LAHDEN AMMATTIKORKEAKOULU
Lahti University of Applied Sciences

BUSINESS OPPORTUNITIES IN VIETNAMESE ANIMAL HUSBANDRY SECTOR FOR BIOGAS SMEs

CASE STUDY: Finnish biogas enterprises

LAHTI UNIVERSITY OF APPLIED SCIENCES
Degree programme in International Business
Thesis
Spring 2014
Bui Linh Chi

Lahti University of Applied Sciences
Degree Programme in International Business

BUI LINH, CHI: Business opportunities in Vietnamese animal husbandry sectors for biogas SMEs
Case: Finnish biogas enterprises

Bachelor's Thesis in International Business, 101 pages, 4 pages of appendices

Spring 2014

ABSTRACT

In these recent years, as a corollary of the tremendous changes in every aspect, Vietnam has emerged as an attractive investment destination. The fast industrialization has led to the rapidly growing energy consumption, making Vietnam confront with the risk of turning into a net energy importer in 2015. The Vietnamese government has set a target to increase the share of renewable energy in total commercial primary energy from 3 percent in 2010 to 5percent in 2020 and 11 percent in 2050. Being endowed with a relatively huge amount of renewable resources, Vietnam is among potential markets for developed innovative companies from Finland

At present, there are more and more western companies heading out to the Vietnamese market to make more profit and improve their international image. However, almost all foreign enterprises report that they have to deal with a serious lack of information about the target market. Therefore, the thesis is made to assist Finnish biogas companies in the decision whether to expand internationally to Vietnam. In order to achieve this goal, information about the target market, investment conditions in Vietnam, the main stakeholders, Finnish biogas companies and their innovations are studied.

The method used in this thesis is qualitative, with a deductive approach. In the theoretical framework, data are collected mostly from published sources such as books, articles and earlier studies. In the empirical part, data are collected from personal observations, Vietnamese government publications, and especially in-depth interviews with professionals in the field of renewable energy.

Analyses of the Vietnamese biogas market and Finnish enterprises are the core content in the empirical part. Common biogas technologies and on-going projects in Vietnam are provided. Besides, competitor analysis is also taken into account, equipping Finnish companies with the most accurate view about the target market.

In conclusion, the author suggests some positive entry modes for Finnish companies to successfully enter the Vietnamese biogas market. Four recommendations are made, in which, cooperation with Vietnamese governmental institutions is set as the priority.

Key words: anaerobic digestion, animal husbandry sector, animal wastes, biogas technologies, household scale farms, market entry modes

CONTENTS

LIST OF FIGURES

LIST OF TABLE

LIST OF ABBREVIATIONS & ACRONYM

ADB	Asian Development Bank
ASEAN	Association of South East Asian Nations
EU	European Union
EVN	Electricity Vietnam
FDI	Foreign Direct Investment
FUAS	Federation of Universities of Applied Sciences
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IE	Institute of Energy (Vietnam)
MARD	Ministry of Agriculture and Rural Development (Vietnam)
MoIT	Ministry of Industry and Trade (Vietnam)
MWh	Megawatt Hours
MONRE	Ministry of Natural Resources and Environment
NDF	Nordic Development Fund
NGO	Non-governmental organization
RE	Renewable energy
ROI	Return on Investment
VND	Vietnam Dong, the Vietnamese currency
WB	World Bank
WTO	World Trade Organization

1 INTRODUCTION

Being made up of six sub-parts, the introduction chapter begins with the background information of the thesis topic. The explanation of the objectives, research questions, scopes and limitations then follow. The data collection and research methodology are conducted in detail. The theoretical framework is included; and the thesis structure is illustrated in the end.

1.1 Background

Energy is one of the key indicators in the economic development of each country. It means a country's developing pace is somehow judged by whether it is able to ensure its energy security. There are two common reasons for energy to be considered as a global concern attracting the interest of all nations around the world: not only the great efficiency it has brought, but also the dangerous consequences for the planet it has caused. Due to climate change, Vietnam is currently among one of the five countries which have suffered heavy casualties assessed by the United Nations (EnDev, 2014). Hence, how to balance economic growth with energy and environmental issues is raised as a particularly urgent question for the Vietnamese government. In order to address this problem, finding alternative sources of energy such as solar energy, wind energy, biomass energy or hydro energy is deemed to be a thorough solution. In recent years, renewable energy has turned into a significantly important chapter in the national energy development in which biomass and biogas energies have been much more focused on.

As mentioned above, the exploitation and utilization of biogas technology in the Vietnamese current situation have contributed highly to ensure the energy security and environmental protection. Particularly, in rural and mountain areas, the implementation of this renewable energy is a realistic action, contributing to the improvement of the living environment, changing the customs and habits as well as the lives of rural people. In addition, biogas also helps to solve environmental pollution thoroughly in rural areas, to prevent epidemic diseases and to protect clean water resources. Vietnam has high potential for biogas production; however, it has not been fully exploited so far.

Having been a student of chemistry with interest in environmental technologies, the idea for writing this thesis came up while the author was introduced to the Connect project. First launched by FUAS, this project is known as a co-creation of network modes for market entry in developing countries, supporting growth and speeding up internationalization of Finnish renewable energy SMEs to new blossoming markets. By understanding the Vietnamese market background, the author has recognized that in spite of significantly promising market for environmental products in Vietnam, foreign companies have to face with a serious lack of information about how to access the potential, and turn it into tangible business opportunity. This paper is hence conducted to provide a general picture about Vietnamese biogas sector, as well as appropriate necessary information for the Finnish companies to be successful in this challenging market. Last but not least, the study is considered the first step on the author's road to pursuing ecology management later in her career.

1.2 Objective and research question

The primary objective of this research is to assist Finnish companies which are operating in the field of biogas technologies and equipment in their decision whether to enter the Vietnamese market. In order to come to the final conclusion, Finnish companies are equipped with a comprehensive background of the new market with a lot of up-to-date information and statistics. The secondary objective is to suggest different market entry options for these companies to successfully enter the target market. Two main questions are then proposed, directly corresponding with the two objectives of the thesis.

Should Finnish companies enter Vietnamese market? If yes, what is a feasible market entry for them?

In order to achieve the objectives and clarify the main questions, the following sub-questions are identified:

Is Vietnam a promising market for Finnish companies to expand their internationalization?	How does the Vietnamese market function?
	What are the potentials for biogas production in the animal husbandry sector?
	What are the obstacles for foreign companies to do business in the Vietnamese market?
	How does the Finnish biogas sector function? How innovative their products are when being compared to current ones in the Vietnamese market?
How can Finnish companies successfully find their way to enter the target market?	Who are the main players and the most important stakeholders in the market?
	How do the on-going biogas projects function?
	What is the most appropriate market entry?
	What is the current investment condition in Vietnam

FIGURE 1. Research questions and sub-questions

1.3 Scope and limitations

The aim of this research is to provide Finnish companies with a clear background about the Vietnamese biogas market, particularly in the husbandry sector, and to propose feasible entry modes to be successful in penetrating this overseas market. Although the author is extremely diligent in doing the thesis precisely, some limitations are completely unavoidable.

First and foremost, the thesis is limited to the biogas potential in the husbandry sector despite the fact that the other sources of biogas such as sewage, crop residue, vegetable, etc. are also abundant and promising.

Secondly, the purpose of this study is only to give Finnish companies a broad view of the potential of the Vietnamese biogas market with a main focus on animal wastes. Hence, those who want to expand their business to Vietnam ought to carry out further research to form a comprehensive plan.

The next limitation is about the importance and prospect of biogas in the future. The fact that whether fossil fuels can be replaced by alternative energy is much of the controversy. Some proponents of renewable energy show their confusion on the unsustainability and inefficiency of the fossil fuels. They claim that it is environmentally destructive and the primary contributor to global climate change. Meanwhile, thanks to its nature of infinity, renewable energy is predicted to meet energy demand better than limited fossil fuels. More importantly, in the actual case of Vietnam, it will help to boost the economy and reduce the threat of reliance on the foreign electricity market. On the contrary, there is some opponent argument about the technological hurdles. They reasons that fossil fuels is still currently needed to operate the machines generating energy from the renewable resources. Within the limited size of this thesis, the position of renewable energy in Vietnamese market as well as public awareness of sustainability is not taken into account.

Last but not least, although the research is built as a wholly market entry plan, it is limited to the market entry modes. In addition, the financial, sales and marketing strategies are also not taken into consideration. The implementations of the solutions are not fully focused on either.

1.4 Theoretical framework

According to Sevilla, et al. (1992, 55), theoretical framework refers to the set of interrelated concepts, definitions and propositions that presents a systematic view of a phenomena by specifying relations among variables. Back to the research, it is built under the form of a market entry plan in which proficiency in analyzing tools and market are critical. There is no specific field of knowledge is mentioned. The descriptions of adopted theories are the main content of the theoretical framework. In reality, three main analyzing tools are applied: PESTLE, Porter' Five forces and SWOT analysis. While PESTLE gives the macro view of the target market, the other two frameworks are used to examine the internal and external background of Finnish biogas enterprises. The theoretical framework of the study is illustrated below:

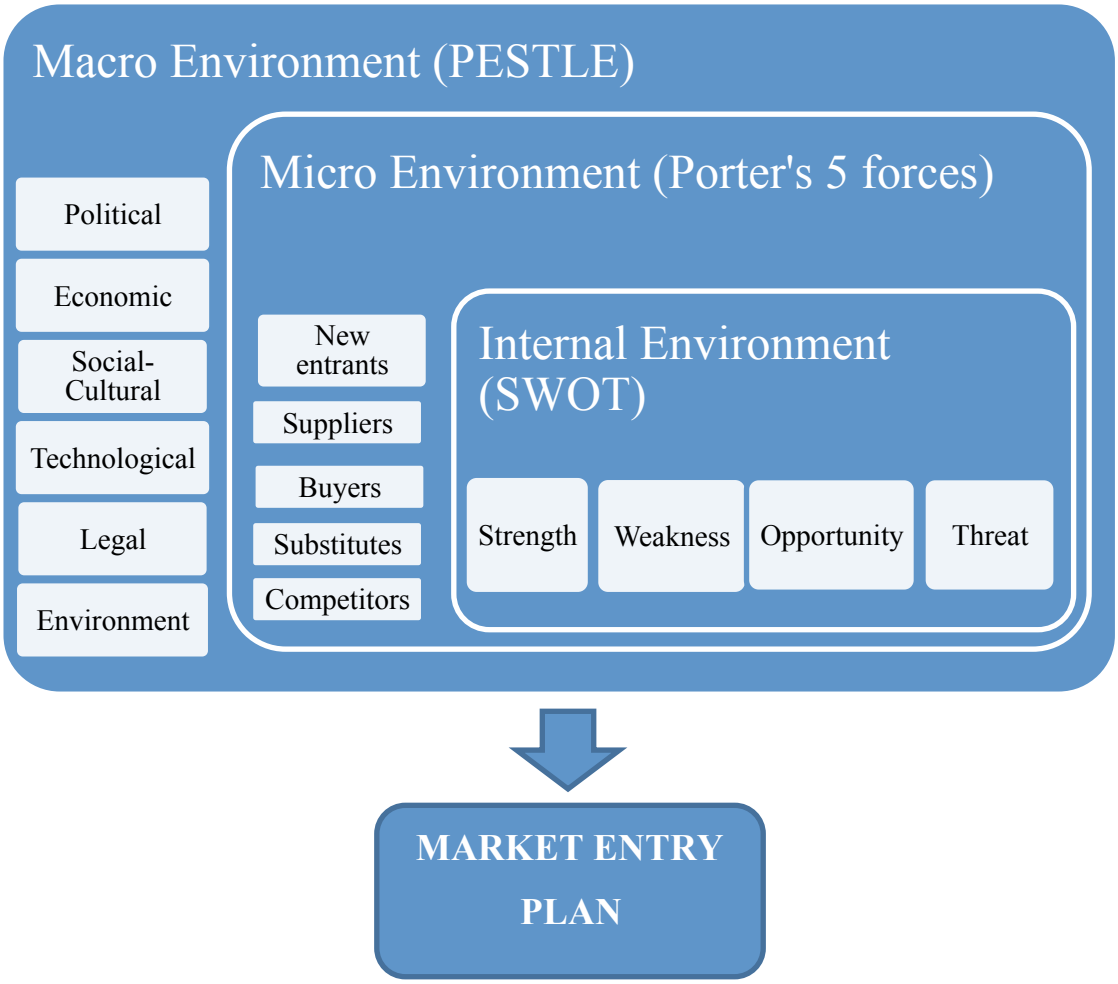


FIGURE 2. Theoretical framework

1.5 Research methodology

The quality of any research notably relies on the appropriate research design selection and the way it is conducted. The terms 'Research Methods' and 'Research Methodology' are sometimes used interchangeably; however, they are essentially different. Greener (2008, 10) explains that the first term refers to specific activities designed to generate data such as questionnaires, interviews, or observation while the second one is more about the author's attitude, understanding and strategy to answer the research questions. This chapter focuses on interpreting the research methodology used in the thesis. It is presented in the figure below:

