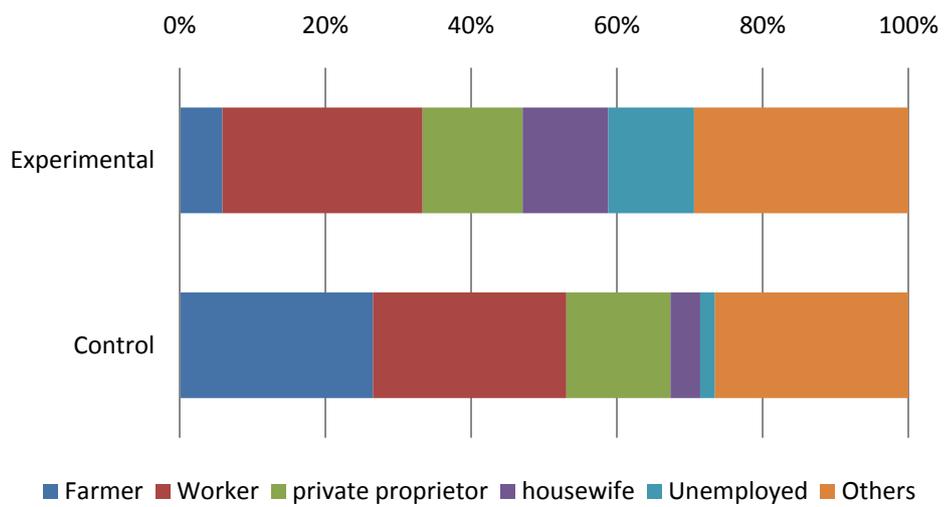


Fig 3- 6: Occupation Information of Participants

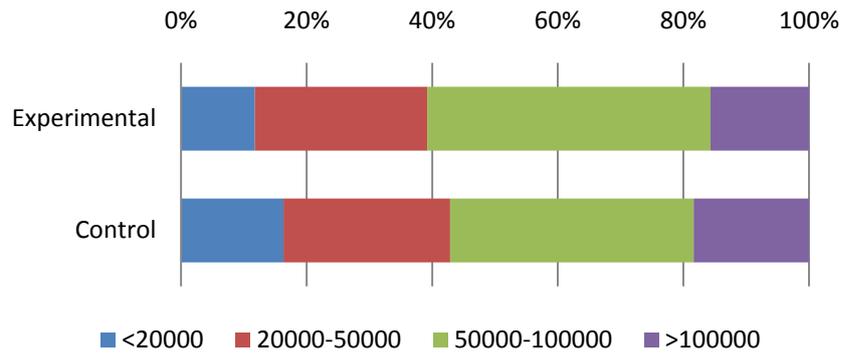


Fig 3- 7: Annual Family Income Information of Participants/ Yuan

Shown in the figures above, except the occupation, two samples’ demographic structures are similar, which means the differences caused by external elements are minimal. Hence, the following analysis considers each sample as a whole and compares data of the whole group directly.

3.3.2.2 Subjective Results

The answers of subjective questions demonstrated that the bridge has generated some impacts on rural communities’ values somehow.

Table 3- 2: Average score for each value

	Experimental Sample	Control sample
Familism	3.51	3.50
Gender Inequality	2.84	3.32
Hard Working	2.98	3.59
Weak Civic Consciousness	2.62	2.79
Frugality	2.72	2.88
Unadventurous in investment	2.65	3.33
Low Environmental Awareness	2.37	2.50

Table 3-2 shows that responders in experimental sample got lower average score for almost each value except “familism”. That’s mean the rural residents in Haiyan County,

compared to the other common rural communities, gave up more traditional thinking. Indicated in Fig 3-8, the bridge has brought changes on these values in different levels. The value of “familism” was insisted by the rural communities because DI for this value – 0.29 is small enough to be extinguished compared to other DIs. Values such as “gender inequality”, “hard working” and “unadventurous in investment” were influenced greatly while changes of “weak civic consciousness”, “frugality” and “low environmental awareness” were not distinct.

