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**Finnish Government contribution in Hai Phong Water
Supply, Drainage, Sewerage and Sanitation Management
Programs in Hai Phong city, Vietnam**

A Case Study

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Thesis abstract

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The objective of the thesis is to bring out a general point of view in the contribution of the Finnish aid of Finnish Government, targeted in the development of urban area as well as water supply and sanitation of Hai Phong city, the most Northern port city of Vietnam, which holds an important role in the economy system of Vietnam. Moreover, Hai Phong is one of three targeted cities that get Foreign Direct Investment as well as support from Finnish government for the development of local water supply and sewerage treatment, which directly affect its own economy and national economy.

The thesis will concentrate on professional and academic source of information such as government material, public documents of international official organization and published books and qualified online articles that somewhat related to the subject.

Keywords: sanitation, water, economy, rehabilitation, cooperation.

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Abbreviations

WB	World Bank
ADB	Asian Development Bank
WHO	World Health Organization
UNICEF	United Nations Children’s Fund
IQ	Intelligence Quotient
GDP	Gross Domestic Product
FDI	Foreign Direct Investment
WSDSSMP	Water Supply, Drainage, Sewerage and Sanitation Management Programme
OECD	The Organization for Economic Cooperation and Development
WSS	Water Supply and Sanitation
MFA	Ministry for Foreign Affairs of Finland
Hai Phong WSCO	Hai Phong Water Supply Company
Hai Phong URENCO	Hai Phong Urban Environment One Member Limited Company

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1 INTRODUCTION

Background of the research as well as methodology and hypotheses of the thesis will be presented as below.

1.1 Background

This paper will generally provide readers a brief understanding of the contribution of Finnish Government to the development of the facility, infrastructure of water sector in Hai Phong city, Vietnam. The water supply and sanitation (1B project) is a part of the Vietnam: Three Cities Sanitation Project, largely financed by World Bank to continue the previous water supply improvement plan since 1990, with the involvement of Finnish Government and further funding of Japanese Government, WB and ADB. Therefore, a long term development plan to improve, recreate and upgrade the infrastructure of water supply and proper sanitation has been requested from Vietnamese Government since 1990. This is one of the highest important goal for Vietnamese national economy since Vietnam has been recovering and rebuilding the infrastructure after the war.

First of all, the importance of clean water and sanitation will be generally discussed. Then the impacts of clean water and sanitation will be taken to account economically, both short term and long term. Furthermore, the situation from both sides, Hai Phong city and the success story of Finnish water will be presented as the environment of the study.

Finally, the thesis will concentrate on the study of how Finnish government successfully contributed in the water sector of Vietnam, both clean water and sanitation improvement. The objective of the thesis is to concentrate in how important

this cooperation have been to the development of Vietnam, both economically and socially.

1.2 Methodology

This thesis use qualitative research, in which all the available and suitable materials will be carefully considered and evaluated in the purpose of collecting necessary information, statements, theory and description. The thesis will be divided into two important points: Theory and Case study, therefore the qualitative study on available materials will give a more trustworthy view on the matter and other professional statements. Main source of material can be found from official website of WB, in which urban infrastructure development from those countries directly take a loan from, available material and document can be found. Other sources of materials mostly comes from trustworthy published sources from the Internet such as Government's websites, international organizations and a limited number of documents provided from Hai Phong Department of Planning and Investment, Hai Phong city, Vietnam.

1.3 Hypotheses

Back to the 1990's, Hai Phong city has been assigned as one of the four main point cities of Vietnam: Ha Noi, Hai Phong, Quang Ninh and Da Nang that needed upgrades and developments in the water and sanitation sector.

The situation of Hai Phong city is rather critical as it is one of the most important city of Vietnam, holding the key position of trading and military. Just 100 km away from Ha Noi, the capital city, Hai Phong is considered as one of the most vital port city that needed immediate development. Haiphong was badly suffered from unhygienic water source and low quality sanitation, due to post-war rehabilitation and reconstruction, making the look of such important city dull, undeveloped and

above all, causing plenty of water related diseases that brings serious concerns to not only local community but also on a larger scale, the Vietnamese government.

Meanwhile, from 1995 to 2009 witnessed the continuation on a large scale in the international efforts of Finnish government to improve the water and sanitation all over the world during and after the International Drinking Water Decade. They experienced many lessons and precious knowledge that are really helpful in developing the water sector. Moreover, sanitation has been brought to the general development of water sector in rural areas as an incorporation. This was a critically important package for countries like Vietnam, Nepal or Ethiopia which suffer from poor quality water supply and inappropriate sanitation. The well-known success story of Finnish water is the perfect basis for any developing countries which in need of water and sanitation infrastructure rehabilitation.

Table 1: Coverage of improved water supply and sanitation in selected countries of Finnish development cooperation (Source: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Progress on Sanitation and Drinking-water: 2010 Update.)

Country	Year	Population million)	Urban (%)	Improved water supply		Improved sanitation	
				Urban (%)	Rural (%)	Urban (%)	Rural (%)
Ethiopia	1990	51,1	13	74	4	19	2
	2006	81,0	16	96	31	27	8
Nepal	1990	19,1	9	97	70	36	6
	2006	27,6	16	94	88	45	24
Vietnam	1990	66,2	20	87	43	62	21
	2006	86,2	27	98	90	88	56

2 WATER AND SANITATION ROLE IN OUR LIFE

Water is an essential part of human's life. 2005 to 2015 remarked a historical age of Earth's water sector, when the United Nations General Assembly proclaimed this period as International Decade for Action – Water for Life, just right near the end of International Year of Freshwater, 2003 (Water Decade 2005-2015). Understanding the importance of water to human life is a general knowledge that have been adopted everywhere, with the recognition of every countries in the world and the awareness of their own citizen, especially in developing or poor countries, where the access to safe and clean water resource is sometimes an expensive scenario. This called for a commitment and a far greater effort in not only focuses but also effective actions that brings significant changes to the infrastructure of urban water sector in developing countries. This bring the promised countries of 2003 to a whole new level of committing to the ongoing 2000 Millennium Declaration sign 8th September 2000 (Water Decade 2005-2015):

“The Decade will focus on water-related issues, at all levels and on the implementation of programmes and projects, and the furtherance of cooperation at all levels, in order to help to achieve the internationally agreed water-related goals contained in the United Nations Millennium Declaration, and in Agenda 21 and the Johannesburg Plan of Implementation of the World Summit of Sustainable Development of August 2002 (WSSD)

Moreover, from 1981 to 1990, the UN has declared it as the International Drinking Water Supply and Sanitation Decade with the humane sole purpose for people from all around the world to have proper access to safe drinking water and basic sanitation as part of human right. Therefore, this action of UN for International Decade for Action – Water for Life is a further step to the sustainable development of infrastructure and environment in water sector which has been implemented since International Drinking Water Supply and Sanitation Decade. (Water Decade, 2005-2015)

2.1 Hydrological cycle and its value to human life and the economy

Water is, again, an essential part of human's life when 70% of our body mass is water. We lose water and intake water every day, through most basic daily life activities. Therefore, logically, most of the animals walk on the surface of the Earth needs a sustainable supply of freshwater to survive and develop. Plenty living creatures depends their lives as well on a very small amount of safe water supply such as green plants, mammals, fungus..etc. Thus, the ecosystem which is absolutely cannot missing any component to make it a well-built machine to operate smoothly, will be in great danger if any of these components get affected by the inappropriate water supply.