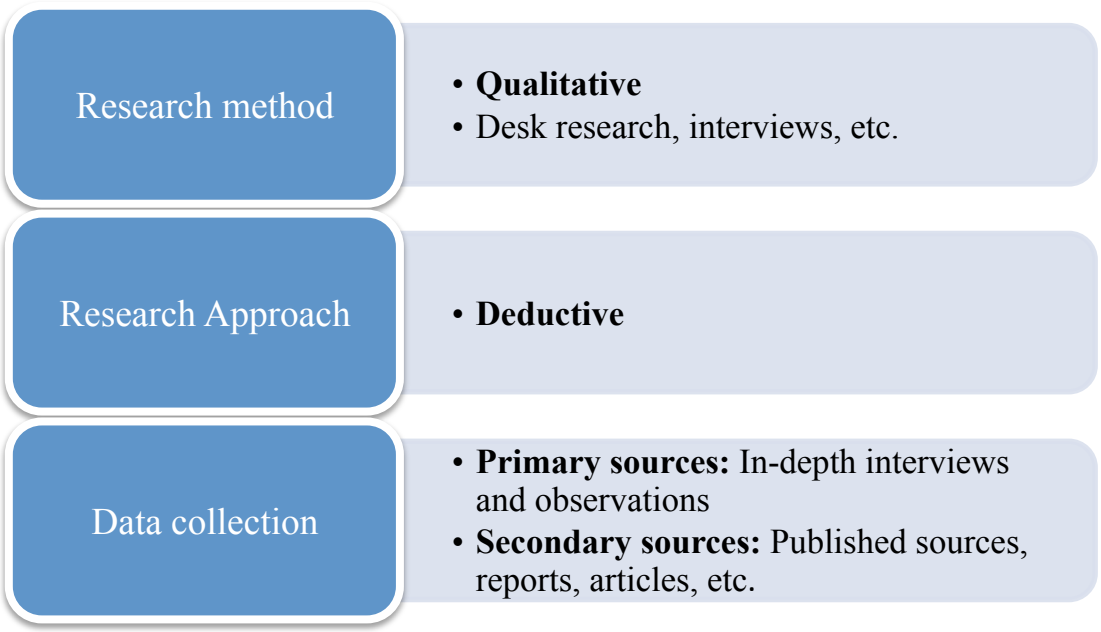


FIGURE 3. Research methodology

Research Approach

It is stated that there are two traditional research approaches known as induction and deduction (Burney, 2008). Researcher may utilize one or combine both approaches based on the emphasis of the research and the nature of the research topic (Creswell, 2003).

Inductive approach is defined as a theory building process. Kenneth F. Hyde (2000, 80) explains that induction starts with observations of specific instances, then analyzing to establish generalization about the phenomenon under investigation. In contrast, the deductive approach begins with and applies a well-known theory. It means a theory (or hypothesis) is developed based on existing theory, and then a research strategy is designed to test this hypothesis (2007, 124). The distinction between the two approaches is illustrated in the following figure:

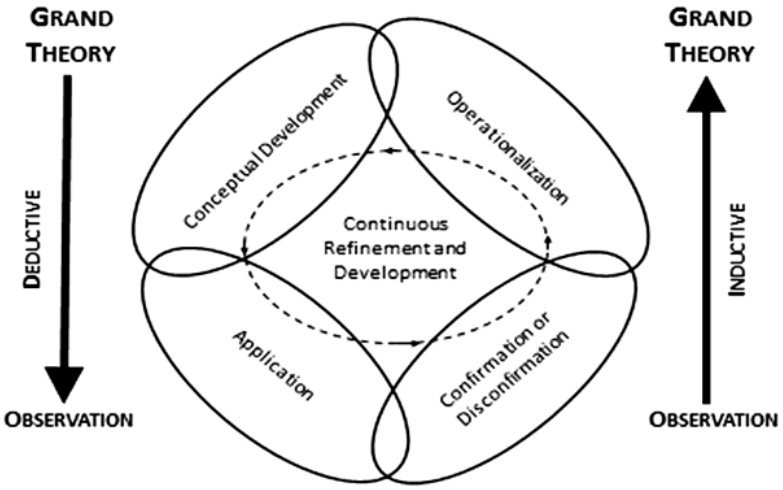


FIGURE 4. Inductive and deductive approaches (Mangaliso & Lewis, 2012)

The nature of the study is market research in which the case study is analyzed, based on existent academic literature. Consequently, in this case, deductive research is applied. Figure 2 demonstrated the approach of deduction:

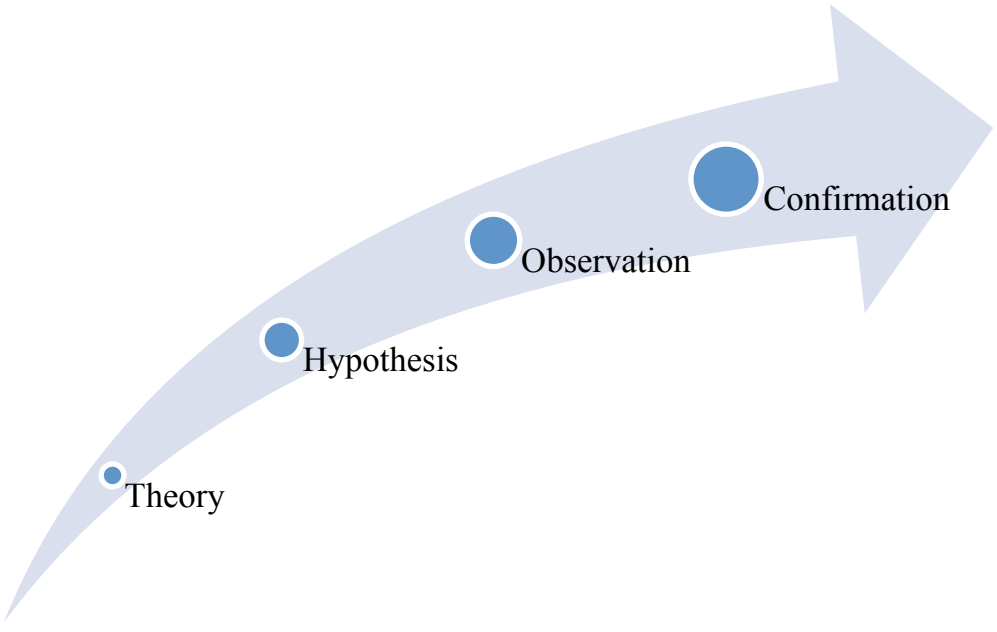


FIGURE 5. Deductive approach

Research Method

In terms of research method, there are also two fundamental methods, along with the combination of them. Qualitative research is defined simply as an empirical research where the data are not in the form of numbers (Punch, 2013, 4). Due to the fact that this method works with subjective information and observation to investigate the context, it comes to the end with wider understanding of the entire situation. Meanwhile, quantitative research is usually applied in the case of testing hypotheses, considering cause and effect, and calculating the size of a phenomenon of interest (Johnson & Christensen, 2008). By processing random sampling data into numbers and statistics, the research's conclusive result is usually mentioned in statistical report. Sometimes, both methods are use simultaneously to improve the quality of the research.

Back to this thesis, qualitative method is adopted. More in-depth and comprehensive description of the target market's prospects is measured owing to its exploratory and open-ended nature.

Data collection

Data collection is understood simply as a process of gathering and measuring information on variables of interest. The importance of ensuring accurate and appropriate data collection is placed at the top. The rigour and reliability of the thesis is enhanced by the number of multiple accurate sources rather than a single reference. In this thesis, different sources of data are collected respectively, depending on it is either theoretical framework or empirical part.

The theoretical part of the thesis is mainly extracted from secondary data which is obtained from published sources such as books, industry reports, academic journals, articles, and earlier studies.

In the empirical part, data are collected from personal observations, unpublished sources provided by author's mentor, Ms. Maarit Virtanen, and Vietnamese government publications. Remarkably, invaluable insights were provided from in depth interviews with Mr. Do Ninh Hai, Deputy Director of New and Renewable

Energy Department, General Directorate of Energy, Ministry of Industry and Trade and Ms. Maarit Virtanen, Connect Project Manager.

1.6 Structure of the thesis

This thesis includes seven chapters, basically being divided into theoretical framework and empirical study. Both of them act as the backbone of the thesis. Chapter one provides the audiences with the background information about the thesis: the basic idea of the thesis topic, the scope and limitation, the manner in which the research is conducted. More importantly, the main questions are raised and divided into sub-questions for further examination.

The theoretical part is located in the chapter 2 in which all the applied theories and models are presented.

All information discussed in chapter 3 to 6 is involved in the empirical part. To begin with chapter three, an external analysis about the Vietnamese market in general is analyzed, followed closely by chapter four which deals with the potential and challenge in the biogas sector in particular. The purpose of chapter five is to examine Finnish biogas companies with their nature and competences, range of the products, and its innovations when comparing to companies operating currently in the target market. The main intention of chapter six is to compose some strategic feasible entry modes in the case the internationalization decision is made.

Chapter seven comes up with the main findings throughout the whole thesis, conclusion and suggestions for further study. Last but not least, the thesis is wrapped up in chapter eight, in which the main idea of the study is synopsized.

The thesis structure is illustrated in the following figure, in which C is abbreviation for chapter.

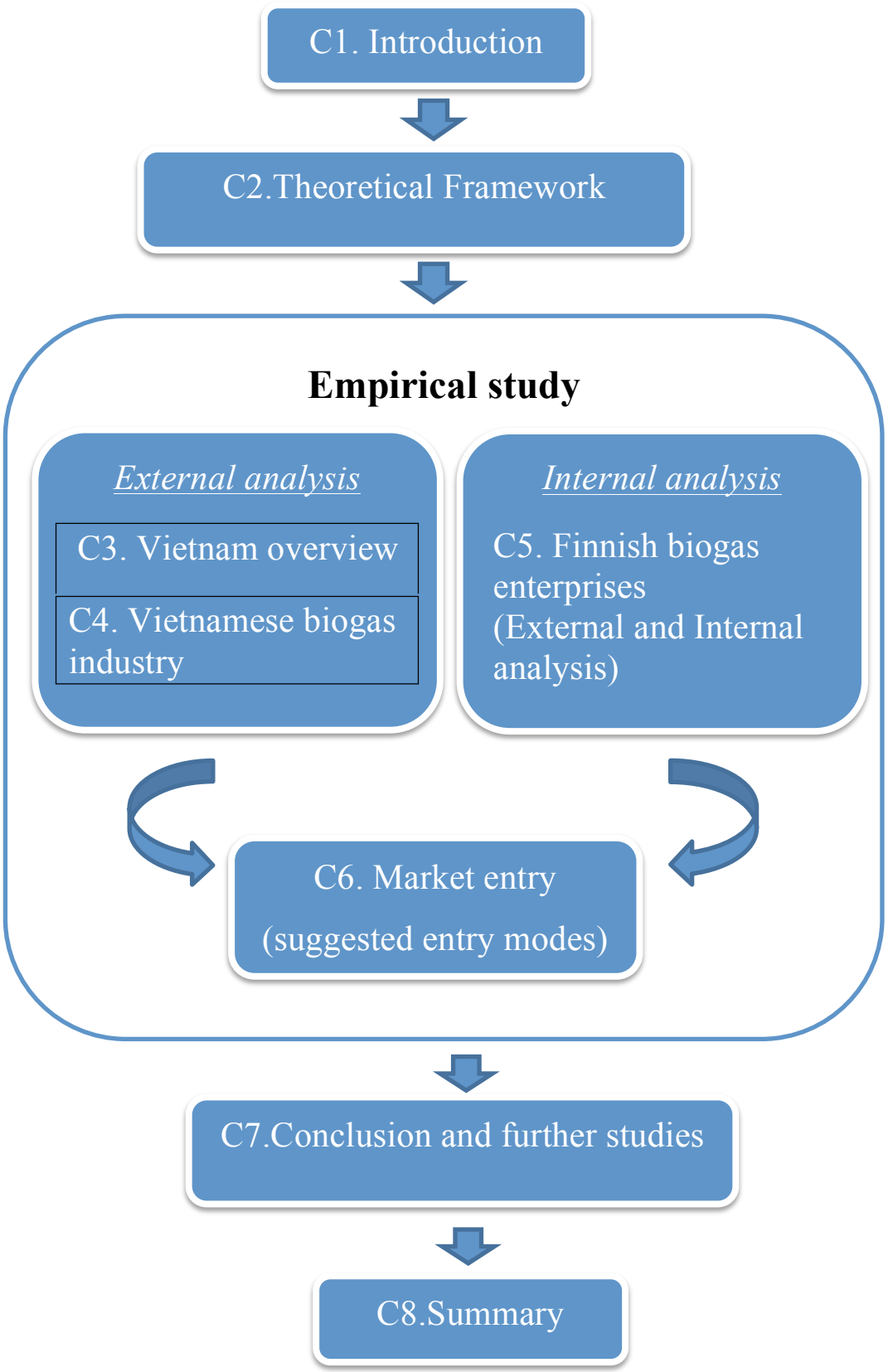


FIGURE 6. Thesis structure

2 ANALYZING TOOLS AND MARET ENTRY MODES

2.1 Internal analysis

"*If you know the enemy and know yourself, you need not fear the result of a hundred battles*" – Sun Tzu, The Art of War.