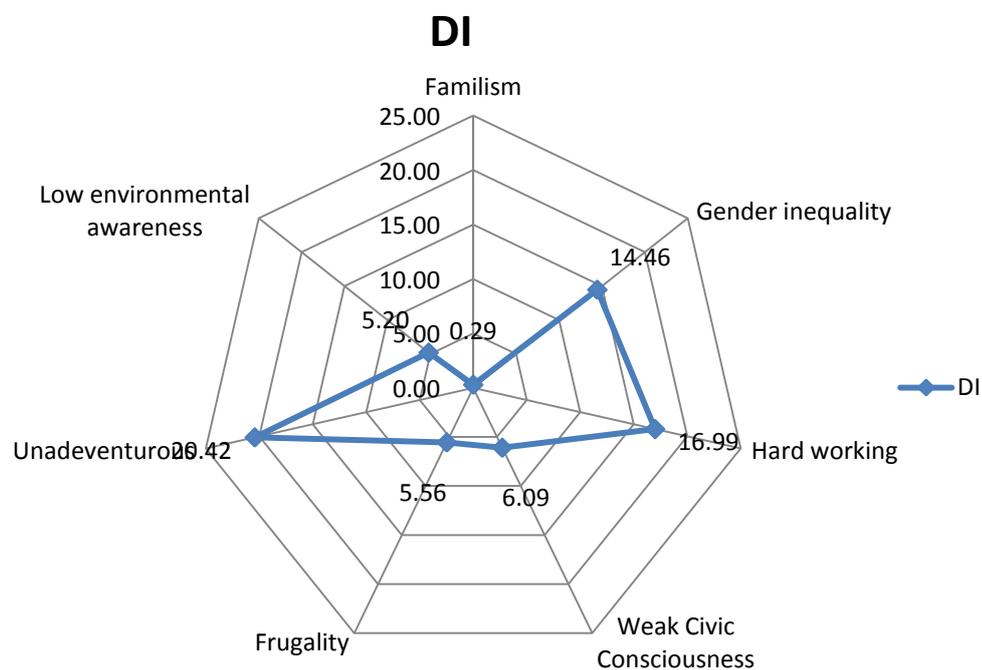


Fig 3- 8: Deviation index for each value

3.3.2.3 Objective Results

To clarify how these changes happened, answers for objective questions were analyzed. Question 2-O-4 and 2-O-5 explain why responders in experimental sample regard female status more important. According to the Fig 3-9, only 9.80% families in Haiyan County get their income from agricultural output while in other counties, more than 36.73% families are still depends on agriculture. That’s mean in the study area the pillar industry was transferred from agriculture to secondary and service industry, in which labor force

is not the determinant anymore and female have more advantages. As a result, different from the old perception that husband is the principle breadwinner and wife has primary responsibility for the home and children, women also get paid to support families financially. This fits quite well to the results shown in Fig 3-10: On the whole, male and female incomes are almost same in experimental sample. But for control sample, in around half families, male incomes exceed female’s while in 12.24% families women have higher economic status.

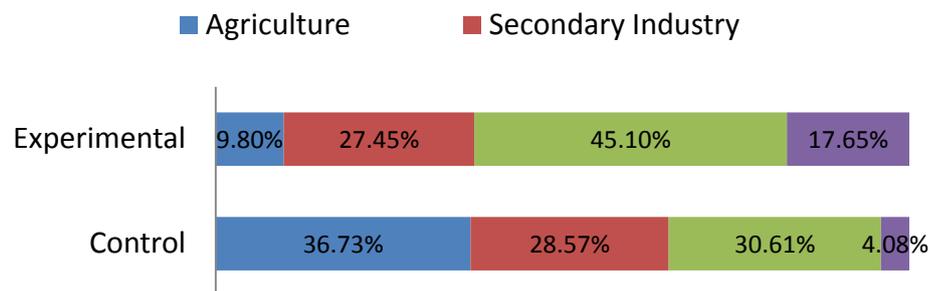


Fig 3- 9: source of family's main income

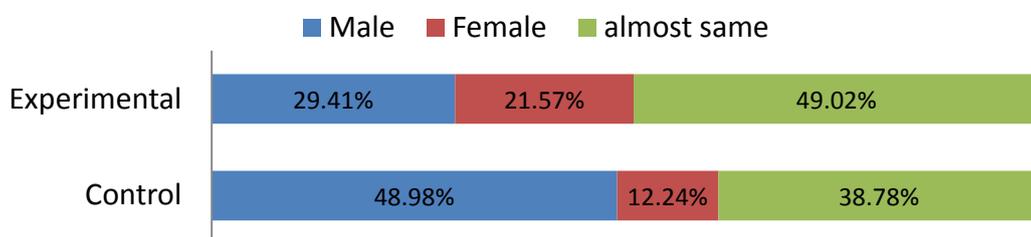


Fig 3- 10: who earns more money in your family?

Come to the value of “hard working”, through the questions 3-O-1 and 3-O-2 we could get some information about rural communities’ working conditions: Responders in experimental sample have shorter working time (Fig 3-11) and more holidays (Fig 3-12). On the other hand, in Haiyan County, rural communities’ average annual income is 14111 Yuan per capita, only a little lower than Jiaxing City’s average level -14365 Yuan per capita. (Haiyan Yearbook, Jiaxing Yearbook, 2010) In other words, rural communities in the study field could do easier job and enjoy almost same lives as communities in

other counties. So it is not strange that responders in experimental sample express a disdainful attitude toward “hard working”.