However, as one of the most advanced breed of living creatures, it can be seen clearly from the development of human being along with the history that we have developed through researches for availability of safe drinking water since the water source has been fully aware as a limited natural resource of the world. Any effort of archiving safe drinking water from digging wells for underground water to harvest and storing fresh rain water for further purpose, all has shown human's capability of survive the difficult situation when the water resource is restricted. Temporarily, the situation has been improved for a brief period of time but after all, the availability of freshwater supply is still a problem that has been ongoing since the modern time of awareness.

The water mass of the Earth has been continually regenerated over most of recorded history. Water is a renewable resource of the earth when the transportation of Earth's water through many forms has kept water to the earth since the very beginning. This general liquid amount of water has been passed on many places all over the world as a non-stop movement by a natural yet significant process called the Hydrologic cycle or Water cycle. This natural cycle not only guarantee the amount of water of the surface of the Earth stays unchangeable but also brings many benefit to human's daily activities throughout history. Human learnt to use natural phenomenon and events such as rains, storms and waterfalls in advantage of their own benefit, which are the direct relating results of the water cycle. To be more specific, the water cycle include the following processes:

Evaporation

To put the definition simple, the process of water being evaporated from liquid state to ethereal state under heating process. It takes approximately 600 calories of heat energy to completely evaporate one gram of water, theoretically. (Northwest River Forecast Center) However, there's plenty other factors affect the process of water evaporation in nature, such as: temperature, air pressure, atmosphere pressure, winds...etc. All of these factors heavily depends on the natural geographical traits of the specific areas, which makes each place in the world unique when it comes to evaporation process. Besides, evaporation happens from different condition of water such as raindrops or any water surface or even melted snow and ice. (Northwest River Forecast Center)

Another fact is, nowadays a high percentage of evaporation is caused artificially, both on large and small scale. Not only the small scale of factories, buildings, public projects and plenty other activities but also the impacts of human in a longer term, the exploitation as well as the pollution, all and all created a chaotic atmosphere, which makes the greenhouse effect more and more serious and the earth keeps getting warmer and warmer, which escalate the natural evaporation process. After the evaporation, the moisture is lifted to the air from the mentioned

water surfaces as vaped water. Because the process is continuous, there is always vaped water being kept in the atmosphere. (Northwest River Forecast Center)

Condensation

Condensation is simply put a concentration of water in the air after it has been evaporate in the evaporation process. The physical form of water now is being changed from vaped water and moist into liquid drops. Vaped water is now being gathered together, condensing from air molecules into layers of fog and clouds. The main events of condensation is realizable when the temperature in the upper air gets cooler, narrows the space between molecules or the evaporation is significant enough that the vaped water reach the saturation state. Afterwards is the assembly of vaped water back to liquid state and the afore mentioned heating calories that evaporate water is now being released (Northwest River Forecast Center).

Precipitation

As being commonly known by “rainfall”, precipitation is one of the most significant event in the water cycle that marks the halfway of the cycle. The process happens from the moment the rain drops after the condensation process is matured enough or reached a proper size that the drops themselves started to be exposed in the atmosphere to gravity. The gravitational force is now performing its own job, pulling down the rain drops on a gigantic scale together with frictional dragging force. The first cloud-scale drops leaves a turbulent events which allows the premature drops to fall down faster, hence the continuously drops of rain, until there’s no rain drops exposed anymore. (Northwest River Forecast Center)

This process happens way faster than the condensation process, which leads to the stop of the rain. Other possibility is the crystalize process, which can replace the mentioned agglomerate process of rains. This crystalize process works the

same way as rain, however instead of rain, in a certain areas the temperature is low enough to form the ice in clouds. This ice falls down, drag some drops with it, which makes the crystals to grow to proper size, hence the snows flakes or ice pellets. Sometimes, when it's cold but the lower layer of atmosphere is not cold enough, the melting happens, which cause rainfall. Small and unprecedented rainfall mostly end up being returned to the atmosphere by evaporation. Precipitation can happen everywhere, including the original evaporating area. (FWR – Foundation for Water Research)

Groundwater

After precipitation, major part of the main water after rain is absorbed by the lands and ground surfaces. This is the most significant source of water found during the formation of water surfaces such as rivers, lakes, underground water and channels.

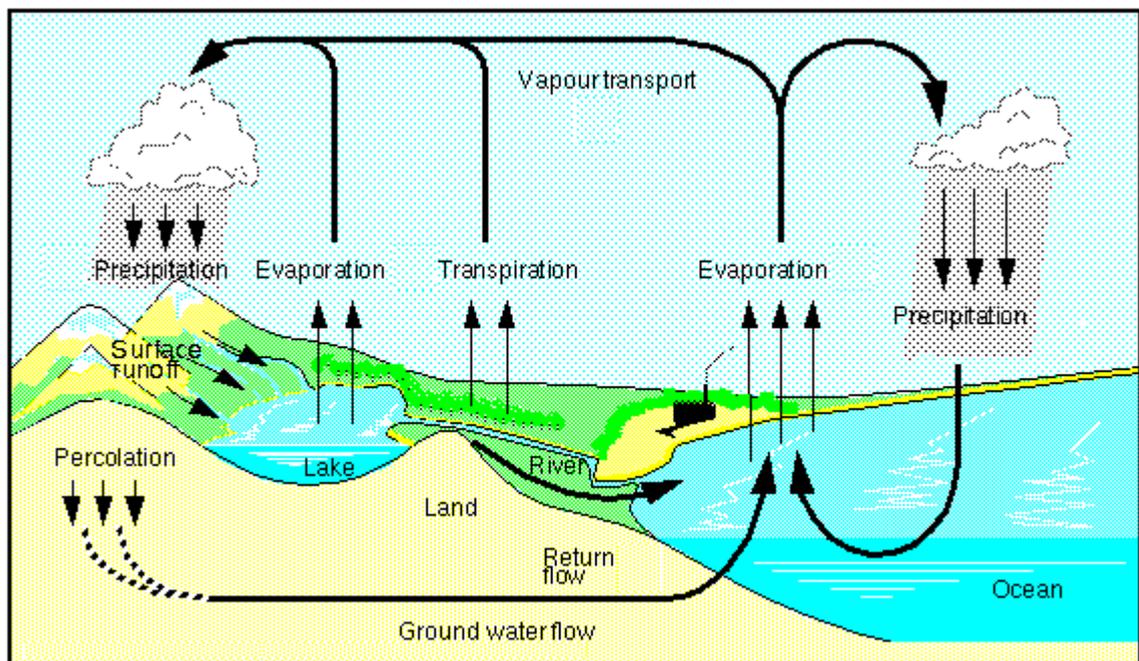
Moreover, after the absorb process happens, there's a noticeable amount of water not able to evaporate stuck underground, between layers of rocks, dirt and soils. This water called groundwater. This water insinuate through the upper layers of soils and rocks until reaching an impenetrable surface of fossil deeper underground, then the water will start to travel sidelong. This deep under layer of fossil is called "aquifer", which leads the water back to lakes, rivers and oceans. This running process of groundwater is preferably a minor part of the cycle since the process happens slowly and takes significantly amount of time to begin a new cycle, yet it is undoubtedly important for the cycle on a longer term scale. (FWR – Foundation for Water Research)