As is often said, business is war. In order to lead the business ahead in the market full of competitors and challenges, it is crucial for a company to thoroughly understand its own capacities and competencies. Therefore, internal analysis would be the first yet the most important step to consider before making any business decision. This thesis will utilize one of the most robust framework models for internal analysis known as SWOT.

SWOT refers to Strengths, Weaknesses, Opportunities, and Threats that a business may encounter. SWOT analysis is a simple technique that requires no intensive training or resource. Moreover, this tool gives the ability to comprehend all sources of information from internal to external conditions and generate a general picture of the business (Hartline & Ferrell, 2012, 87). Analysts could use SWOT analysis to synthesize the information from other analysis tools such as McKinsey 7S or PESTLE (Henry, 2008, 61). The important things to analyze in a SWOT analysis will be briefly discussed as following:

TABLE 1. SWOT analysis (Adapted from Argowiki, 2013)

Internal	**Strengths** • Technological skills • Leading brands • Distribution channels • Customer • Loyalty/Relationships • Production quality • Scale • Management	**Weaknesses** • Absence of important skills • Weak brands • Poor access to distribution • Low customer retention • Unreliable product/service • Sub-scale • Management
External	**Opportunities** • Changing customer tastes • Technological advances • Changes in government politics • Lower personal taxes • Change in population age • New distribution channels	**Threats** • Changing in customer base • Closing of geographic markets • Technological advances • Changes in government politics • Tax increases • Change in population age • New distribution channels

Strengths are the internal factors that the organization possesses in order to achieve the objectives. Weaknesses are also the internal factors that may prevent the business from accomplishing its goal. On the other hand, Opportunities and Threats are external elements which will enhance or decrease the chance of success (Quincy, 2012).

Like other analyzing tools, SWOT analysis has many pros and cons and misconceptions about its role. To avoid the negative misconception, there are several things to notice when conducting a SWOT analysis. First, SWOT should be done on corporate level rather than lower level. Second, SWOT needs to be revised when there is a change in the original resources in order to correctly reflect the business situation. Finally, the changes in the market locally and globally need to be considered for better analysis results (Koch, 2000).

2.2 External analysis

As stated above, understanding the competitive world surrounding you is as critical as understanding yourself. The purpose of external analysis is to acquire a complete look of the market conditions. Therefore, the external analysis focuses on four main factors: customers, industry, competitors and environment (Paley, 2005, 58). PESTLE analysis and Porter's Five Forces will be applied in this thesis to analyze the external market factors.

2.2.1 PESTLE analysis

The term PESTLE is originally referred to as PEST analysis which looks at political, economic, social, technological aspects that may affect the business. Later, legal and environmental factors were added into PEST analysis to form the PESTLE analysis model (Office & Murray-Webster, 2010, 88). The PESTLE analysis is simple and quick just like the SWOT analysis. The table below demonstrates some elements of each factor to consider while conducting the PESTLE analysis. The key elements to focus on may differ from case to case.

TABLE 2. PESTLE analysis framework (Kachru, 2005, 88)

Political factors	***Economic factors***
• Government policies • Government term and change • Trading policies • Current legislation • Future legislation • Regulatory bodies and process • Ecological/environmental issue	• Economy situation and trends • Taxation specific to products • Market and trade cycles • Specific industry factors • Customer/end-user drivers • Interest and exchange rates
Socio-cultural factors	***Technological factors***
• Lifestyle trends • Demographics • Consumer attitudes and opinions • Brand, company, technology image • Consumer buying patterns • Ethnic/religious factors s	• Replacement technology/ solutions • Maturity of technology • Manufacturing maturity and capacity • Innovation potential • Technology access, licensing, patents
Legal factors	***Environmental factors***
• International Law • Employment Law • Competition Law • Health and Safety Law • Regional Legislation	• Environmental impact • Environmental legislation • Energy consumption • Waste disposal

2.2.2 Porter's Five Forces

Michael Porter introduced his business competition model in the 1980s and it has become one of the most influential concepts on strategic management. Before the Porter's model, the main business competition was thought to come from rivalry

business selling the same product; and price, kind and quality were considered the most important factors in competition. Michael Porter's model consists of five forces; thus, it was named Porter's Five Forces. These forces are competition of the existing business rival, bargaining power of suppliers, bargaining powers of buys, threats of substitute products, and threat of new entrants (Orcullo, 2008). The Porter's Five Forces model is illustrated in the figure below:

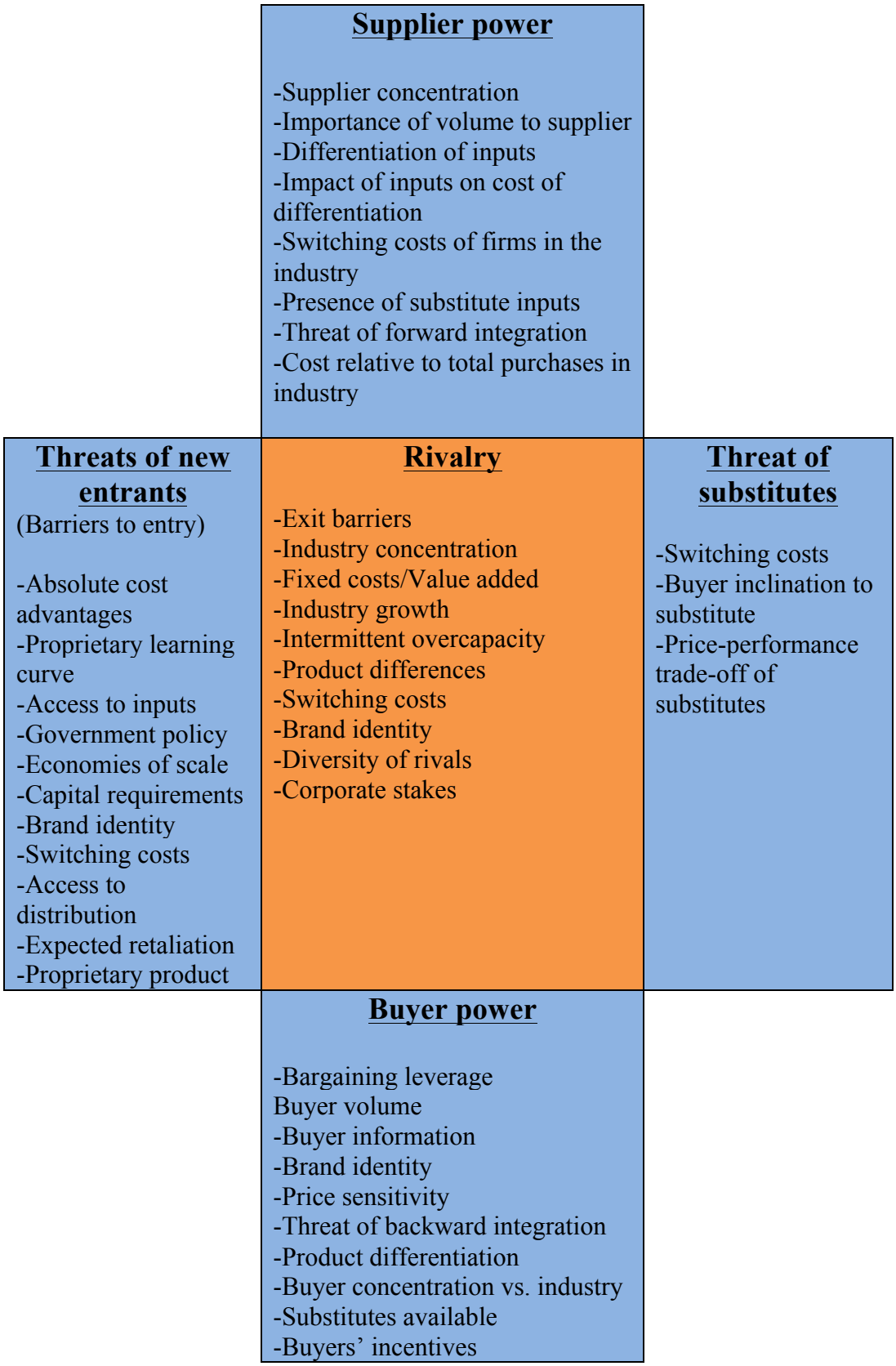


FIGURE 7. Porter's Five Force Model (Adapted from QuickMBA, 2010)

Competitive rivalry within an industry refers to the direct or the key competitors in the industry that provide the same or similar products/services. Thompson and Strickland (2001) pointed out the following issues that need the most concern: price, quality improvement effort, advertisings/sales promotion, efforts to build stronger network, efforts to offer better products, products innovation, and use of other weapon of rivalry.

Bargaining power of suppliers examines the role of suppliers who provide raw materials, components, labor or in other words, the input for the business to operate. Suppliers are considered as a force of competition because they have the power to manipulate the price of input which results in higher cost and lower profitability (Allen, 2001, 104). Suppliers can become the direct competitors in some cases (Orcullo, 2008). Among many aspects, the two most important issues affecting the power of suppliers are supplier concentration and switching costs.

Bargaining power of customers is considered a very strong competitive force. The power of buyers is much different from industry to industry. In case the number of buyers is small and contributes large income to the business, buyers' power is strong. In this case, they can bargain about price and lower the business' profitability. Two main aspects to consider about power of buyers are also buyers' concentration and switching costs (Allen, 2001,102).

Threats of new entrants come from new and potential players that attempt to enter the market or provide the same/similar products. These new players are likely to have new marketing strategy that may affect the business. The new players will face obstacles called barriers to entry which includes the following issues: cost of entry, the attractiveness to customers, access to market, regulatory constraints (Allen, 2001,107).

Threats of substitutes refer to the competition from the products or services that satisfy the needs of customers but in a different way. In some certain industries, substitutes are likely coming from the advance of technology in recent years, which pose as a threat to old players. The two main threats that substitutes present to the existing business are limiting profits and redefining or destroying the industry (Allen, 2001, 107).

2.3 Market Entry Modes

One key to succeed when an organization decides to do business overseas is to choose the right mode to enter the new foreign market. The decision of choosing an entry mode depends on many factors both internal and external. There are numerous modes of entry which are categorized into three main groups: Export modes, intermediate modes and hierarchical modes. The classification of market entry modes is illustrated below:

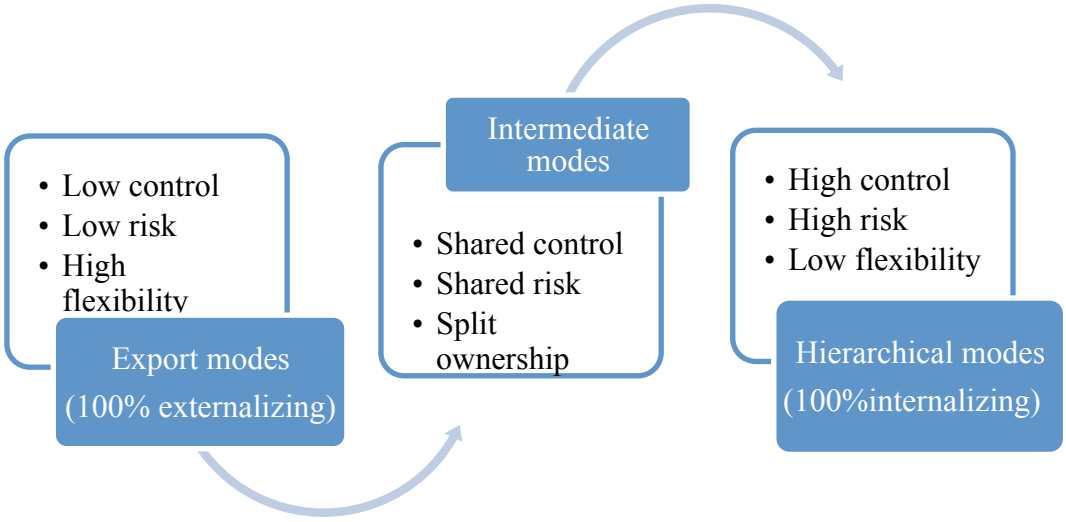


FIGURE 8. Classification of market entry modes (Adapted from Hollensen, 2007)

Each group is comprised of several specific market entry modes which have their own advantages and disadvantages. The detailed list of entry modes is drawn:

TABLE 3. Market entry modes (Adapted from Hollensen, 2007)

MARKET ENTRY MODES	
Export modes	Direct export (Distributor/agent)
	Indirect export(Export agent, broker/export management company/trading company/piggyback)
	Cooperative export
Contractual modes	Contract manufacturing
	Licensing
	Franchising
	Joint ventures / Strategic alliance
Investment modes	Manufacturer's own sales force (a wholly owned subsidiary)
	Sales branch
	Sales and production subsidiary
	Region center
	Transnational organization

In this sub-part, only some most important market entry modes are clarified in detail.