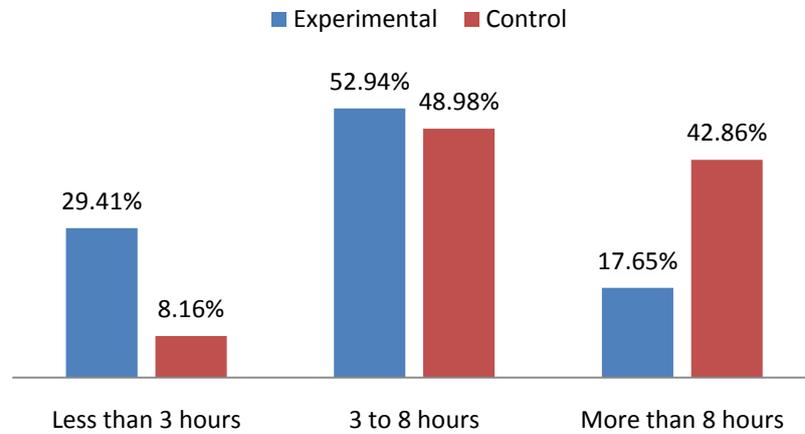


Fig 3- 11: Participants’ working time per day

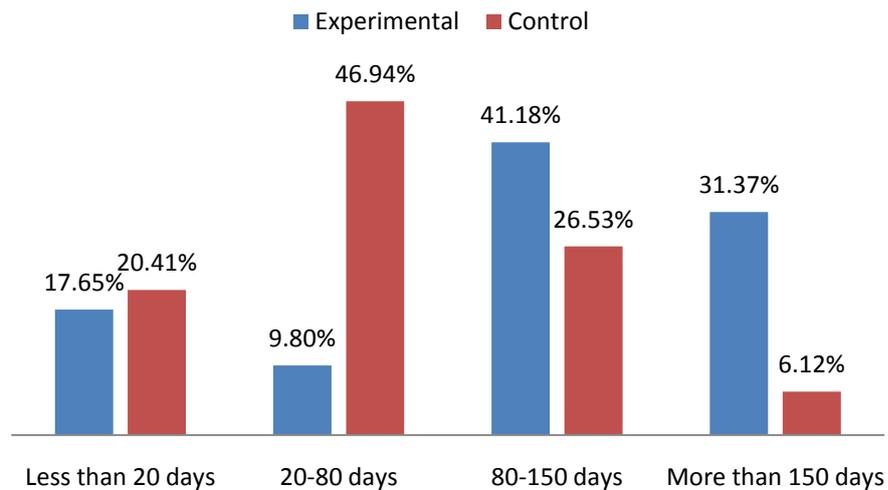


Fig 3- 12: Participants’ holidays per year

The investigations about rural communities’ expend and invest experiences give evidences for changes of economic values. For the question “Have you or your relatives had successful experience of investment?” more responders chose “Yes” in experimental sample. (Fig 3-13) In that case, people who have been aware of the benefits of investment or have learned skills in investing would have more adventurous values. Another question “Is it very convenient for you to buy anything you want?” interprets a

reason contributing to changes of frugality. 80.39% responders in Haiyan County feel it's convenient to buy whatever they want while only 44.90% responders in other rural areas think so. (Fig 3-14) The access to goods and services of course could promote the consumption behaviors and change people's attitude toward frugality.

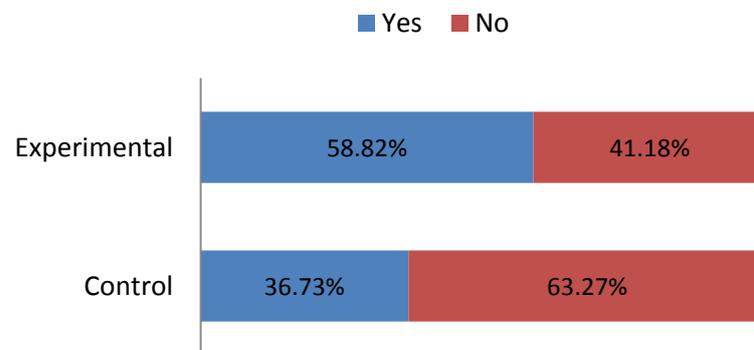


Fig 3- 13: Experience of successful investment

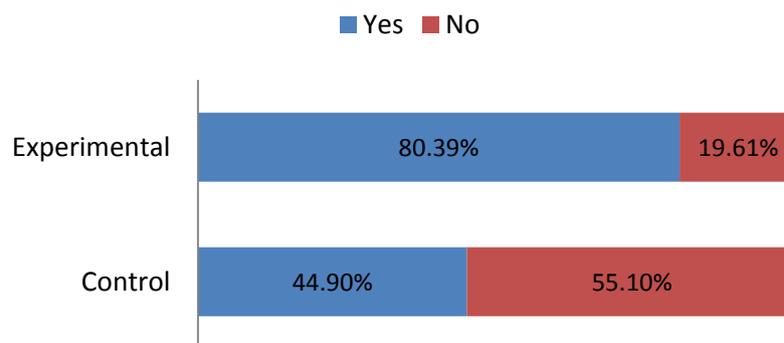


Fig 3- 14: Convenience of shopping

3.3.3 Results of individual interview

The connection between the bridge and changes of values are not revealed clearly through the questionnaire survey. There are still plenty perplexities: Why residents in Haiyan County could get easier jobs with almost same salaries? Why do they have more experience of investment? Why the values of “weak civic consciousness” and “low environmental awareness” were also changed? ... With these questions, individual interviews were conducted in order to uncover the relationship between the

infrastructure and rural communities' values.