Run-off

After the process of precipitation, most of the water amount fell to the ground and form temporary puddles of water or temporary flows, mostly downhill. These downhill flows is called run-off. Partially, this run-off will be absorbed on the way

as groundwater later on, but mostly will follow the flow back to rivers, lakes and oceans, the major surfaces for the first process – evaporation. Needless to say, this run-off complete a cycle of hydrological.

In this run-off and storing phase, the amount of groundwater will be increased or decreased, depends on the flow whether if it is indeed heavy or not. When the layers below the upper most surface is saturated and the ground water/soils percentage increased to a certain level, flooding may happens due to the precipitation process is now overwhelmed the capability of groundwater storage and run-off. (FWR – Foundation for Water Research)



Courtesy Erich Roeckner, Max Planck Institute for Meteorology

Figure 1: The stages of the Hydrological Cycle. Source: Live from Earth & Mars.

The Water Cycle (http://www-k12.atmos.washington.edu/k12/pilot/water_cycle/grabber2.html)

As mentioned previously, the major of inland flows of water is back to rivers, lakes and oceans, partially back to groundwater. However, the most critical component is by the government for it to flows into residency areas and households via pipes and taps system. This is an important matter to both any country's government and citizen of the country because people needs a clean, fresh and sustainable supply of water for survival and development on a basic need level. When it comes to clean water supply and sanitation, the most essential part in every country is infrastructure, with networks of pipes, water process and pumping stations as well as sewage treatment system, for the Government to deliver safe and clean drinking water supply and proper sanitation. The sanitation process is ultimately important since to protect the environment and remain a sustainable source of clean water, therefore the utility unit's duty is to gather and transport the wastewater through the sewerage system back for processing and purifying and return the clean water back to the environment. It is a direct relationship between the water cycle and water supply and sanitation especially in developing countries, when the limited access to water supply is a common problem for the resident. The water utility process encourage the collecting of rain water hence the direct connection to precipitation. The flow of water back to lakes, rivers and oceans or run-off has been utilized for a long time for multiple purposes: waterfall hydroelectric facilities, dividend of flows for domestic using purposes, agriculture and industry...altogether forms a strict connection between run-off and water supply and sanitation, hence the relationship between hydrological cycle and water supply and sanitation. (FWR – Foundation for Water Research; Katharina Conradin, SSWM – Sustainable Sanitation and Water Management – The Water Cycle)

2.2 The definition of clean water and sanitation in general

To understand how important clean water supply and proper sanitation to a country, first of all the definition of clean water and sanitation must be defined at a basic level as below:

2.2.1 Clean water

There's absolutely no official or universal definitions for clean water. As a result, this thesis will pay attention and focus on a few different aspect of clean water as an alternative method to approach a clearer definition.

Clean water is the type of water that satisfies the requirements of not harming human's health, convenient for daily life access, which should be drawn from a safe and fresh water sources, which accounted up to 2.5% of total approximate 1.4 billion cubic kilometres of water covering the surface of the earth. Out of this 2.5% there's only 1% of which water is safe to drink without basic treatment. (U.S Geological Survey 2000).

Biologically, clean water should have no germs, zooplankton and so on...as long as there's no harmful or toxicities bacterium. Physically, clean water has to be transparent, smell less, tasteless and pH degree in the range of qualified or ordinary degree. Chemically, clean water has to satisfy the ordinary content of necessary chemical compounds for human's body such as iodine, magnesium and so on.

Just like air and light, it is almost impossible for human being to live completely without water since 70% of our body mass is water. In the formulation of life on Earth, water act as one of the most critical role. Water helps regenerate in the organic world (e.g. photosynthesis). Water is the central of metabolic activity. Every physical and chemical activities happens inside our body with the essential appearance of water. Water is the solvent material of many substance as well as directing important mineral into our body system. In society, water serves as many roles. Moreover, water acts as an extreme factor in many industries such as: agriculture, forestry, mineral... For trees and plants, water is the basic requirement as well as conditioning heat, lights, nutritive, microorganism, etc.)

2.2.2 Sanitation

According to WHO 2015:

“Sanitation generally refers to the provision of facilities and services for the safe disposal of human urine and feces. Inadequate sanitation is a major cause of disease world-wide and improving sanitation is known to have a significant beneficial impact on health both in households and across communities. The word 'sanitation' also refers to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal.”

According UNICEF, 50% out of 120 million children born in developing countries are at risk of survival and development due to the limited efficiency sanitation, 88% of deaths from diarrhea diseases is the single-handed result of poor sanitation, which leads to a total unhygienic scenario and worst of all, 1.5 million child mortality deaths per year.

2.3 Clean water and sanitation impacts on the social economic system

Clean water and sanitation can actually significantly increase a country's economic system growth rate. Moreover, it has been proven that clean water and sanitation can act as factors to end financial deficiency and crisis in many countries over the world.

“Water is crucial for the economy. Virtually every industry from agriculture, electric power and industrial manufacturing to beverage, apparel, and tourism relies on it to grow and ultimately sustain their business.”