Indirect exporting is the form of exporting where the exporter does not directly carry out the transaction with the foreign importer but through intermediaries. This mode does not require much knowledge of the foreign market or the process of exporting. The company also does not have to establish infrastructure in the foreign country. Therefore, the risk is lower and so is the profit. The middlemen or the intermediary agencies are located in the home country (Cherunilam, 2010, 603).

Direct exporting refers to the exporting transaction that is done directly between the manufacturer and the importer. The exporter may do the business with the distributor or middleman in the oversea country. One advantage of the exporting modes is that the resources for production are concentrated in the home country. In direct exporting, the company will face more risks, need more efforts, and more knowledge to do the exporting transaction than indirect exporting, but the return will be higher (Cherunilam, 2010, 606).

Licensing and Franchising are contractual agreements which are made between two companies in two different countries. These agreements are non-equity and long-term. In licensing mode, a company will grant a license or permission to use its intellectual properties instead of selling products. The company will be called licensor. The property includes trademarks, patents, copy rights, brand names, or production techniques. Licensing requires no equity, has high ROI in the short time period, and involves low risk (Erikson, 2009, 54). However, licensing has the biggest risk is that the licensee may learn the technology and become the direct competitor once the agreement expires (Singh, 2012, 49). Franchising is similar to licensing but with much more restricted terms and conditions. The franchisee must follow certain terms when using the brand name, brand logo, products, processes, and methods of operation (Singh, 2012, 50). The franchisor usually provides national or international advertising, and other supporting services (Erikson, 2009, 54).

Joint Ventures are agreement between two international business parties. In a joint venture, two businesses contribute equity to form a subsidiary and share risk, profits, control and/or management while both parties remain independent (Luiki, 2010, 1). This mode of market entry allows the business to enter a new market with the help of a partner to share costs, risks, and of course profits. However, the disadvantage of this entry mode is that the control of activities is limited and it is difficult to coordinate globally (Peng, 2010, 287).

Mergers and acquisitions can generate fast entry speed into new international markets by acquiring local companies. A merger happens when two companies agree to combine their entire asset to create a larger form that benefits both parties. An acquisition occurs when a company takes over another company. In

some cases, the target company is unwilling or the board even has no prior knowledge of the acquisition. Mergers and acquisitions are quicker way to enter a new market with complete equity and control. However, the risks and costs are also much higher (Singh, 2012, 51).

Strategic alliance is a form of international business relationship where two or more companies cooperate to enhance the competitive strengths. This form is different from Joint Ventures because Joint venture requires both parties to invest capital and management while strategic alliances are just business relationships. These relationships help all parties to take exploit others' technology, distribution, and share the risk of foreign expansion. For example, many airlines can form a partnership to share mileage program and integrate schedules and routs (Singh, 2012, 52).

A wholly owned subsidiary is the situation when a company fully invests and owns an operation in the foreign country. The mother company controls all of the equity, management, process, investment and operation of the subsidiary. By this way, a company can enter oversea market in full operation, localize the labor forces, utilizing local raw material and also face risks of local business environment. The company will have full control but will encounter full risks and threats of doing business in a foreign country (Singh, 2012, 52).

3 TARGET MARKET: VIETNAM

This chapter is divided into three parts. By using the strategic diagnostic tool PESTLE, the first sub-chapter gives the detailed picture of the Vietnam environment as a promising target market. The second one enumerates some key points of the bilateral trade relationship between Vietnam and Finland. The last one draws the general overview of Vietnam's renewable energy development.

3.1 Country overview

In recent decades, Vietnam has emerged as the second most attractive investment destination in ASEAN (VBN, 2012). Strategically located in one of the most advantageous positions in Southeast Asia, Vietnam possesses sound fundamentals to become a potential land for foreign investors around the world such as abundant competitive labor force, highly-ranked political stability and high GDP growth but also richness in natural resources. With the area of about the same size as Finland's, this more-than-90-million-inhabitnat country has gradually asserted its position on the global map.

PESTLE method is used in the chapter for analyzing Vietnam as a target market. However, instead of giving only an overview outlook of the external environment of the country, the author points out some existing weaknesses, which Finnish companies has to cope with when entering the market. The macro environment is first recapped in the following table:

TABLE 4. PESTLE Vietnam summary

	Positive points	Negative points
Political	-High political stability -Efforts to find a comprehensive approach to country's renovation, international integration, opened market based economy, etc.	-Higher governmental control over autonomy for the foreign organizations
Legal	- Some positive changes to create a more comprehensive legal framework -Legal documents supporting development of renewable energy and environmental protection	-Still lack of clear legislation and proper legal framework for a market economy -Corruption and abuse of office -Infringement of intellectual property rights
Economic	-Market-oriented economy since 1986 -Goal to an industrialized and modern economy by 2020 -One of the fastest growing economies in the world: high growth rates, high rate of export and FDI, etc. -Transmission to a higher-end electronics exporter -Trade surplus of 5.9% in 2012, remaining in 2013	-Devaluation of domestic currency -Dominated by low-end product export -Weak banking system
Social-Cultural	- A young population with a strong purchasing power -Abundant and cheap labor forces -High rate of urbanization -High share of agriculture→ Potential for biogas production	-Low-skilled labor market -Significantly cultural differences for foreign investors

Environmental	-Effort to face climate change: Incentives for companies operating in field of environment and renewable energy	-Among five countries most affected by climate change -Annual consistent increases of CO2 and SO2 emission
Technological	-Increased Internet and mobile penetration, wider broadband capacity -Transmission to high-tech production -Improvement of infrastructure -Plan to narrow the scientific and technological gap with global indicators by 2020	-Currently dominated by low-tech production -High rate of piracy

3.1.1 Political

Being a single-party state, the Socialist Republic of Vietnam, along with China, Cuba and Laos, is one of the world's four remaining single-party socialist states officially espousing communism. The Communist Party of Vietnam plays the central role in all organs of government, politics and society (SJ, 2012).

Back to the independence after two fierce wars against the French colonialists and the U.S imperialists ending in 1975, the 'seclusion' policy caused Vietnam to become isolated and they experienced an economic crisis in 15 years. The country was then put on the brink of bankruptcy (SJ, 2012). To face with the vital question, the Vietnamese government launched the new reform policy named 'Doi Moi' (Renovation), transforming the centrally planned economy into a 'market economy with socialist orientation' (Dang, 2008). By allowing private ownership and encouraging foreign investments, the country has achieved significant economic growth, rapid poverty reduction, and improved human development.

Due to the fact of the communists' monopoly on power still being firmly in place, Vietnam as a whole is more likely to have higher governmental control over autonomy for the foreign organizations that aim to enter the domestic market. However, on the good side, the political stability is rather high; and the situation is expected to remain the constancy over the upcoming few years. In January 2011, The 11th Congress of the Communist Party of Vietnam was held, in which tackling the economic problems was considered the priority. In addition, finding a more comprehensive approach to the country's renovation, promoting greater citizens' participation and unity within Vietnam, and engaging proactively in international integration were also taken into account. Although the Vietnam's approach to state-led development was reaffirmed, some key policy documents were revised, emphasizing much more on market processes and non-state ownership of economic assets (World Bank, 2013).

3.1.2 Legal

Being a member of the WTO since 2007, Vietnam's government has made some significant changes to create a more comprehensive legal framework. Under the high demand of energy sufficiency for economic development and reduction of negative impacts on the ecological environment, the government has set renewable energy as a worthy field of investment. A number of investment preferences and incentives for investors in renewable energy areas, along with related policies are drawn up and approved. The detail of these legal documents is going to be evoked later, in sub-chapter about investment condition in Vietnam.

In spite of the reforms to laws and regulations made to create a friendly business environment for overseas companies, Vietnam is still ranked 99 out of 189 economies regarding ease of doing business. The lack of clear legislation and proper legal framework for a market economy is considered as one of the main reasons. In addition, Heritage Foundation (2014) believes that corruption and abuse of office cause a lot of uncertainties for not only domestic companies but also foreign investors. In spite of the strong commitment to fight corruption in every stage of the government, the situation seems to be reverse. The ongoing corruption situation is widespread and flagrant than ever before. According to the

Global Corruption Barometer, Vietnamese are less confident in their government's ability to stop corruption than in past years (VOA News, 2013). Besides the Anti-Corruption Law, the cooperation from citizens plays the vital driver to the success of addressing corruption. Last but not least, infringement of intellectual property rights is quite common (Heritage Foundation, 2014).

3.1.3 Economic

As a result of the political and economic reforms launched in 1986, Vietnam has experienced a wholly tremendous change, being transformed from a centrally planned economy to a more market-oriented economic model. Since the reformation, the country has gained plenty of achievements. The high growth rate has been maintained continuously in many years, changing Vietnam into one of the fastest-growing economies in the world. The average annual foreign direct investment and total export value rose sharply. Furthermore, the positive movement of becoming a member of WTO in January 2007 has not only brought opportunities but also created many challenges. The government has set the goal of becoming an industrialized and modern economy by 2020. Some key priorities have been defined to meet the ambitious target: stabilize the economy, build world-class infrastructure, create a skilled labor force, and strengthen market-based institutions (SJ, 2012).

As other economies in the world, Vietnam was badly hit by the global economic crisis, which originated from the U.S in late 2007. The GDP growth reduced drastically from 8.5 percent in 2007 to 6.3 percent in 2008 and 5.3percent in 2009. The country's economy recovered slightly in 2010, growing at a rate of 6.8percent (Datamonitor, 2011). However, as can be seen in the bar chart below, in 2012, the country experienced the lowest growth rate since 1999. Between 2008 and 2011, Vietnam's currency, the Dong, was devalued in excess of 20 percent. Foreign direct investment inflows fell 4.5 percent to 10.5 billion USD in 2012 (CIA, 2014).

Owing to steady recovery since 2013, the worst seems to be over for Vietnam's economy. Rising foreign investments are judged as the main reason for the restoration. In 2013, foreign-invested sectors amounted to 63 percent of the total

exports and 53 percent of its total imports (Zhang, 2014). FDI remained positively stable with 9.6 billion USD in the first ten months of the year (Harjani, 2013). As stated by Nguyen T. D. (2014), in 2013, although the global demand showed some fluctuation and the commodity prices witnessed a downward trend, export expansion rate still reached 15.4 percent honorably. The portion is even predicted to grow up by nearly 5 percent in 2014.

When it comes to the trade balance, Vietnam has been known as a trade deficit based economy. Nevertheless, the year 2012 marked a milestone in the economic development with a marginal surplus of 5.9 percent, the first ever since 1992 (World Bank, 2013). The surplus remained in the next year with a lower amount of 900 million USD (Nguyen T. D., 2014).

FIGURE9. Vietnam trade balance, 2003-2013 (Nguyen T. D., 2014)

According to data released by the General Statistic Office, Vietnam's official economic growth rate in 2013 was 5.42 percent, a little bit higher than a 5.25 percent pace in 2012 and the median estimate of 5.3% (Bloomberg News, 2013). The real GDP growth is predicted to accelerate slightly at average of 5.9 percent in this year and the year after (Economist, 2014). Regarding inflation, in accordance with ADB, it plunged dramatically from over 20 percent in 2011 to 6.5 percent in 2013 as a result of declining food price inflation (ADB, 2013). It was the all-time inflation record in Vietnam since its first transformation,

surpassing all nations in the region. At the beginning of 2014, the rate is forecasted to rise up to around 7.5 percent. This situation is on account of fiscal and monetary policies which would be loosened to foster the growth (Chi, 2013). However, thanks to governmental actions, the actual rate updated in February was luckily kept at 4.65 percent (Trading Economics, 2014).

FIGURE 10. Inflation rate, Vietnam VS Finland, 2011-2014 (Trading Economics, 2014)

It is believed that the biggest problem, which is holding back Vietnam's economic development, lies in its banking systems. In spite of dominance of state-owned commercial banks, they operate inefficiently in comparison with smaller joint stock banks (Datamonitor, 2011). The rate of bad debt is highest among nations in Southeast Asia, continuing to plague the banking sector. As reported by Leslie Shaffer (2014), there are at least 15 percent of banks' total assets showing problems. Above 4.7 percent of non-performing loans is initiated from the State Bank. In order to restrain negative impacts of banking systems to the economic development, a number of actions are suggested by the government such as structural reforms or low-interest loans. An asset-management was established to acquire banks' nonperforming loans (ADB, 2013). Furthermore, foreign investors are allowed to take bigger shares of the nation's lenders as an effort to bolster the diseased banking system (BloombergNews, 2014). Nonetheless, the recovery of banking sector is relatively sluggish.