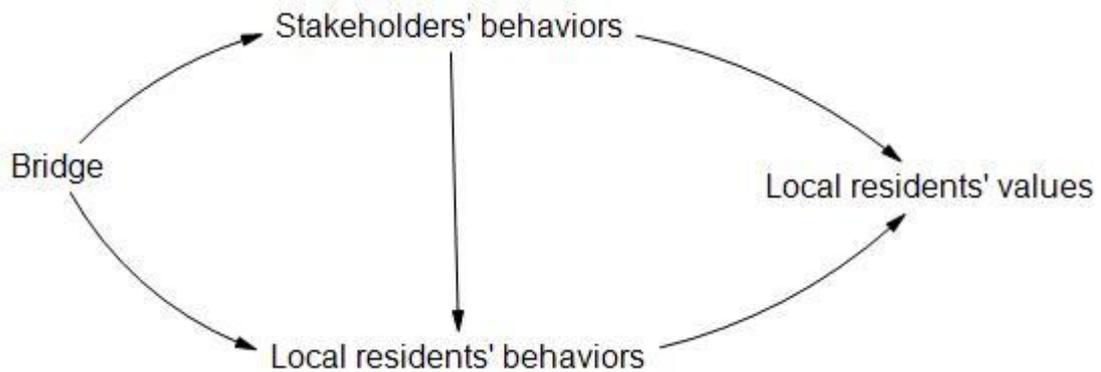


Fig 3- 15: Framework of the impacts delivery

Fig 3-15 depicts the general framework of the impacts delivery: bridge could change local residents' behaviors directly or pass on the effects through changing stakeholders' behaviors. And the updated behaviors could go deep to affect residents' values. Table 3-3 lists the behaviors following the bridge project summarized from the interviews and informal conversations.

Table 3- 3: Behaviors following the bridge project

Stakeholders	Behaviors
Government	<ul style="list-style-type: none"> ● Organize the resettlement and compensation project ● Guide the economic development and optimize the economic structure
Companies	<ul style="list-style-type: none"> ● More high-tech companies settle down and provide some positions for local residents ● Attract migrant workers out of town ● Generate higher economic benefits (more business opportunities; lower cost of transportation)
Passengers	<ul style="list-style-type: none"> ● Demand more services because of the increased number of passengers.
Local residents	<ul style="list-style-type: none"> ● More access to big cities ● Enjoy better welfare provided by the government

Combined with the detail information from the interview, the explanations about how these changes of behaviors penetrated into residents' values are given:

(1) Bridge and unadventurous in investment

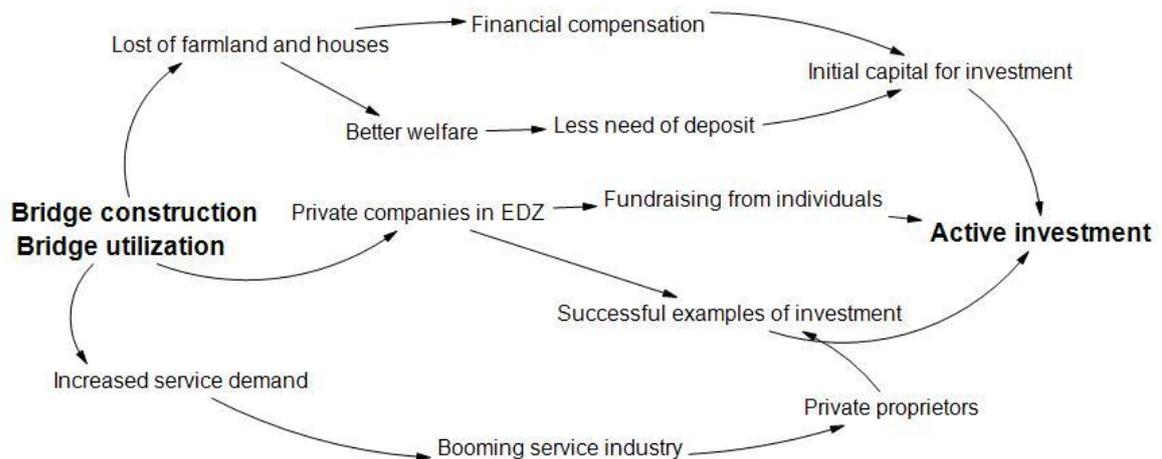


Fig 3- 16: Bridge and communities' investing habits

The high DI value for “unadventurous in investment” shows that the bridge has brought great changes on rural communities' investing habits. There are three elements stimulate the change of investing habits: initial capital, investing opportunities and knowledge about investment. The bridge construction made the local communities lost their farmland and houses. As compensation, according to the area of farmland and houses, a great amount of money was provided by the local government. The average amount in the interviews is about 300,000 Yuan which equals 10 years' income of a common farming household. Besides, all these residents could enjoy policies of medical insurances and pensions paid monthly. People who had a reliable future which provided by better welfare do not need too much deposit and can use the money as initial capital for their investment. Come to the investing opportunities, the convenient traffic brought by the bridge contributed to the development of the EDZ. Many private companies launched fundraising from individuals which provided the investing opportunities for

local residents. What's more, after bridge opened to public use, the number of passengers increased sharply and their demands for services also increased. Grasping this chance, some local residents did service business and became private proprietors successfully. Right now, some rural residents are doing their own business, some are lending money to companies and some others are looking for new investments such as stocks.

These examples showed profits, the attractive character of investment to the local residents and transfer their attention on risks.