Pacific Institute, Water Scarcity & Climate Change: Growing Risks for Businesses & Investors

There is an undeniably inseparable relationship between clean water- sanitation and the economy. Whether the country is developed or developing, to make better, more well-prepared and stable country's complete development strategy for close future as well as the macroeconomic system (both financially and politically), they should have a solid and sustainable plan for the water and sanitation sector. This is just a fact that every country has to accept. Obviously, many industries that linked with water and sanitation infrastructure development are the backbones of the economy such as: trade (goods importation and exportation), agriculture, marine time... All heavily refers to the essential characteristics of clean water and effective sanitation. The macroeconomic system and nations critical decisions can be controlled and governed more effectively and fairly, by simply integrating the advantages and foreseen benefits of a better water resources and sanitation management and supply into close future economic expansion reckoning. Plenty of developing countries are on the path of a more magnificent changes in the macroeconomic developing procedures, thanks to the on-going prominence of globalization and economic reorganization. (Mark Sanctuary, Hakan Tropp and Laurence Haller 2005, 7-9)

2.3.1 Short-term impacts

The third most dangerous risk to human health in developing countries with high mortality percentage is the limitation in access to clean water, sanitation and food hygiene. For example, limitation in access to clean water and sanitation may cause diarrhoea, a deadly epidemic which cause around 1.8 million deaths every year. Sorrowfully, 90% of these deaths are children under the age of 5 (Mark Sanctuary, Hakan Tropp and Laurence Haller 2005, 12). Moreover, there are quite many other intestinal infection that usually have the same cause such as: Hookworm disease, Trichuriasis or Ascariasis. Meanwhile, immediate impacts of clean water and sanitation has been seriously considered as of its benefit in preventive actions could have been done. For example, according to WHO, in 1991, a chol-

era epidemic in Peru has cost around USD 1 billion to temporary eliminate instead of a solid USD 100 million could have been well-spent and prevented the epidemic just by investing and improving the water and sanitation infrastructure (Mark Sanctuary, Hakan Tropp and Laurence Haller 2005, 13). Economically, the financial expenses, wasted of time when taking to account of working days per capita, and the lost number of population is a sustainable proof that preventive planning and investment in water and sanitation sector are actually urgent and more needed than ever, for its own immediate effect on the economy. (Mark Sanctuary, Hakan Tropp and Laurence Haller 2005, 12-14)

2.3.2 Long-term impacts

We all noted the instant benefits of clean water and sanitation through citizen's health improvement channel, one of the most important aspects of general economy. However, the benefits of clean water and sanitation improvement is far more effective than that. Not only short-term benefits are being taken to account but also long-term economic growth profits are being delivered for a clearer insight.

First of all that needed to be considered is the development of education in one country and its benefit in the economy system theoretically, according to human capital theory. The simplest example is to be qualified as a person who is able to participate in important social activities and giving contribution to the society according to his rights and/or duty, he must have the most basic education level literacy and numeracy. The better the access to water source and the quality of water, the less time children and their family in developing countries have to spend outside of schools and spend more time effectively learning and increasing knowledge level. Education, after all, is the most basic foundation to a country's development.

There is an undoubtedly strong connection between sanitation and intestinal diseases. Taking education into consideration as a nation development factor, children need to attend school frequently to achieve certain points of basic knowledge. There is also a correlation between absent percentage and number of infected children, study shown. Several water- related diseases from intestinal vermin in developing countries which does not have proper sanitation is actually one of the reasons that stunts the development of children's physique and presentation in school. This is a direct negativity to children efficiency and chance to learn their ways to escape poverty.

Water related parasites is the main reason why many children all around the world suffer badly varieties of deficiencies in nutrition and malnutrition. This cause several symptoms of future faulty physical development in children and also leads to a high percentage in attendance rates and performance, as stated by UNICEF. In developing countries, it is very common that schools themselves cannot satisfy the requirement for basic sanitation system. Frequently, it can be observe that the most basic factors of a common sanitation such as water supply for hand washing and self-cleaning or the facility for those said purposes usually not available or, most of the time, not functioning properly. Therefore, it is not a surprise that schools actually can be infected by plenty diseases, arise from germs and bacteria. This is a serious situation that needed government attention, otherwise, this will lead to episodes of failure in the effort of improving the situation. (Mark Sanctuary, Hakan Tropp and Laurence Haller 2005, 14-15)

Table 2: Incidence rate and cause of diseases related to drinking water. (Source: Access to Safe Drinking water and Its Impact on Global Economic Growth, a study for HaloSource, Inc. by Josephine Fogden 2009.)

Disease	Morbidity (incidence of disease/year in 1,000s)	Relationship of disease to drinking water
Cholera	140 ⁵¹	Caused by the presence of the bacterium <i>Vibrio cholerae</i> in drinking water
Diarrheal diseases	1,000,000 ⁵²	Caused by a host of bacterial, viral and parasitic organisms in contaminated drinking water
Dracunculiasis	100 ⁵³	Caused by the presence of a <i>Cyclops</i> that has ingested the larvae of the large nematode (roundworm) <i>Dracunculus medinensis</i>
Poliomyelitis	114,000 ⁵⁴	Caused by the presence of the polio virus in water

According to Warford and Yining (2002), approximately 64,000 deaths in China have a strong connection to water-based diseases (about 1.5% of all counted deaths in total), index from The China Council for International Cooperation on Environment and Development. Moreover, China has been suffered from IQ loss in children, which can be traced back as a result of polluted water digesting process. These water sources are mainly affected by many chemical subsidies and heavy metals such as lead, mercury. As the obvious result, about 6.5 point has been decrease from the IQ scale of China because of 7 million infected children. Back in 1990s, about 1.3% of China's GDP has been decreased approximately, equals USD 13.4 billion loss estimated from the effects of polluted water on residents health. (Hansen and Bhatia 2004)

Not only result in children IQ loss, researchers have noticed that parental skills and experience get affected heavily by high rates of disease in general. The higher infant and child mortality percentage in one country, the higher percentage of fertil-

ity, which cause overwhelming number of population in general. Following this cause is the more poorly investment in children, especially on health and education aspect.

According to Bloom and Sachs study in 1998, in comparison with quick-developing countries in East Asia, about half of Africa's economic improvement deficit can be linked as a result of poorly treated water and sanitation system as well as geography which cause plenty of water-related disease than normal cause of economic growth such as the macro-economic system and political reasons.

Moreover, water-originated epidemics are a serious apprehension to investment aspect on macroeconomic level, especially talking about FDI. As long as the diseases are still not completely eliminated, the industry and economy of a country still suffer from them. The potential risks from these epidemics prevent one country from attract businesses for investments.

Generally, the economy get heavily affected by untreated water resources: the labour force suffer due to poor labour health and working environment, leads to plenty of missed opportunities. Afterwards, the long-term growth suffer from those missed opportunities, which cause slow rate development in almost entire economy, depends on the strength and weakness of the country. Empirically, according to Jeffrey Sachs, it is totally important for a country to foresee and realize the important role of clean water and sanitation on health and education, which has been afore mentioned as the key factor of improving the social economic system of a country, especially poor or developing countries which were suffering from the poorly equipped facility or infrastructure of unhygienic water and inferior sanitation system. He also mentioned an important point according to his research that, among the world's poor countries that access to clean water and basic sanitation, the better the access to improved clean water and sanitation could be, the higher economic growth the country will experience. (Mark Sanctuary, Hakan Tropp and Laurence Haller 2005, 11-15).

3 RESEARCH ENVIRONMENT

In order to be able to understand the case study better, first of all this chapter will give a better picture to the audience about the research environment: how badly the situation was before WSDSSMP in Hai Phong city and the development of Finland in the water sector.