To conclude, in any manner, Vietnam's economy is foreseen to experience an even brighter prospect in 2014. The country can benefit from exports, particularly from foreign-invested manufacturing firms. Surplus is still projected this year, along with GDP and inflation are expected to be at modestly rising rates.

3.1.4 Social-Cultural

With the estimated population of nearly 93.5 million people in July 2014, Vietnam is among the most inhabited nations in the world (CIA, 2014). The majority of the population is under the working age (15-65 years old), accounting for 62.6%. The median age is below 30 (around 50%), which indicates that Vietnam has a young population with a strong purchasing power. It can be seen as one of the advantageous points when compared to Finland where more than one fifth of population is over 65. Among 54 various ethnic groups, Kinh people are dominant with 85.7 percent of the population. The official language is Vietnamese with English increasingly favored as a second language.

In spite of a high rate of urbanization, nearly 70 percent of the population is still living in rural areas, being engaged in agricultural activities which provide a huge amount of inputs for biogas production. Ranked 33th in comparison to the world in field of education expenditures (CIA, 2014), Vietnam has gained some significant achievements, regardless of a poor country with low per capita income. However, according to World Bank (2013), Vietnam should pay attention on making its workforce more productive. At present, almost all Vietnam's adult workforces are able to read and write. The challenge is to turn these good readers into critical thinkers and problem-solvers who are well equipped with both technical and soft skills.

Although a number of traditional values are being faded away as a negative impact of globalization, for thousands of years under Confucianism, lots of invaluable cultural values and customs are still maintained until now. Since the economic opening up, more and more western companies want to do business in Vietnam. However, they have to face with many challenges arising from cultural differences. Thus, in order to successfully enter this emerging market, Finnish

companies are advised to spend more time to learn about Vietnamese culture and human before getting to the negotiating table.

3.1.5 Environmental

As consequences of urbanization, industrialization and intensive farming, Vietnam's environment is impacted negatively. At present, Vietnam is among five countries most affected by climate change (EnDev, 2014). The expected increased frequency of floods, typhoons and droughts is threatening thousands of coastal and farming communities' lives.

According to Datamonitor (2011), there are annual consistent increases of carbon dioxide (CO2) emission, from 104.1 million tons in 2008 to 108.3 million tons in 2009. Owing to the increasing reliance on fossil fuels, the CO2 emissions are projected to increase at an annual rate of 8.5 percent and could reach 400 million tons by 2025 (Do M. T., 2011). Moreover, Do (2011) added that sulfur dioxide (SO2) emission, which is the fundamental component of acid rain, is predicted to increase from 0.34million tons at the moment to 1.1 million tons by 2025. The government thus has had serial actions to confront with this situation, from environmental incentives to increased public awareness.

The most important legal documents concerning environment include:

Law on Environmental Protection (Law 52/2005/QH11)
Approved on November 29, 2005 by the National Assembly of the Socialist Republic of Vietnam, the law first defines environmental protection actions as those which encourage development, use of clean energy, renewable energy, GHG emission reduction, reduction of ozone layer destruction(Article 6, 33). It additionally states that organizations or individuals who invest in environment protection actions gets support from the state on tax, investment capital and land for project construction.

Decree on incentives, support on environmental protection activities (Decree 04/2009/ ND-CP)

Approved on January 14, 2009, the decree clarifies incentives as well as supports which organizations and individuals investing on environmental protection activities can get:

- Regulation on incentives, support on land, capital
- Tax exemption, reduction of tax, fees for environmental protection activities
- Price subsidy, support for products from environmental protection activities, other incentives, support for environmental protection activities and their products
- In the list of products with incentives, there is energy generated from waste treatment .For example, solid waste treatment project gets 50% investment capital from government.

3.1.6 Technological

When it comes to the technological aspect, Viet Nam is a significantly developing country although it is far from moving into high-tech production (Datamonitor, 2011). To boost the technological improvement, the government has adopted the strategic plan of economic and social development, period 2011-2020, in which infrastructure is set as one of main targets (Anthony Ba, 2011). A number of expressways are built; the local transport networks are upgraded to meet the requirements of rural industrialization and modernization. They are eventually connected to the national system to reinforce the goods circulation and speed up the economic development.

In addition, according to Brothers Anthony Ba (2011), the above plan concentrates on narrowing the scientific and technological gap with global indicators by 2020. The top priorities also include enhancement of scientists and managers' competences, encouragement of training courses partnered with foreign competent partners. Scientific and technological renovation is also focused to sharpen the competitive edge of local products. Furthermore, companies operating in the areas of biotechnology, information technology, new materials technology such as Nano technology, manufacturing technology and automation will receive supports and assistances from the government.

Business Monitor International (2014) forecasts that Vietnam's IT market will grow at a compound annual growth rate of 14.1% in 2017. This significant growth is mainly driven by rising incomes, enterprise modernization and governmental supporting polices. At the moment, some leading firms in the field of information technology such as IBM, Microsoft and HP reckon that Vietnam is on the tipping point of a technological revolution (Thompson M. A., 2013). In the near future, cloud technologies will be deployed widely throughout the country to increase competitiveness and streamline operations. Furthermore, Vietnam is predicted to become a global center for electronics production as a result of wages rise in China which is currently known as the factory of the world (BMI, 2014).

Last but not least, Datamonitor (2011) figures out that Vietnam has a high rate of piracy which could deter investment in intensive R&D area. For example, the software piracy rate in Vietnam was among the highest in the world, accounting for 81%. It represented a commercial value of unlicensed software of US$395 million (IIPA, 2014). This negative impact was brought about by the increased Internet and mobile penetration and more widely available broadband capacity. At the end of 2012, it was estimated that there were about 35 million users of Internet, making up 39.5% of the country's population. The proportion of mobile subscriptions was 134 million (IIPA, 2014).

3.2 Trade between Finland and Vietnam

Notwithstanding about 40 years of diplomatic relations, trade and investment relations between the two countries are relatively modest. In 2012, the country strategy for development cooperation with Vietnam in the period of 2012-2016 conducted by Ministry for foreign affairs of Finland pinpoints Vietnam as a long-term partner country. However, the bilateral grant-based development cooperation modalities are under the transition from traditional ODA towards a more comprehensive partnership for mutual benefit (Formin Finland, 2013). As stated in reports, some objectives are proposed to support to the development of Vietnam.

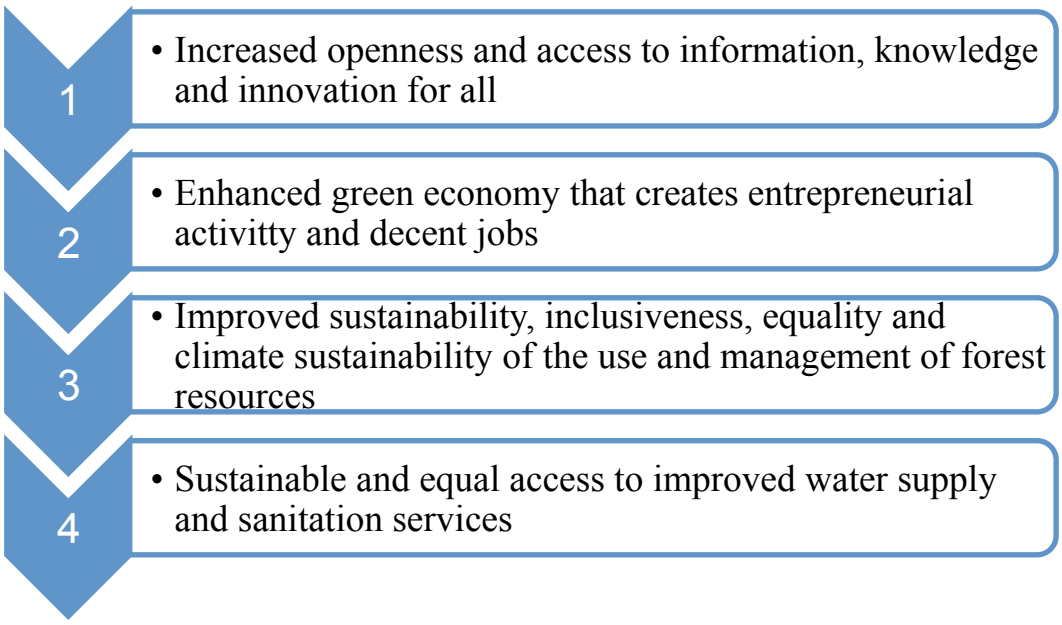


FIGURE 11. Finland's commitments to Vietnam's development (Adapted from Formin Finland, 2013)

Finnish government's commitments to sustainable use and management of natural resources, climate sustainability, and improvement of a knowledge-based society can be obviously seen from the figure above. With the purpose of strengthening and diversifying partnerships between the two countries in all fields, high-level visits, policy dialogue, along with economic, commercial and innovation cooperation are further reinforced (Formin Finland, 2013).

The Embassy of Finland in Hanoi (2013) has reported some positive signs in the trade figures these recent years. From the year 2011, Finnish exports to Vietnam have grown by 13 percent, and conversely, Vietnamese exports to Finland have increased by 18%. In 2012, the bilateral two-way trade between the two countries amounted to approximately 304 million USD, making an annual growth rate of 44 percent (Vietnamnews, 2013). Vietnam's crucial export goods to Finland include coffee, rubber, footwear, garments and textiles, fine arts, wood products, plastics, bicycles and spare parts. Meanwhile, machinery, equipment, mass media products, garments and textiles, plastics, chemical products, electric equipment, components, iron and steel are imported from Finland. (VOV News, 2013).

TABLE 5. Trade between Finland and Vietnam, 2007-2011 (Adapted from FinPro, 2011)

	2007	*2008*	*2009*	*2010*	*2011*
Finnish Exports	61.4	70.4	68.7	65.7	65.3
Finnish Imports	77.6	97.6	95.5	114.4	117.3
Trade Balance	-16.2	-27.2	-26.8	-48.7	-52.0

According to a survey done by the Finnish Business Association, Vietnam is among the most attractive Asian markets for Finnish companies, only after China and India (Ngoc, 2013). It is reported that there are around 100 Finnish affiliated companies presenting in Vietnam, particularly in the renewable energy and clean technology sectors. Almost all of them are operating through local agents, and a couple of companies have a representative office lead by either Finnish or foreign personnel (CONNECT, 2013). At the end of 2012, Finland had invested in 8 projects with a total registered capital of over 320 million USD, ranking 27th out of 98 foreign investors in the country. Furthermore, a bilateral trade target of 1 billion USD is made between the both sides (Vietnamnews, 2013).

According to Kimmo Lahdevirta, Finnish Ambassador to Vietnam, one of the most important difficulties for Finnish companies to work well in Vietnam is how to find a feasible domestic partner (Vietnamnews, 2013). In order to assist Finnish companies in the new emerging market, Finland Business Partnership Programme (Finnpartnership) plays an important role with its advisory services free of charge and financial support. Contrarily, Vietnam companies are able to seek for business cooperation with Finnish partner by matchmaking service which is available in its website. Vietnam and Finland are important reciprocal companions in some business development programs aiming to support private industry, such as Innovation Partnership Program (IPP), Energy Partnership Program (EPP), and Concessional Credits (CONNECT, 2013).

3.3 Renewable energy development in Vietnam

Energy consumption in Vietnam has witnessed a ceaseless increase in these recent years as an inevitable consequence of the fast socio-economic development. As an estimated demand of electricity capacity is predicted to double in 2020 compared to the portion in 2008 (Heinze & Zwebe, 2012), the country will soon have to face with an energy shortage. In addition, AmCham Vietnam (2011) foresees an inequality of rising dependence on fossil fuels and dropping share of renewable sources in the near future. It is forecasted that the share of fossil fuels in the total primary energy supply will rise from 42 percent in 2002 to 69 percent in 2030 while renewable sources' division will go down from 58 percent to 22 percent over the same period. Although Vietnam is currently a net energy exporter, it is likely to turn into a net importer by 2015. Expected primary energy imports will account for 36 percent of total primary energy consumption in 2020 and the proportion will rise to 57 percent in 2030 (Heinze & Zwebe, 2012). At present, Vietnam's power sector is dominated by the integrated state-owned EVN, which is in charge of generator to retailer. It contributes more than half of the total generated power in the country. However, when the energy deficiency is getting more and more serious, EVN's monopoly is believed to hinder the development of the power sector (Vietnamnet, 2013).