(2) Bridge and hard working

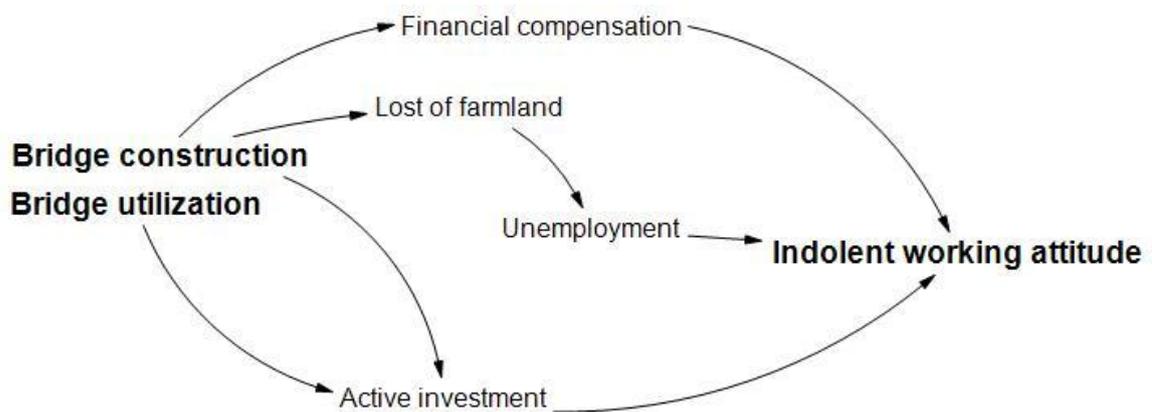


Fig 3- 17: Bridge and communities' working attitude

Some of the rural communities who lost their farmland had problems in finding a new job because of the limitation of knowledge and skills. These unemployed residents with a large amount of financial compensation got used to enjoy the spare time. On the other hand, the active investing habits caused by the bridge project which has been proved above lead people to enjoy the fruitful benefits from trading or gambling. After tasted the sweetness of investment, many local residents prefer pursuing potential benefit to working hard with low salary.

(3) Bridge and Gender Inequality

Fig 3-18 explains both bridge construction and bridge utilization generated impacts

promoting gender equality in Haiyan County. In Chinese traditional culture, aged populations without incomes are supported only by sons, neither daughters nor society. That's why most families prefer boys than girls and treat sons much better than daughters. To support rural communities who lost farmlands on which their main income depends, local government, the key pusher of the bridge project, takes responsibility to support the old people by providing better welfare. That's the main reason for that the gender preference is disappearing gradually. On the other hand, the booming service industry including restaurants, hotels, and souvenir shops encourages rural females to look for a job and get paid. As a result, female income increased and women became to be the financial supporter of the families. With the improvement of women's economic status in the family, the gender equality was also heightened.

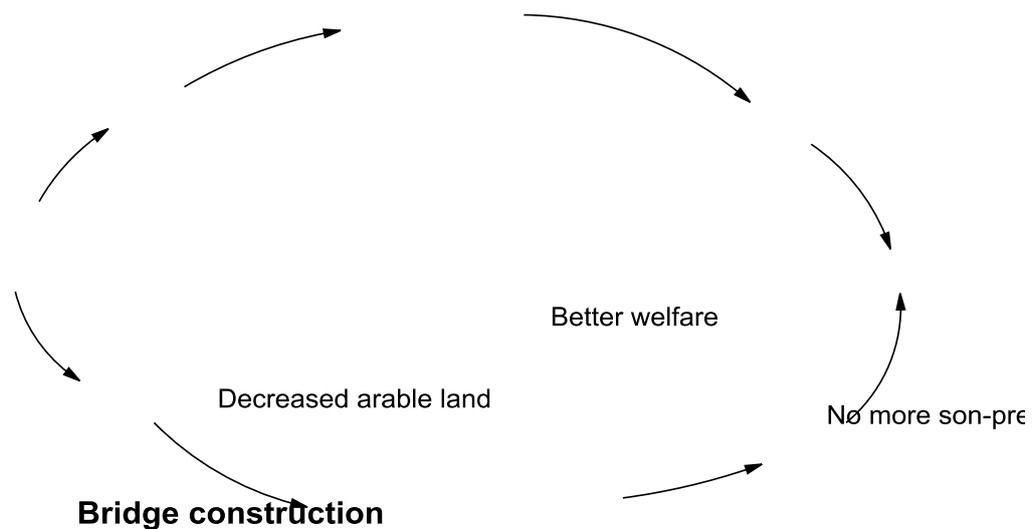


Fig 3- 18: Bridge and Gender Equality

As DI shows, besides remarkable changes on these three values, the bridge also has impacts on other values. These impacts are not so distinct and difficult to summarize. However, during the interview, some reasons may contribute the value transformation were detected.

(1) Bridge and weak civic consciousness

Civic consciousness is a quite fresh term for local residents because they still follow the conventions formed under feudal system – focus on the domestic issues and keep away from the social ones. However, the bridge construction broke the Household-responsibility system and let the rural residents immerse themselves in the society.

Someone mentioned that after started working in the current company, they had a feeling of being connected and accepted within the group. This sense of belonging helps them get along with others, especially the migrant workers who have different background, and participate in the public activities held by the company.

Some interviewees were invited to attend the public hearing and comment on the bridge project. Most of them firstly realized that their opinions could really affect the policy making.