3.1 The situation of environment and citizen's health concerning water sources and sanitation in Hai Phong before WSDSSMP

Before WSDSSMP, Hai Phong city suffered many serious problems with the environment in general. Most of city area in Haiphong are widely spread with pollution, and there are several local points of the city that are the sources of pollution as well as the trouble-spot of diseases, especially unofficial waste and garbage concentrating points and polluted rivers and lakes. The history behind Hai Phong city is richly traditional, traced back hundreds of years of agronomy and fisherman tradition, due to the geography characteristics of the city. Hai Phong has a relatively large number in population quantities, mostly urban and heavily populated in all city area. The border area of common lakes in the city has been decreased due to the fast growing population and housing requirement.

The water situation is not really positive when most of the surface water sources are salty and sometimes even muddy because of tidal fluctuation is not under appropriate control, except for a few natural lakes, ponds and wells.

The most serious environment situation in Hai Phong city is the pollution caused by poor sanitation system. This is the main reason of public health risks and environmental pollution, which cause plenty of further healthcare problems and way far worse than that. The only waste treatment plants in the city was for the fluency operation of Children's Hospital and Viet Tiep Hospital. However, these treatment

plants was not working proper anymore for a few years back. This made the situation go an unexpected and undesirable way that waste water from both households and industrial use were released through the lakes and channels inside the city, making the aquatic life of these system the reluctant wastewater treatment for the city. Moreover, Hai Phong city is considered suffer badly from natural factors, especially storms, tidal and heavy rains, which means without the proper exhaustion for the rivers and lakes, wastewater will stuck there and only get dissolved thanks to limited flows and limited evaporation. Being close to the sea, the final destination of wastewater from Hai Phong will end up in the sea, which make it the ultimate reception of the city's wastewater. This is a total negative point to the environment and ecosystem.



Figure 2: Geographical position of Hai Phong city (with the red part on the map being the city) Source: “Haiphong” at Wikipedia.org 2015, May. Retrieved from <http://en.wikipedia.org/wiki/Haiphong>

3.2 The long term well-known success of Finnish water and sanitation and their international contribution

When talking about Finnish water, the country of thousand lakes, it's not only a successful story water resources management but also the technology and experience in planning, construction, research and development to achieve such title. Moreover, the know-how experience allowed Finland to build a sustainable system of water resource controlling and sanitation then bring different sectors around the water business closer together, in order to create a strong network for sustainable development in the future of Finnish water.

Yet, Finland doesn't keep the secret of their successful story of water and sanitation management to their own. In fact, they share their own technology and experiences with many developing countries, for a better developed world, where water can be seen as the utmost basic factor that everyone in the world should enjoy as a right. This is exactly the reason why Finland seeks long-term and equality in partnership internationally, based on mutual interests and respect, about sharing and learning expert knowledge.

Another aspect that need to be taken to account, is the experiences Finland earned from their own approaches for clean water and sanitation. The best approach to improve water supply and sanitation in certain rural area is use the local community as the resource of support, which require a total commitment and co-operation.

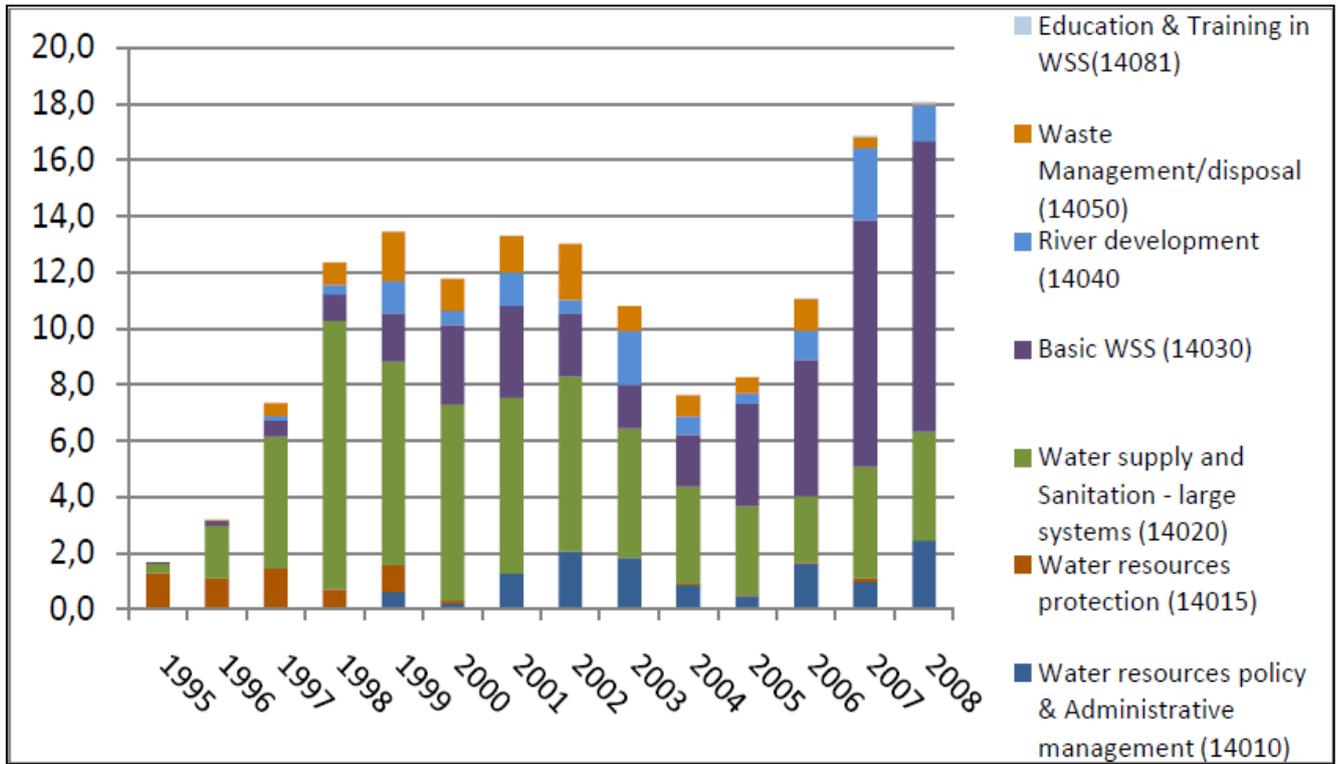
In the co-operation aspect, Finland has got the experience of being successful, which leads to very important lessons for further future successful partnership between Finland and other countries or even, the real-life lesson for any country who want to successfully give contribution to water sector to other countries in need. The most valuable lesson is water and sanitation as being called "a right" to local community can lead to a lower investment and lower further maintenance cost than an on-site sanitation system. This type of cooperation not only result in a

better economical outcome but also divide the responsibility into multiple contractors and operation, which means stricter and more disciplined rules for them to follow on a larger scale.