Indeed, the demand for alternative energy resources is more necessary and important than ever. As fossil fuels are becoming exhausted and there are some limitations in constructing new hydro power plants, the exploitation and utilization of renewable energy are obviously one of the most potential solutions for the energy scarcity. Actually, RE has been used for cooking, heating and lighting from way back. However, how to utilize these alternative energies in power generation and transportation is at the early stage of research and development. The improvements of technology and material knowledge, governmental supporting policies, as well as cost reduction give rise to the strong development of RE. The development of RE by the end of 2030 is illustrated in the figure below:

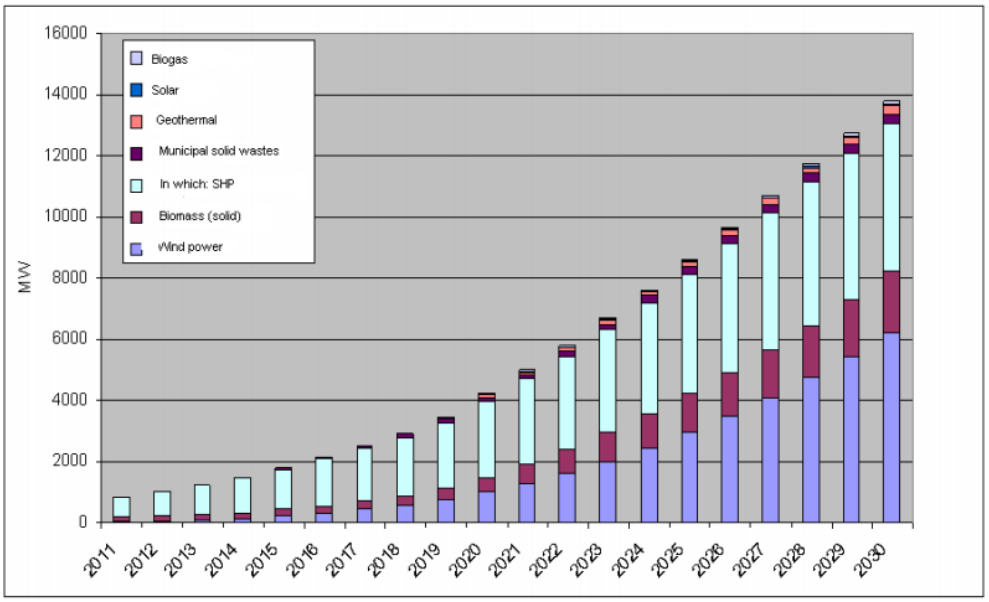


FIGURE 2. Renewable energy development, 2011-2030 (Nguyen C. D., 2012)

Being a developing country with favorable geographic position and climatic conditions, Vietnamese economic activities still rely heavily on agro-forestry and animal husbandry. This reality enables Vietnam to access to relatively huge amount of renewable energy resources distributed throughout the country. Statistics about these promising resources collect by CONNECT (2013) are summarized in the table below:

TABLE 6. Potential for renewable energy production in Vietnam (Adapted from CONNECT, 2013)

	Supporting factors	***Estimated energy capacity***
Solar energy	• 2,000-2,500 hours of sunshine/ year • Solar radiation levels: -Southern and central areas: 4 to 5.9 kWh/m2/day, uniformly distributed throughout the year -Northern areas: 2.4 to 5.6 kWh/m2/day	43.9 billion TOE
Wind energy	• A coastline of 3,000 km • Average wind speeds: - Coastal regions: 5.6 m/s - Certain islands: 8 m/s	Approximately 513 GW
Biomass energy	60 million tons of biomass available in agriculture residues and waste	1000-1600 MW
Geothermal energy	More than 300 hot streams from 30 °C to 148 °C	1,400 MW (400 MW used to generate electricity by 2020)
Hydropower	2,400 rivers of 10 km or longer	1,600-2,000 MW

Theoretically, these massive reserves can be effectively harnessed to meet the rising demand for energy, being a replacement to fossil fuel while contributing simultaneously to environmental protection. However, the development for alternative energy in Vietnam is not commensurate with the potential and existing strengths. This situation is mainly caused by unappealing economics of renewable energy resources while the production costs are pretty high. Besides, barriers related to policy mechanism, implementation institutions, information and database, and technological application level have hindered the deployment of renewable energy projects seriously (Nguyen C. D., 2012).

Under the high pressures of energy sufficiency for economic development and environmental protection, attaching special importance to renewable energy sector is set a top priority. According to the national power development plan for the 2011-2020 period with the vision to 2030 (shortly called the “Power Master Plan

VII") approved by the Prime Minister of Vietnam on July 21 2011, the country will produce a power capacity of 75,000 MW, of which 500 MW will be generated by RE (Mayer Brown, 2011). Furthermore, the plan has also shown an upward trend in every single type of RE:

TABLE 7. Power capacity by sector, 2020-2030 (Mayer Brown, 2011)

	Targeted Capacity by 2020	Targeted Capacity by 2030
Wind Power	1,000 MW	6,200 MW
Biomass Power	500 MW	2,000 MW
Hydropower	17,400 MW	/
Pumped Storage Hydropower	1,800 MW	5,700 MW
Gas-fired Thermal Power	10,400 MW (with electricity production of about 66 billion kWh)	11,300 MW (with electricity production of about 73.1 billion kWh)
Coal-fired Thermal Power	36,000 MW (with electricity production of about 156 billion kWh)	75,000 (with electricity production of about 394 billion kWh)
Nuclear Power	First nuclear power plant to be put into operation.	10,700 MW (with electricity production of about 70.5 billion kWh)
LNG Power	2,000 MW	6,000 MW

In general, it can be concluded from all the above data and information that coal-fired power plants will remain the most important source of electricity in Vietnam while renewable energy sector will witness vigorous changes year by year.

4 VIETNAMESE BIOGAS MARKET

Generally speaking, Vietnam has a huge potential to convert wastes from household and processes of industry, agriculture, or forestry production into clean fuel sources. However, these energy sources have not been fully tapped. Some statistics point out that every year, there are several million tons of untreated wastes are dumped directly into the ecological environment in different forms (An, 2013). It is subject to the more and more environmental polluted condition and misuse of the national abundant resources. In this context, biogas technology is given as an effective solution. It not only creates alternative energy sources in place of fossil fuels but also aggressively tackle wastes to meet environmental standards.

Biogas technology has been researched, adapted and implemented in Vietnam since the 1960s of the 20th century. Over the past 50 years, the technology has been improved and applied widely at different levels, creating a lot of significant socio economic and environmental benefits for the farmers.

There are basically three reasons for investing in biogas plants in Vietnam. First and foremost, Vietnam possesses favorable climatic conditions for biogas production. Its heat and humidity are considered preconditions for the effective functioning of a bio-digester (Energypedia, 2014). Secondly, Vietnam has a large animal husbandry sector which provides ample feedstock for bio-digesters (Energypedia, 2014). It is shown in the below figure that Vietnam's pig market has ranked number fourth in the world, after China, the USA and Brazil (Economist, 2011). The last reason is about the popularity of household scale biogas plants in rural areas. Vietnam's animal husbandry sector is formed mainly by small family farms; and almost of them have their own biogas plants with capacity of below 50m3 (Energypedia, 2014). This type of plants is generally simple and affordable to Vietnamese farmers.

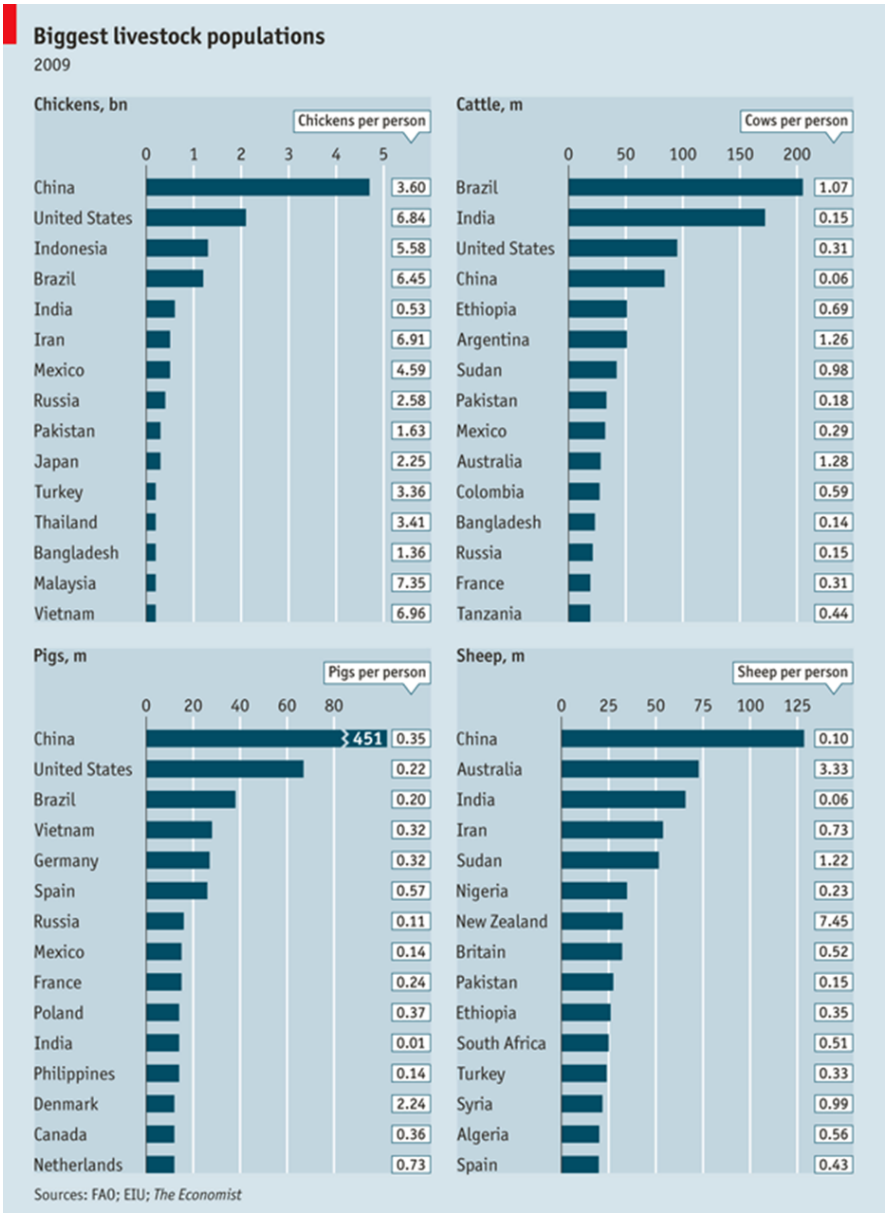


FIGURE 12. Global livestock populations, 2009 (Economist, 2011)

4.1 The usage of biogas

Since first used in Vietnam in the early years of the 1960s, after 50 years, biogas in Vietnam has undergone the strongest development with all sizes from small to medium and large. In which, small scaled biogas plants are considered the most complete technologies (GIZ, 2011).

In animal husbandry sector, household-scale farms have become more familiar with biogas while those on a medium to large scale have just been at the starting point. In rural areas, farmers with more than 15 pigs can build biogas plants with

capacity of 15 to 20 m3. The gas produced from these plants can be used to generate electricity at capacity of 1.5 to 3 kWh (GIZ, 2011). Around 500 000 biogas digesters (under 10m3) were constructed by the end of 2011. Although there was no official figure, it was estimated that there was less than 100 business-oriented biogas digesters with the capacity of 100-200 m3 over the same period. Almost all of these digesters were operated by pig farms. Besides, there was only 0.3 percent of about 17 000 large scale pig farms had a biogas facility. The National Rural Clean Water Supply and Sanitation Strategy defined by the government has set its target to increase the portion of farms using waste management systems, specifically biogas tanks for waste management treatment by 2020 to 45 percent (Swedish CENTEC Vietnam, 2012).

At the industrial scale, according to Swedish CENTEC Vietnam (2012), some tens of biogas plants were counted nationwide. The main purpose of these plants was power generation for direct use within the factory or product drying.

Based on two scales of farm, it is indicated that biogas Vietnam is utilized by two main purposes: heating and electricity generation (Nguyen C. D. , 2011).