(2) Bridge and frugality

The bridge brought more goods from outside with low prices because the cost of transportation was cut due to the convenient traffic and shorter route. Most interviewees expressed that they have more consumption choices after the bridge went into service and the access to more goods with cheaper prices gives them an impetus to expend money. In addition to sending products from outside, the bridge inspires local residents to go out and touch the urban society. One day tour in Ningbo City, the other side of the bridge, is quite popular and welcomed by the local communities. Moreover, the detail design of the bridge – a platform for emergency aid in the middle of the bridge – provides a good view of the ocean and stimulates local people to expend on travelling through this bridge.

Not only the bridge itself, the service industry aiming passengers also brings along the local consumption. Following the restaurants and hotels, the art, entertainment and recreation services emerged and became popular. There are more than 500 establishments, ranging from fitness centers to karaoke boxes, enrich rural communities' spare lives to a great extent. According to private proprietors who involved in the interview, around 30% - 40% customs are local residents and this proportion is

increasing now. All the interviewees had the experiences to enjoy these services and some even develop the habits of eating outside at times, going for workout regularly or killing spare time in the pubs.

(3) Bridge and environmental awareness

Through the interviews, it is noticed that local communities' had began to recognize the importance of good living surroundings and learn basic environmental knowledge even though their practical actions for environmental protection was still not enough. This finding explains why rural communities' environmental values are changing but not distinct.

The reasons for these changes were discovered from several detail points:

According to the requirements of the bridge construction, the local residents have to live in new residential district which was designed by the local government. Referring to experiences of urban design, these artificial constructions and equipments include many details that help rural communities create a clean and beautiful environment. Take waste management as an example, different from the old way – gathering all the waste in arbitrary places, sorted trash cans were installed in new residential sections. On the other hand, departing from the natural life, some residents that suffered from noises and polluted air were missing the previous life that humans and nature blend in harmony.

The comparison between old and new lives, no matter progress or recession, arouses residents' environmental awareness somehow.

4 Conclusion and Future Work

4.1 Conclusions

4.1.1 Findings

Accord with the theoretic analysis, the case study – Hangzhou Bay Bridge gives an illustration by changing local rural communities' values of “gender inequality”, “hard working”, “weak civic consciousness”, “frugality”, “unadventurous in investment” and “low environmental awareness” in different levels.

In this case, the original purpose – provide convenient traffic – realized the expected function of expand communities' social circle and promote the local economies. Following the “expand communities' social circle”, (Fig 2-4), local residents participate in more public activities and their weak civic consciousness are improved. Come to the effects on familism and intercultural communication, they are not distinct in this case study. However, the theoretic analysis about chain effects of local economical development (Fig 2-1) is well proved by this case study because all the issues coming after this function are mentioned in interviews.

The case study also proves that not only the social and economic purpose which embedded into the infrastructure, but also the infrastructures itself can change rural communities' daily lives and then change their attitudes toward surroundings and the way of thinking. Bridge's requirement of large land brought a series of effects including farmland expropriation, residents' resettlement, and compensation which is the main player in changing local communities' values. Fig 3-16, Fig 3-18, Fig 3-19 all mentioned how the change of land use affect people's investing habits, attitudes toward the work and the gender equality. Besides the land use of bridge, its PPP financing model which involved the private sectors into public construction and its environmental impacts also respectively affected rural communities' civic consciousness and environmental awareness.

The bridge also gave an example of how the detail design generated cultural impacts.

The emergency aid platform with good seascape on the bridge encourages communities' consumption on travelling.

Review the previous researches about infrastructure, the social effects in the first stage such as promoting economic development and changing communities' behaviors have been recognized and discussed in detail but following that the capability of altering communities' values is seldom touched. Considering the availability and lifetime of infrastructure, the changes created by the infrastructures can affect large range of people and last for a long period. Therefore, infrastructures' impacts on values relating to both current and future social development play an important role in the sustainable development and urbanization of rural areas. Since the values have key status in social evolution, an accurate description of infrastructures in rural China is given by adding its impacts on communities' values:

To assist human beings activities, infrastructures in rural China, a set of public works, are constructed and operated to provide goods and services. They interact with the social development and deliver impacts to public values by changing communities' surroundings and behaviors in their long lifetimes.

4.1.2 Suggestions for future infrastructure projects

Learning infrastructures' role in value changing, author proposed two basic suggestions for future projects:

- SIA including the investigation of cultural consequences should be fully conducted before an infrastructure project is approved. In current system, SIA is carried out as part of EIA and not investigated carefully even though environmental impact assessment is strictly ordered by the law and implemented very well. In most assessment reports, social impacts are just simply mentioned or even not. Actually,

according to this research, the impacts on social and cultural values are always hidden behind the social phenomena and pass on through the chain effects. The evaluation of potential changes of values should be carefully made based on a good understanding about local community and repeated assumptions.

- Infrastructures' impacts on rural communities' values could be modified by the detail designs. Once the infrastructure project is approved, some impacts are also fixed. In order to promote desirable impacts or mitigate the undesirable impacts, the specific elements should be considered and changed to be compatible with the need of social development. Take Hangzhou Bay Bridge as an example, if the compensation for residents who lost their arable land transferred from direct financial subsidy to career guidance, more local communities would still keep the value of hard working.
- While infrastructure can have certain cultural consequences, it can be used as a method to shape communities' values which is needed by the social development. For example, if we want to promote rural communities' environmental awareness, infrastructures such as telecommunication could be introduced and let more people know the serious conditions and information about green activities. So in light of what kinds of values we need, the decision makers should consider the cultural consequences of different infrastructures and then choose the right one.