It is fine to say that, water improvement is one of the main areas that Finland contribute internationally. A few of Finland's ongoing success partners in water sector are: Vietnam, Ethiopia and Nepal. Meanwhile, there are other water programs that has been launched in other developing countries such as Kenya, Sudan, Somaliland and Zambia. Other regional cooperation are the Nile, Mekong River, Lake Victoria, Central Asia and the region of Eastern Europe.

One significant successful story can be mentioned is the Community Development Fund, a new funding system which created under the name of local community for their own interest of water management and sanitation system. In other regions such as Eastern Europe and Central Asia, many Finnish organizations which responsible for the development of water sector has made significant progress to work with partners from those mentioned areas for a mutual outcome in the improvement of water supply and sanitation. Finally, across the Mekong River, the effective collaboration between Finland and the Mekong River Commission and local government has shown a significant effort in increasing the ability of these countries in controlling the water resources. (Finnish water best practices – Facts and Developments of Finnish Water - Academy of Finland).

Figure 3: Disbursement of Finnish aid (without interest subsidies) according to OECD Water sector definitions, in MEUR. (Source: MFA Water sector evaluation Part 2 – Final report 2010, 21)



4 HAI PHONG WATER SUPPLY AND SANITATION MANAGEMENT RESEARCH

This case study will concentrate on the development and changes in Hai Phong city in 2 different yet related areas: water supply and sanitation. It will summarize the activities and actions of both Governments in planning and implementing the rehabilitation of water supply and sanitation system.

4.1 General description of the study

Water sector is one of the most concerning factor for Finnish government. Therefore, Finland has been known for a brief period in the history of water development, both nationally and internationally cooperation in water management as well as sanitation. There are plenty organizations get involved in these programs, from Finnish Government and Foreign affair to regional organization and concerning institution, both from inside and outside Finland. As one of the leaders in water management field, these concerns of Finland create a win-win situation for the benefits of both themselves and those countries in need.

According to the development plan of water sector, strategies and regulations, Vietnam is one of the three countries that are on the list of top high priority that in need of water improvement in general (Ethiopia, Nepal and Vietnam). From the side of Finnish Government, the Commissions and Ministries who are responsible for this development process has officially confirmed that, water is the utmost basic requirement for not only the development of a country, economically speaking, but also, the decrease in scale of poverty in these countries back in 1990's.

However, financial needs of Vietnam as well as Ethiopia and Nepal are different, concerning infrastructure, economic growth and other factors. Therefore, this study concentrates more in Vietnam aspect and Hai Phong city, to be more specific.

From the point of view of developing countries about the water management situation, there's a false consideration of water being an infinity resource. It is completely understandable when people's cultural standard still being limited by education and economy's development. However, it is a different perspective when water exploitation being taken to account of inconsideration and without authorization or responsibility. This could be a serious problem for further development of a country, which make co-operator like Finland to Vietnam taking it to a different level of alert in actions and correlative behaviours. There are quite a few international concerns towards developing countries that are under cooperation consideration in this point but the utmost important are:

1. Water regulation are not being taken seriously when taking to account of physical affects concerning citizen's daily water access.
2. The negative influence to the water sector due to corruption.

These important concerns are a call for attention towards the situation on water and sanitation from the government all over the world as well as better efforts on larger scale from cooperating countries and partners, for a better understanding in further future of development and cooperation.

4.2 Objectives and Planning

To improve the situation of water supply and sanitation, the following specific plan has been implemented to be taken into actions.

4.2.1 Water Quality Improvement

This plan traced back to the period of 1990's, when Hai Phong, Ha Noi, Quang Ninh and Da Nang were chosen to be the first 4 cities that receive the improvement in water supply plan to satisfy these following demands (Urban Development Sector Unit – East Asia and Pacific Region 2006, 2):

1. Improvement in Water supply service quality through renovation of existing facility and infrastructure.
2. Ensure the sustainable development in different factors of the water management system such as: physical work investment, professional capability of local water supply units, commercialization the facilitating agency as well as professionalization in staff's working skills.
3. Act as assistant role of future investment program preparation according to the water demand after year 2000.

To be more specific, in Hai Phong city there will be construction sites around the city to setup, renew or upgrade the following component:

- Pumping station and water transmission for new exploited water.
- Water treatment plant.
- Primary and secondary distribution pipelines, which is balance tank is included.
- A ternary distributing system in for 17 wards (Phuongs) of the city, including water meters.
- Provided necessary equipment, vehicles and facilities for maintenance.

4.2.2 1B Wastewater Project

The solely main purpose of the 1B wastewater Project in Hai Phong city, Vietnam is to improve the local environmental condition. Lakes and channels in the city back to the 1990s were considered as one of the most natural but only limited destination of natural wastewater recycle system. Therefore, they were overwhelmed by the amount of sewage, they got polluted or radically decreased in the capability of natural sewage treatment. Certainly, these lakes and channels water created unpleasant smells, unnatural water color and full of germs and parasites which is a great deal for public health care because of the possible risks of diseases they could bring to local community's health. (Soil and Water Ltd 1998, 11-12)

The garbage and disposal collecting system of Hai Phong city is working fine, however, the recycle treatment plants and disposal station still undeveloped. The public face is clean of garbage in the center and main street, however the smaller the scale of public place get, the more garbage and disposal can be witnessed. With the systems of alleys and open area everywhere, it is actually quite difficult people to acknowledge how serious the situation is, when they were, in a way, educated to see public open areas as the place to dispose household garbage. They got used to the fixed idea that the Government will take care of it, so there's no responsibility for them to properly dispose their garbage. This cause a certain area of the city, without the knowing of the garbage collecting and disposal systems, clogging the drainage system of the city, causing public health threats. One of the common situation which is extremely unacceptable for the ecosystem around happened right in the city, when the river cut through the middle of the city, the surrounded local community tends to "dispose" their garbage by throwing them directly to the water. (Soil and Water Ltd 1998, 11-12)

Therefore, a set of actions has been strategized into 1B Wastewater Project planning as below (Hai Phong Wastewater Project):

- 130 km of combined sewer system inside of urban area of the city will be unsoiled
- Rebuild or fix 9000 manholes in city area
- Implementing the sewer network for the vulnerable areas to floods (about 6 km)
- New quays and 6 km of intake sewers for lakes and channels areas of Tien Nga, Mam Tom and Ho Sen (Name of local polluted lakes)
- Empty and cleanse 6.2 km of inner city sewerage waterways, 150,000 m³ sludge water. Meanwhile a route of management road need to be built along for 6.2 km.
- Restore 3 big sewers to prevent tide at high season
- Building 17 hectares area of lagoon and sludge treatment area in Trang Cat
- Sludge treatment of 100.000 m³ need to be delivered
- Rehabilitating the main sewers in the serving purpose of 37 wards and those smaller in scale for other 17 wards
- Rehabilitating and improve about 160 streets, roads and lanes with concrete for sustainable public infrastructure development and ensuring traffic safety, proper sanitation and better looks for the public infrastructure of Haiphong city
- Equipping necessary materials, equipment, vehicles for local facility water management maintenance and other water-related purposes.