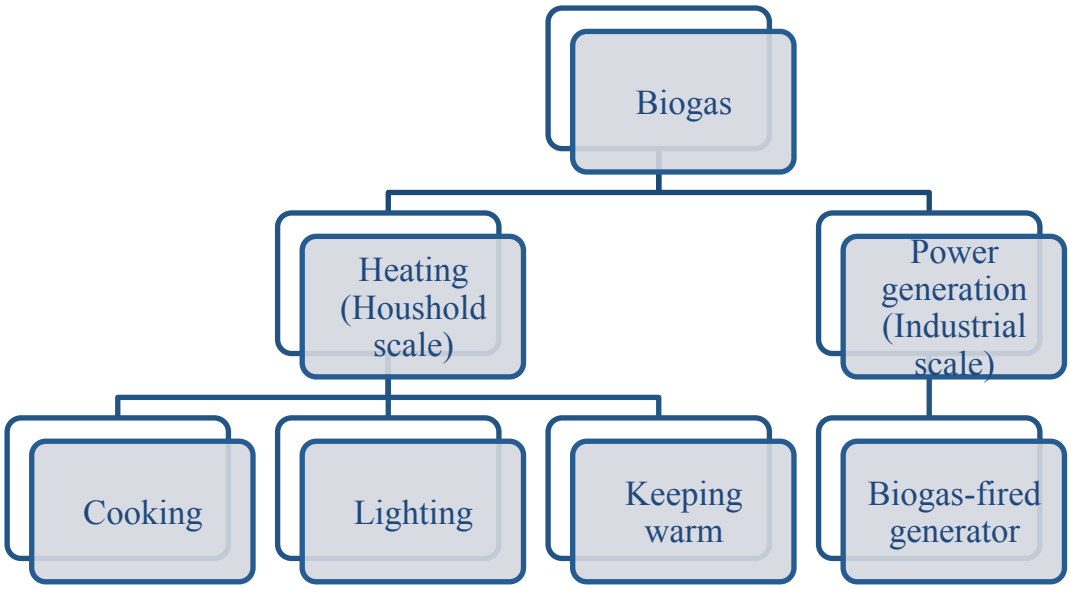


FIGURE 13. The use of biogas (modified from Nguyen C. D. , 2011)

At the household level, a survey on users of biogas indicates that 90 percent of participants mainly make use of biogas for cooking and lighting. Sometimes, it is utilized to keep piglets or small chickens warm in winter, to run freezers, to maintain fruits and cereals or to incubate poultry eggs (Nguyen C. D. , 2011). However, these applications in term of production purposes have been restricted to research, experiment or demonstration due to the fact that gas supply from small size facilities is often only enough for cooking.

The main functions of using biogas at the industrial level are electricity generation to facilitate manufacture within the factory or product drying. The only one existing biogas plant generating power in Vietnam is built and installed by Solutions Using Renewable Energy Inc. (Philippines) (MoIT, 2013). This construction is located in the San Miguel Pure Foods' sow farm (Binh Duong province) with the capacity of 2 MW. In general, the development of biogas generators at the industrial scale is limited because of both subjective and objective. For example, in sugar factories, alcohol factories or biofuels factories, the input of biogas production depends considerably on farming. In breeding ground, although this cause is less influential, the investment costs for the entire system are relatively high and the lifespan of generators is low (MoIT, 2013).

4.2 Pros and cons of biogas technology

There are no perfect energy sources. Each type of them has its own advantages and disadvantages. This sub-chapter describes briefly pros and cons of biogas technology.

To begin with, the most obvious benefit of biogas is an alternative renewable energy that does not pollute the environment. Because the production of biogas does not require oxygen, the resources are conserved by not using any further fuel (Converse Energy Future, 2014). Secondly, it helps to reduce landfills, contributing to the decreased soil and water pollution. The greenhouse effects are then diminished. The last reason for applying widely biogas technology is that it is cheaper and much simpler when comparing to other bio-fuels (Eco Village, 2012). It is ideal for Vietnam's current context in which small scale application is the most common.

On the other hand, on the large scale, the process of using biogas is not economically viable. There are some difficulties in enhancing the efficiency of biogas systems. In addition, biogas contains some gas as impurities which are corrosive to the metal parts of internal combustion engines (Eco Village, 2012).

The benefits and downsides of biogas application are summarized in the following figure:

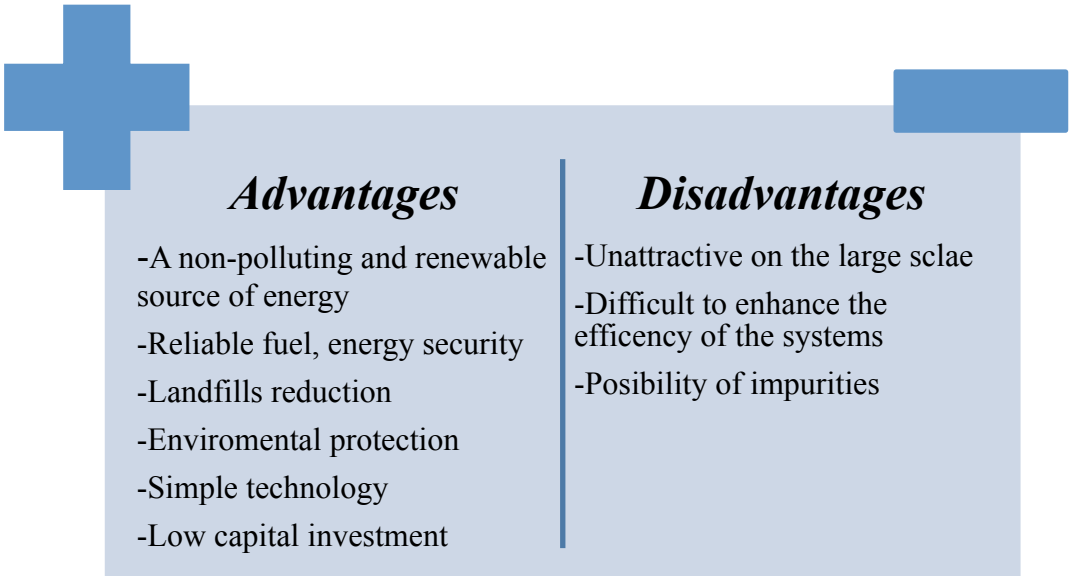


FIGURE 14. Pros and cons of biogas

4.3 Source of biogas

In the agriculture sector, there are an estimated 195 million tons of plant protection products, wastes from breeding and aquaculture discharged directly into the environment per annum. In detail, about 27.1 million tons of waste treatment products, 56.2 million tons of agricultural wastes, and 28 million tons of organic substances produced from household hazardous wastes are unused. A vast majority of these harmful contaminants comes to the environment without any treatment and recycling (An, 2013).

Biogas resources are basically divided into three categories: Wastes from animal husbandry sector, wastes from municipal areas, and wastes from treatment process of foodstuff and beverage industries.

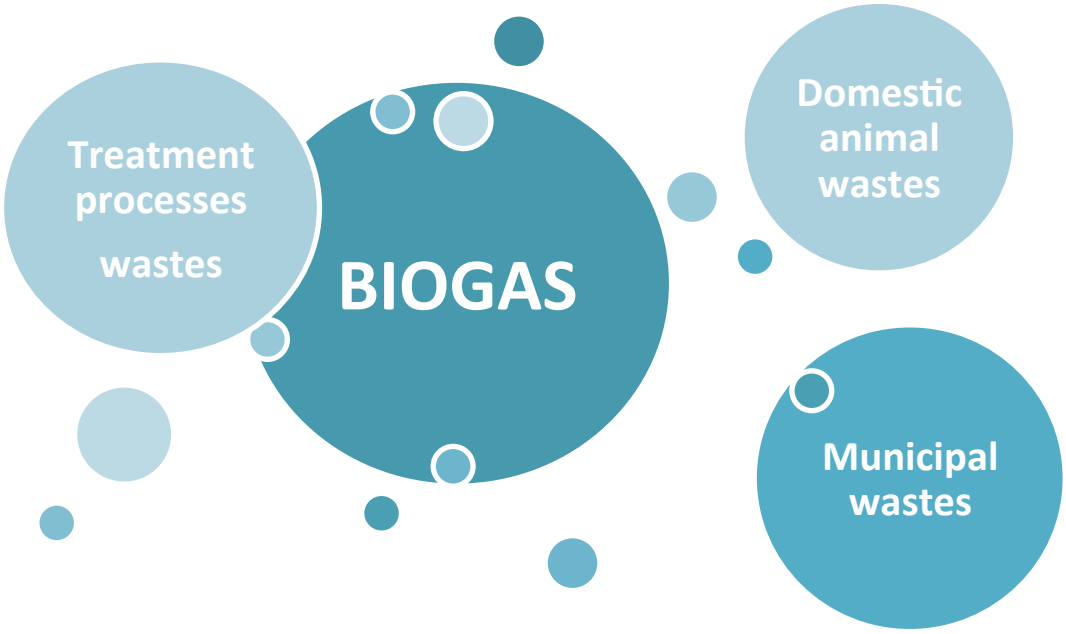


FIGURE 15. Sources of biogas (modified from Nguyen C. D. , 2011)

4.3.1 Wastes from the animal husbandry sector

The development of Vietnam can trace its roots back to a poor backward agricultural country. In these recent years, it has been in the transition towards a modern industrial market economy, being considered as a major manufacturing center of the world. Although there is a downturn in the agricultural production, it still remains its key indicator in the country's share of GDP (Bockel, 2011), accounting for approximately 20 percent (CIA, 2014). Besides, it is also a key contributor to export and creates employment for more than half of population (Duiker, 2013).

Among sub-sectors of agriculture, livestock plays the key role in the livelihood of the farmers. It is estimated that the earnings from livestock make up to 70% of the famer's total income in the rural areas (Hoang, 2012). Hence, owing to the large share of livestock in the agricultural sector, Vietnam is endowed with a huge amount of animals' wastes which can be seen as the most important resource for biogas production.

In this sub-part, the author goes deeply into the animal husbandry industry in the target market.

Thanks to about 8 million cattle and more than 27 million pigs, Vietnam can produce biogas with the capacity of 2 445 million m3 annually (Swedish CENTEC Vietnam, 2012). In the table below, the total numbers of each animal in the period of 2007 to 2012 are illustrated:

TABLE 8. Domestic animal and poultry population, 2007-2012 (Gathered from GSO, 2013)

	Buffalo	*Cow and bull*	*Pig*	*Poultry*
2007	3.0	6.7	26.6	226.0
2008	2.9	6.3	26.7	248.3
2009	2.89	6.1	27.6	280.2
2010	2.88	5.9	27.4	300.5
2011	2.7	5.4	27.0	322.6
2012	2.6	5.2	26.5	308.5

The year 2012 witnessed a slight drop in the livestock sector. It can be seen in the table that in this year, there were about 26.5 million pigs, 5.2 million cows and bulls, 2.6 million buffalos, and about 308 million various types of poultry.

In Vietnam, the livestock sector is comprised mainly of industrial farms and household farms. According to Hoang (2012), there were around 23 000 industrial farms and 8.5 million household farms nationwide in 2011. Although there are uncertainties in the quality and quantity of small scale farms' performance, they still account for about 65 percent of total number of pigs, 70 percent of the chicken population and 90 percent of the buffalos and cattle raised in the rural areas.

FIGURE 16. Common farm sizes (Do T. K. ,2011)

In 2010, it was estimated that the domestic animal herd discharges were nearly 100 million tons of solid wastes, a couple hundred million tons of liquid wastes and multiple million tons of gaseous waste (Nguyen C. D., 2011). The total amount of wastes is shown in the following table:

TABLE 9. Total amount of wastes produced in 2010, (Adapted from Nguyen C. D., 2011)

Livestock & poultry	*Number (million)*	*Daily discharged waste amount* (kg/animal/day)*	*Waste amount (million tons/year)*
Buffalo	2.9	18-25	19-26 (Average:22.5)
Cow and bull	5.9	15-20	32-43 (Average: 37.5)
Pig	27.4	1.2-4.0	12-40 (Average:37.5)
Poultry	300	0.18-0.34	19-37 (Average: 28)
	Total		82-145
	Average		113.5

According to the Decision No 10/2008/QD-TT dated 16/1/2008, it is predicted that the population of animal and poultry in Vietnam will continue increasing in the next several years, although the expected average growth rates are relatively modest.

TABLE 10. Plan development for herd of animal, poultry up to year 2020 (Adapted from SVN, 2011)

Year / Animal	*2010*	*2015*	*2020*	*Expected average growth (%/year) 2010-2020*
Buffalo herd	2 913.3	3,000	3 000	0.29
Cow herd	5 916.2	10 000	12 500	7.77
Herd of goat, sheep	1 288.3	3 200	3 900	11.71
Pig herd	27 373.2	31 900	34 700	2.40
Poultry flock	300 497.5	310 600	358 700	1.79

As stated in the development strategy for Vietnam's livestock and meat industries with a timeframe of 2010 to 2020, the Ministry of Agriculture and Rural Development (MARD) has aimed to expand the share of livestock production out of the total agricultural production to 42 percent in 2020 (Stanton, Emms, & Sia , 2011). At that time, the populations of pigs and cattle are also expected to reach 35 million and 12.5 million respectively. Hence, thanks to these utmost efforts, opportunities created by the animal husbandry sector for the development of biogas production in Vietnam are extremely promising.