4.2 Limitations and Future works

4.2.1 Challenges and Limitations

As with any research, challenges and limitations are also associated with this study. The biggest challenge is the methodology of investigating the communities' values which are implicit and unconscious according to Edward T. Hall. In this study, one-to-five rating system of the specific descriptor statement is used to assess communities' values. These statements include people's beliefs and behaviors that could reflect their values in a large extent, but it is impossible to represent communities' values totally by these statements. The better assessment method may be needed to give better judgment of local rural communities' values.

Another limitation regarding to the case study is that the bridge is a specific type of infrastructure and cannot reveal the impacts caused by the other infrastructures such as telecommunication, water supply, power plants and etc. Unfortunately, the other kinds of infrastructures are not cited in this research because of the time limitation. The case study of Hangzhou Bay Bridge just gives an example proving that infrastructures do generate impacts on rural communities' values and shows how to make use of the theory of "chain effects" in analyzing the infrastructures' social impacts.

4.2.2 Future works

Regarding the future works, due to the limitation of case study, the other cases of infrastructures with different functions and in different scales could be applied. Specific attention could be paid on the comparison between different infrastructures to get more concrete and detail explanations about how the infrastructures make the rural communities' values change. For example, whether cross-ocean bridge and under ocean tunnel generate same impacts? Does scale of the infrastructures affect their impacts? The answerers to these questions could give us a new point of view to examine the relationships between infrastructures and rural communities' values.

Furthermore, the object of the impacts could be extended to urban communities, all residents in a country, even all human beings. It would be interesting to know whether the infrastructures could change people's values in despite of social backgrounds. If infrastructures' impacts on values in whatever societies have been proved, infrastructure could be considered as a level to adjust the social development by affecting communities' values. Subsequently, more researches with wider topics could be carried on.

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Appendix 1: Chinese Cultural Values

National Traits	33. Benevolent autocrat / Paternalistic
1. Patriotism	34. Solidarity
2. A sense of cultural superiority	35.* Collectivism
3. Respect for tradition	
4.* Bearing hardships	Work Attitude
5. Knowledge (education)	36. Industry (working hard)
6.* Governing by leaders instead of by law	37. Commitment
7.* Equality/egalitarianism	38. Thrift (saving)
8. Moderation, following the middle way	39. Persistence (perseverance)
	40. Patience
Interpersonal Relations	41. Prudence (carefulness)
9. Trustworthiness	42. Adaptability
10 Jen-ai / Kindness (forgiveness, compassion)	
11.* Li / Propriety	Business Philosophy
12.* People being primarily good	43. Non-competition
13. Tolerance of others	44.* Not guided by profit
14. Harmony with others	45.*Guanxi (personal connection or networking)
15. Courtesy	46.* Attaching importance to long-lasting relationship not gains
16. Abasement / Humbleness	47. Wealth
17. A close, intimate friend	48. Resistance to corruption
18. Observation of rites and social rituals	49. Being conservative
19. Reciprocation of greetings, favors and gifts	50.* Morality
20. Repayment of both the good or the evil that another person has caused you	
21. Face (Protecting, giving, gaining and losing)	Personal Traits
	51.* Te (virtue, moral standard)
Family / Social Orientation	52. Sense of righteousness / Integrity
22. Filial piety	53. Sincerity
23. Chastity in women	54. Having a sense of shame
24.* Kinship	55.* Wisdom / Resourcefulness
25.* Veneration for the old	56. Self-cultivation
26. Loyalty to superiors	57. Personal steadiness and stability
27.* Deference to authority	58. Keeping oneself disinterested and pure
28. Hierarchical relationships by status and observing this order	59. Having few desires
29.* Conformity / Group orientation	60.* Being gentleman anytime
30.* A sense of belonging	61.* Obligation for one's family and nation
31.* Reaching consensus or compromise	62.* Pragmatic / to suit a situation
32.* Avoiding confrontation	63.* Contentedness with one's position in life

Time Orientation	Relationship with Nature
64.* Past-time oriented	67.* The way (Tao)
65.* Continuity / time viewed as circular rather than linear	68.* Fatalism / Karma (believing in one's own fate)
65.* Continuity / time viewed as circular rather than linear	69.* Yuan
66.* Taking a long rang view	70.* Harmony between man and nature
	71.* Unity of Yin and Yang

Source: YING FAN, A Classification of Chinese Culture [J] Cross Cultural Management, 2000. 7:2, 3-10

- Terms without asterisk are concluded by Chinese Culture Connection through Chinese Value Survey in 1987. Those with asterisk are added by YING FAN.

Appendix 2: Questionnaire in English

How the Hangzhou Bay Bridge is affecting your lives?

--Investigation about Impacts of infrastructure on rural communities' values

Introduction

Good morning/afternoon/evening. My name is Chen Haiting from Graduate Program of Sustainability Science in Tokyo University.

I am conducting a study to find how the Hangzhou Bay Bridge is affecting rural communities' values. As we know, the bridge has brought great changes to the life of surrounding people, and these changes may remodel the traditional lifestyle and values. The following questions are designed to reflect how the values, especially the domestic, social, economic and environmental values is changing. They take only a few minutes but will provide me with valuable information.