- Build Phuong Luu Lake (about 22 hectares area)
- Rehabilitating Cat Bi Lake
- Supporting accommodation for the Unit of consultants, supervisors and experts of the project
- Implementing pipes and pump systems along with the Northeast and Southwest canals of 6.2 km

4.3 What has been achieved

In this sub-chapter is the result of all results that have been achieved during the implementation of the water supply and sanitation program.

4.3.1 Water supply

The support from Finnish aid has been a huge success to both Finnish Government and Hai Phong Water Supply Company (WSCO) as well as Hai Phong urban infrastructure system. Finnish aid has helped the city with a total budget of 23 MEUR to rehabilitate and improve the water system infrastructure as well as water management and services. (Manfred Matz, Bob Blankwaardt and Soumaya Ibrahim-Huber 2010, 29)

Until the end of the project, Hai Phong city has served and support more than 800.000 household with high performance service and good water quality according to the Haiphong WSCO figures (Manfred Matz, Bob Blankwaardt and Soumaya Ibrahim-Huber 2010, 29). Due to cheaper labor price and materials, the all-in per capita cost took around 29 EUR per consumer, which is much lower than other

urban water developing programs all over the world at the cost of EUR 120 according to Hutton G & Bartram J (2008).

A dramatic increase in water supply coverage in Haiphong city has been reported in the aforementioned period of the program. In 1997, water supply in Haiphong city was 60% on households, means roughly 60% on city's population has access to proper water for daily life basis. This number has been increased significantly to 100% in 2002. (Manfred Matz, Bob Blankwaardt and Soumaya Ibrahim-Huber 2010, 32)

After 5 years of development and improvement, for the first time the whole population of Hai Phong enjoy quality access to water supply. Moreover, this Program leads to plenty other positive consequences (Manfred Matz, Bob Blankwaardt and Soumaya Ibrahim-Huber 2010, 32) :

- 96% of city population has been equipped with septic tanks (of which 95% is the property of URENCO waste processing system)
- Approximately 60% of households in Hai Phong have the environment pollution situation completely under control
- Significant decrease in water-and-sanitation related diseases: Diarrhea decreased by 48% and parasitical worms decreased by 23%
- Vector-borne diseases situation slightly improved thanks to the enhanced water supply
- Hemorrhagic fever is much lower in Haiphong than most other cities in Vietnam, which improved water source act as a critical factor

Until today, Hai Phong WSCO still continuing as the leader of organization management, economical efficiency and water quality, concerning Hai Phong city wa-

ter source as the best drinking water source from all over Vietnam. (Marja-Leena Kultanen 2013)

4.3.2 Sanitation

To improve the sanitation situation in Hai Phong city, from the period of 1997 to 2007, the 1B Wastewater project has been implemented. The main objectives of the project are (Hai Phong Wastewater Project):

- Rebuild infrastructure as well as improving the existing construction of the drainage and sewerage system in the city, emptying spontaneous garbage sites and septic tanks cause by local community for environment improvement in urban area of the city.

- Improve management capability and technical capacity for local sewerage and drainage system, especially when high tide and/or heavy rains for environment sanitation.

After 10 years of implementing and improving the sanitation system according to the plan, there has been a few positive signals implying significant changes are happening in the urban area of the city. Water supply system has been improved, reduced the percentage of faecal contamination in drinking as well as daily use water, clearly reduced the risks of water-based diseases to much lower.

Moreover, on a larger scale of infrastructure, even though Haiphong is a very vulnerable city when comes to terms of natural disasters, the people of the city has been experiencing a much better sewerage system, which cause much less damage to both public infrastructure and urban traffic, especially in the high season of flooding and raining as experienced frequently around the year in Hai Phong city. Meanwhile, obviously, property worth and public property tax will have to be increased, which also means more responsibility for citizen to take care of the in-

frastructure and estate as well as increasing promising attraction for both domestic and foreign investors in the process of city's development.

There are several momentous changes has been noted in the developing process (Hai Phong Wastewater Project):

- The enlargement in sewerage and drainage system, which directly helped reducing floods when high tides and heavy rains happens. The recorded flooding situation happened when rainfall reached 30 mm to 40 mm, now the street can handle much heavier event of rainfall and only occur floods in the rainfall of 60 mm to 70 mm.
- Completely eliminated floods during sunny weather even at high tide.
- The diminish situation in environment pollution in the Northeast and Southwest canals of the city.
- Concerns about local residency social order and household safety has been dramatically progressed and under control, partly contributed in the improvement of the City's landscape.
- Tax money for water supply now partly included tax money for wastewater sanitation (15%), this cause the positive sequence of free-charge septic tank emptying service, mainly in the 4 center districts of Hai Phong city.
- About 17 hectares of lagoon and sludge treatment area has been built.

Table 3: Maximum concentrations of heavy metals (mg/kg) in 10 inner City Lakes in Hai Phong 2002-2003 compared with sludge quality limits according to the international standards. Source: Vietnam: Three Cities sanitation Project – Hai Phong Sub-Project Final Environmental Impact Assessment for 1B Additional Project (Soil and Water Ltd 1998, 23)

mg/kg D.W.	Variation of maximum values of ten inner city lakes in Haiphong	Sludge NL 1) Target value 2)	Sludge NL 1) Intervention value 3)	Sludge Utilisation in Agriculture EU limits 4)	Sludge Utilisation for Landscaping 5)
As	0.28 – 1.99	29	55		
Cd	0.20 – 9.36	0.8	12	3.0	10
Cr ³⁺	18 - 163	100	380		
Pb	11 - 209	85	530	150	300
Hg	0.01 – 0.65	0.3	10	1.0	5.0
Zn	89 - 425	140	720	1500	

1) Dutch Soil Cleanup Guidelines, 1995. Standard soil 25 % clay and 10 % organic matter. Average value.
2) Soils demanding use exceeding Target Value should be cleaned up.
3) Soils exceeding Intervention Value should be cleaned up.
4) European Union limits, 1997
5) Finnish Environmental Ministry Guidelines, 1998

5 FINDINGS, DISCUSSION AND CONCLUSIONS

The key objective of this thesis were to observe and examine the contribution of Finnish government to the rehabilitation and development of water supply and sanitation sector infrastructure and utility in Hai Phong city, Vietnam since 1990. Moreover, the reality purpose of the study that the researcher hopefully can surpass is beyond that purpose, which is the mission to bring the lessons learnt during the study to proposal and improve the remaining situation of water sector in Hai Phong city, Vietnam. This mission will be proposed in the following sub-chapters as well as the conclusion.

5.1 Findings and recommendations

The study leads to a general view on the improvement of Hai Phong city in both water supply and sanitation area and the detailed contribution of Finnish Government to Water Supply, Drainage, Sewerage and Sanitation Management Programs on a both local and global scale. On local scale, Hai Phong city is nowadays the leading unit in water supply sector in Vietnam. The water supply utilities in the city is performing magnificently. Water quality in Hai Phong satisfy WHO standard and many other qualified International water organizations, which is a critical change in comparison to the previously mentioned situation of Hai Phong water back to the period of 1990's. Water service serves the citizen well, with frequent maintenance and water clock examination on a local scale. The financial situation of water supply is sustainable, the resident of Hai Phong city enjoy a steady and affordable range of water price.

However, the sanitation situation in Hai Phong city doesn't look as good as water supply sector, even though as can be seen from the study, the sanitation situation and infrastructure have made critical changes, which leads to plenty of positive outcomes and benefits. Many major problems in public infrastructure that sanitation sector of Hai Phong city faced in the past has been effectively solved, meanwhile in certain detail parts of the city and the suburb, the situation has only been partly improved or remained the same. A few things to be taken to account, that Haiphong city suffered quite many impacts from natural disasters, therefore the situation of the sanitation infrastructure and utility is seriously difficult to achieve according to crafted plan. Thanks to the development and changes in sanitation infrastructure, Hai Phong city nowadays is becoming more and more attractive for not only International public funds such as WB, ADB or Japan government but also FDI. Until 2015, there has been plenty of FDI plan for public infrastructure development and upgrading. This is a positive sign that guarantee the further development of Hai Phong city to be more sustainable and keeping good cooperation between Hai Phong city and foreign partners.

From the water sector, the only seemingly remained that has not been mentioned in the study is the management in water resources. The awareness of the people of Hai Phong city towards saving water has been improved over the years, yet the behaviour still being affected from family education and social awareness. There's a small number of household are fully aware of the water situation according to education, meanwhile the major of citizen still doesn't act accordingly in the effort of saving and managing water. It is still very common to see people let the water run freely without control, especially when it comes to domestic use and services. Sooner or later, with the improving infrastructure of public water utility, the people of Hai Phong city will have to witness the lack in water supply due to insufficient water resource. This is a serious situation that needed to be cautious about, since Hai Phong is a city that suffer adequate amount of natural disaster, therefore any withdrawal in natural resource could be a critical harm to public health and the economy in general.

Therefore, according to the study and key findings that has been mentioned, it is totally right in time and necessary for Hai Phong city government to pay more attention and use both domestic budget and international budget and investment for the purpose of raising the awareness and knowledge of the people of Hai Phong city as well as drafting proper plans and regulations for city's citizen to partially act and contribute to the real effort of saving and managing the water usage as well as water resource. Moreover, it should not only be the scenario that people paying money to contribute to the activities but also how they understand the situation. The awareness and understanding in action generally brings so much more positive changes in the water resource management efforts than slogans and money. Once the problem of water resource management is solved with the above suggestion, the development in water sector of Hai Phong city will be more sustainable, leading plenty of benefit that both Hai Phong city government and the citizen can enjoy. Meanwhile the difficult situation of the city will be faced without the city worrying about the security of citizen's health and economic development.

5.2 Discussions

The validity, reliability and quality of the thesis will be discussed as below

5.2.1 Validity

This thesis is presented as a case study, which means the validity of the thesis is varies on a specific scale. The solely purpose is to have a deeper insight and understanding of the specific situation, which means it is not applicable when comes to a larger scale such as international level with unrelated countries and unrelated development. However, the study can be used as a tutorial document for both Vietnamese organizations and Finnish organizations as a study on the success of international cooperation between Governments for urban infrastructure development. The result of the study maybe general and does not containing any extra details or consulting materials, as the result of the limited availability of docu-

ments and limited access to materials as the original programs have been implemented over 20 years ago.

The case city, Haiphong and both related government organizations and industries from Finland and Vietnam can benefit from the findings and understandings of this thesis. The thesis is indeed a summarization of theory and practical experience of the author concerning the contribution of Finnish Government towards water supply and sanitation in Haiphong city, Vietnam. All the findings in this thesis is publicly available based on general knowledge of the author. Moreover, in further future development, this thesis can be used as a consulting material for many other related sector as a role model that concerning the mutual cooperation between not only Vietnamese-Finnish government but also other international organizations.

The study hopefully has given a deeper insight and summary for the activities and contribution of Finnish government towards the development in water supply and sanitation sector in Hai Phong. For further development of Haiphong city, it will be a complete process in the effort of developing the water sector if the next project of the city concerning raising awareness and knowledge for citizen for a new and good behavior as actions towards the effort of managing the water resource. The limit of the thesis was relatively suitable for a BBA graduate thesis as well as the practical nature of it. Furthermore, according to recommendation mentioned before, a new study about the effort of Hai Phong city or Finnish government towards the development of water resource management awareness and actions will complete the ideal of this thesis.

5.2.2 Reliability and quality

The reliability and quality of this thesis genuinely based on the understandings and knowledge of the author as well as the consultation towards available public documents, which has been found via public international organization's websites and government's website. Moreover, with the help in providing necessary documents from Hai Phong Department of Planning and Investment, the place where the

author had practiced his placement in, he has had access to certain genuine materials which helped him to have a better understanding towards the matter. The thesis ultimately became a summary of his understanding and general knowledge as well as certain necessary ideas and clues for it to be completed. These access to information, trustworthy sources of consultation, real life experience and the collection of selected important materials, altogether makes a perfect combination of theory and practice, which builds up the quality and the reliability of this thesis.

5.3 Conclusions

Locating on the Red River, Hai Phong is one of the critically important city of Vietnam in many fields, especially to the national economy and geographically. Therefore, even though Hai Phong is just a small city but when taking to account of city development, it is totally important that by the end of Finnish water supply and sanitation programs, Hai Phong water treatment plant is the only facility in Vietnam that meet the water quality expectation from WHO.

Based on the case study, it can be seen that Hai Phong after a decade of urban development in water sector, both water supply and sanitation in general, has seen plenty of positive changes and got many profit economically. The completed water supply development and the result of the 1B wastewater project is a proof that, Hai Phong nowadays is growing faster and better, both socially and economically, thanks to the contribution Finnish Government.

However, water resource management problems remains in Vietnam since it is relatively troublesome, related to cultural traits and financial capability of the citizens, which suggests a more sustainable and further development plan in the future from both foreign partners and Vietnamese Government.

It is undoubtedly that once the public health problem and the economy system has been improved through the rehabilitation of public infrastructure, many benefits

arise from them. The story of Hai Phong water and sanitation improvement is another successful story of the development and contribution of Finnish government. Even though the sanitation infrastructure took much longer to be completed and properly function, after the program ended, the citizen of Hai Phong witnessed a much more sustainable development in water management. Water price stay at a moderate and affordable price, water service has been improved significantly and above all, water quality of the city has been considered as one of the best drinking water from all over Vietnam.

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