This questionnaire survey is absolutely anonymous; definitely it will not have any negative influence on your life. Please answer them freely.

Thanks for your participation.

1. Demographic questions

1. No.
2. Sex:
3. Age:
A) <20 B) 20—40 C) 40—60 D) >60
4. Educational Background:
A) illiteracy B) elementary school C) high school D) Bachelor E) above bachelor
5. Occupation:
6. What's the annual income in your family (RMB yuan):
A) \leq 20000 B) 20000—50000 C) 50000—100000 D) \geq 100000
7. Where are you living? _____ County

2.Domestic Values

Objective questions:

1. How many people are living together in your family?
A) ≤ 3 B) 4—5 C) ≥ 6
2. Do you endow your parents or grown children with money?
A) Yes B) No
3. Are you keeping in touch with all your relatives?
A) Yes, always B) Yes, but not very often C) No
4. The main income of your family is from which field:
A) Agriculture B) Secondary Industry C) Service Industry D)Others
5. In your family, who earns more money?
A) Male B) Female C) almost same

Subjective questions:

Please read each question carefully, and tick the answer which best describe you. All questions use five-point scales and the higher scores refer to higher levels agree with the statement provided. ('1' represents 'Strongly disagree'; '5' represents 'strongly agree')

1. When encounter difficulty in life, I will ask relatives for help primarily.()
2. I would like to spend spare time with my family.()
3. To celebrate important festivals, all family members should get together.()
4. I cannot accept the practice of sending the aged into seniors' home.()
5. Being parent is necessary experience in life.()
6. Divorce is a very shamed thing.()
7. Family's advices are very important to me.()
8. If I will have a child, I prefer boy than girl.()
9. Wife should bear more housework than husband.()
10. For women, family is more important than career.()

3. Social Values

Objective questions:

1. How many hours do you spend on your work or study?
A) Less than 3 hours B) 3 to 8 hours C) More than 8 hours
2. How many holidays do you have? (including weekends)
A) Less than 20 days B) 20 – 80 days C) 80 – 150 days D) More than 150 days
3. Have you proposed any suggestions to public projects?
A) Yes B) No

Subjective questions:

Please read each question carefully, and tick the answer which best describe you. All questions use five-point scales and the higher scores refer to higher levels agree with the statement provided. ('1' represents 'Strongly disagree'; '5' represents 'strongly agree')

1. Hard working is the only way to get rich.()
2. Even if I do not like my current job, I will continue it until I find another one.()
3. Even if I have enough money, I still want to work to fulfill my life.()
4. Being at grass without a job is shamed.()
5. I know well about my rights given by country and make full use of them.()
6. If there is a chance, I would like to be a volunteer to help social works.()
7. I always pay attention to the political developments()
8. It is unreasonable that leaders can get better welfare and more rights.()
9. I will not vote for my acquaintances if he or she is incapable.()
10. Law is the only standard to solve dissensions.()

4. Economic Values

Objective questions:

1. Does your family have a car?
A) Yes B) No
2. How many times do your families eat outside every month?
A) Less than 5 B) 5—10 C) 10 – 20 D) 20 – 30 E) More than 30
3. How many times do your families travel every year?
A) Never B) Once C) Twice D) More than twice
4. Have you or your relatives had successful experience of investment?
A) Yes B) No
5. Is it very convenient for you to buy anything you want?
A) Yes B) No
6. How much percentage does the following expenditure take in total expenditure?
1. Food _____ 2.Clothing _____ 3.Housing _____
4. Communication _____ 5.Health _____ 6.Education _____
7. Entertainment _____ 8. Investment _____ 9. Deposit _____

Subjective questions:

Please read each question carefully, and tick the answer which best describe you. All questions use five-point scales and the higher scores refer to higher levels agree with the statement provided. ('1' represents 'Strongly disagree'; '5' represents 'strongly agree')

1. I prefer brands when choose products.()
2. Expenditure on entertainment is necessary.()
3. I am interested in new products and would like to buy them.()
4. If I have spare money, I would like to do some investment rather than deposit it.()
5. Doing my own business is very attractive to me and I would like to try.()
6. It is cost-effective to take the risk of investment because of the potential benefit.()

5. Environmental Values

Objective questions:

1. Do you always sort your garbage and recycle useful items?
A) Yes B) No
2. Do you dump your garbage at appointed place?
A) Yes B) No
3. Where does your daily-used water mostly come from?
A) Tap water B) Well C) River or Lake
4. Do you save water on purpose?
A) Yes B) No
5. Do you plant anything right now?
A) Nothing B) Flowers C) Crops D) Trees

Subjective questions:

Please read each question carefully, and tick the answer which best describe you. All questions use five-point scales and the higher scores refer to higher levels agree with the statement provided. ('1' represents 'Strongly disagree'; '5' represents 'strongly agree')

1. Compared to past decades, environmental degradation is very obvious.()
2. Environmental pollution is a very serious problem related to everyone's life.()
3. Not only the government, but also every resident should pay effort on environmental protection.()
4. Natural Resource is exhaustible.()
5. I think it's necessary to strengthen environmental education for everyone.()
6. I would like to get more knowledge about how to protect environment.()
7. I prefer environmental friendly products, even if their prices are higher.()
8. I would like to pay environmental tax for environment protection and restoration.()