4.3.2 Wastes from municipal areas

Besides animal manure, municipal wastes can be utilized to produce biogas. They are basically divided into four groups: household, construction, industrial and medical wastes. Human wastes normally include those emanating from individual homes, commercial facilities, offices and market places (Nguyen C. D. , 2011).

As seen in the table below, there were about 10 million tons of municipal solid wastes accumulated from all areas throughout the country in 2010. Among them, the five largest cities namely Hanoi, HCMC, Hai Phong, Da Nang and Can Tho accounted for 67.6% (Nguyen C. D., 2011).

TABLE 11. Municipal waste generation in Vietnam, 2010 (million tons) (Adapted from Nguyen C. D. , 2011)

City	*2005*	*2010*
All cities in Vietnam	7.34	10.54
Ha Noi	1.15	2.01
Ho Chi Minh City	2.37	3.15
Hai Phong	0.65	0.83
Da Nang	0.28	0.40
Can Tho	0.37	0.44

At the moment, there are an estimated 28 million tons of domestic waste discharged annually. This average amount is generally rather high when compared to other developing countries. Nevertheless, the number will increase significantly to 43.5 million tons in 2015 and even 67.6 tons in 2020 (Swedish CENTEC Vietnam, 2012). Hence, it can be drawn a conclusion that the utilization of these abundant waste resources in the most effective way will contribute for the reductions of greenhouse gas emissions and burden on fossil fuel.

4.3.3 Wastes from treatment processes of foodstuff and beverage industries

In the manufacture of some special food, foodstuff or beverages, a huge amount of waste is dumped directly to the environment. In Vietnam, they are used as the material sources for biogas production. Outstanding sources include cassava starch plants, alcohol and beverage factories, aquatic products processing plants (shrimp, fish etc.), milk processing plants or sugar plants. It is estimated that Vietnam has about 27.1 million tons of waste from wood and 56.2 million tons of agricultural waste (Swedish CENTEC Vietnam, 2012). Enormous amounts of liquid and solid wastes from these industries need to be managed and controlled strictly to uphold environment standards.

4.4 Current technologies

The technologies implemented widely in the Vietnamese biogas sector are quite simple and backward compared to the technological advances in the world. The technologies vary according to the level of the biogas plants. Due to the constraint

of focused content, only some most common technologies are discussed briefly in this sub-chapter.

4.4.1 In the household scale farm

In almost small-scaled plants, biogas digesters with principal of anaerobic fermentation are used to produce biogas. According to Nguyen C. D. (2011), this category commonly comprises of floating cover, fixed doom cover, composite and vinyl bag systems**.**

Floating cover biogas system

It is one of the oldest biogas systems, which was first used and became common in 1980s. Its structure is described as a steel reinforced gas holder facing down to a water- collecting slot around the digester neck (Do T. K., 2011). The cost of this system is relatively high due to the requirements of high-quality steel cover and regular maintenance. However, it is able to be developed to the large-sized biogas plants, especially in concentrated breeding farms (Nguyen C. D. , 2011)

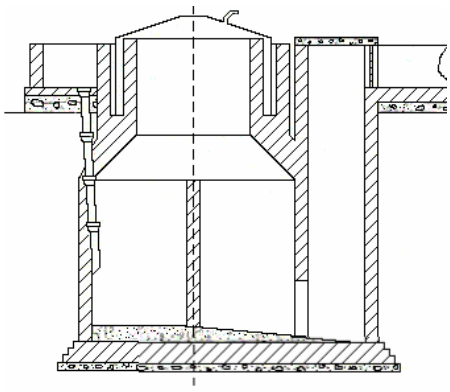


FIGURE 17. Floating cover biogas system (Nguyen C. D. , 2011)

Fixed dome cover biogas system (KT-1 and KT-2)

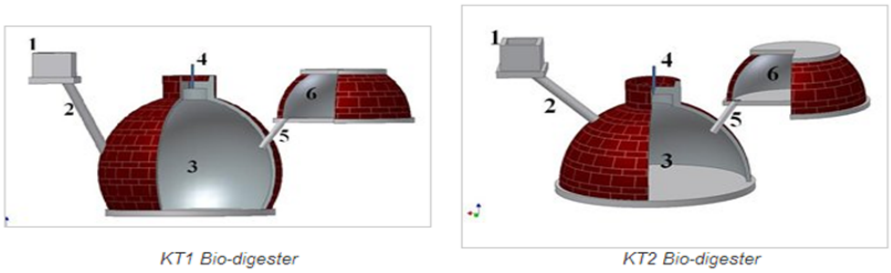


FIGURE 18. KT-1 and KT-2 (SVN, 2011)

The KT1 and KT2 are two most common models of a fixed dome biogas digester in Vietnam. In general, the implementation budget for these systems is much cheaper than floating cover system because they are built of brick and other popular materials such as sand, concrete, PVC pipe, etc. The domed shape of the digester can help to save materials compared to the rectangular or cylindrical ones. In addition, its sizes vary according to individual demand. And one more strength is due to low maintenance requirement and long life span.

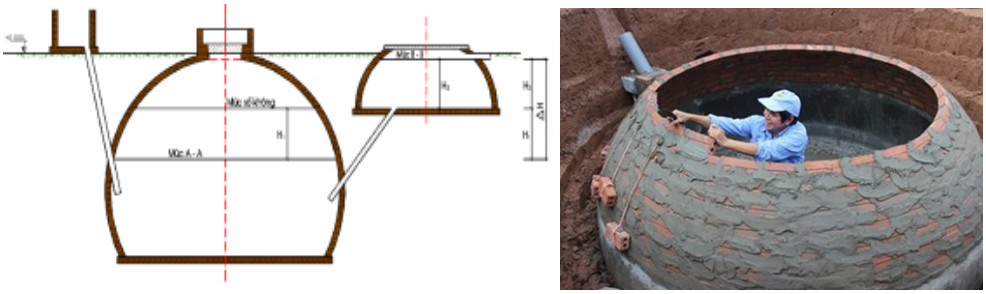


FIGURE 19. Fixed dome biogas digester

Regarding the disadvantages of these models, it can be said that high technical skills and area-intensive requirement are the most outstanding.

There are two obvious differences between the two systems. The KT-1 has its shape of a sphere while KT-2's one is a half sphere. When it comes to the actual implementation, due to the fact that the first system is placed beneath ground surface, it is suitable for good ground layer land with a narrow surface and a low level of underground water. More importantly, the location must not be subsided or collapsed in the case of digging. Meanwhile, KT-2 can be recommended for

areas where they can be vulnerable to deep digging such as weak soil, landslide-prone and high groundwater level areas (Nguyen C. D. , 2011).

VACVINA biogas model

VACVINA biogas model, sometimes refered to as VACVINA's boxed-typed system is simply decribed as a box-typed biogas system with a separated gas storage component as a hybrid version of septic tank design and biogas technology (Nguyen C. D. , 2011).

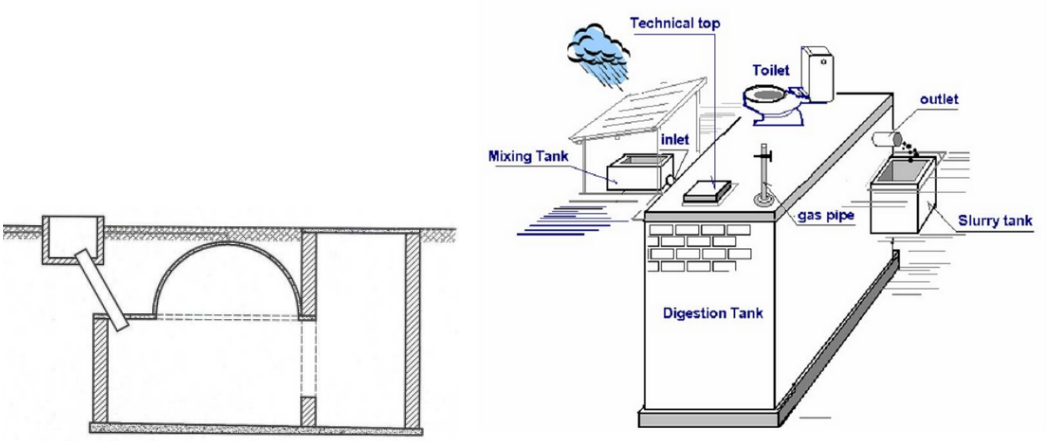


FIGURE 20. VACVINA biogas model (Nguyen C. D., 2011) & general illustration of a VACVINA biogas plant (Paksc, 2012)

The model was first designed by Center for rural communities' research and development (CRRD), then applied nationwide under the MARD's control (Paksc, 2012).

The composite model

Originating from China, the model was first introduced to Vietnam in 2008. It is mostly applied in the northern and central part of Vietnam. By the end of 2010, more than 10 000 units were installed (Nguyen, Phan, & Vo, 2012).

The composite model is comprised of two main parts: the digestion part and the gas storage part. The biogas digester is made of synthetic material such as fiberglass, carbon fiber and polyester, which are wholly imported (Nguyen, Phan, & Vo, 2012). The structure of a composite model is drawn below:

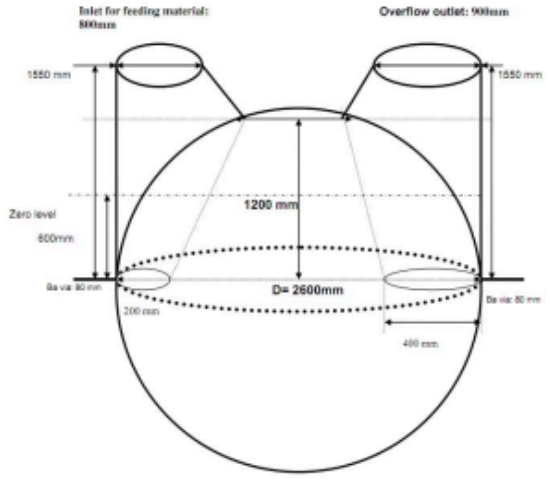


FIGURE 21. The composite model (Nguyen, Phan, & Vo, 2012)

The most important advantages of this model are simple installation and operation, low level of maintenance requirement. However, the price of a biogas digester is relatively high for many end-users.

Plastic biogas digesters

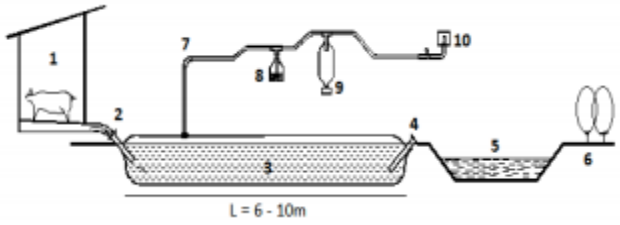


FIGURE 22. Plastic biogas digester structure (Nguyen, Phan, & Vo, 2012)

Initiated from Taiwan, a variety of vinyl bag-typed systems has been developed in Vietnam. Being popular in the early 1990s, more than 35,000 systems have been installed throughout the nation, particularly in the Mekong River Delta area and some Central Highland provinces (Nguyen C. D. , 2011). This system's advantages include cheapest cost and simple technical requirement. However, it

has to face with the biggest drawbacks of short life span, together with idleness in rainy season.

4.4.2 In industrial scale farm

Covered lagoon

At present, covered lagoon is the most common technology applied in industrial-scaled biogas plants in Vietnam. Its designs are adjusted to be compatible with each individual terrain. The figure below illustrates how a covered lagoon digester works:

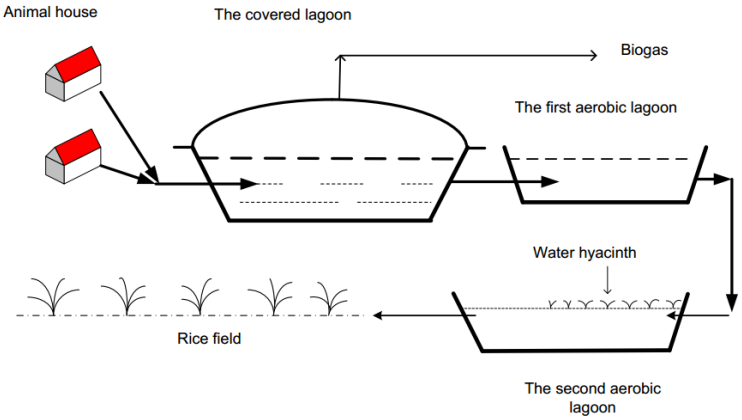


FIGURE 23. Covered lagoon design (Bui, 2012)

In this technology, wastewater from breeding farms or factories automatically flows into the digester through pipes or ditches. The wastewater is separated into inorganic substance and persistent waste before being loaded into the tank through a system that helps to filter wastes and sediment. Decomposed liquid automatically flows out of the device. In some inconvenient terrain, the pumps are used to regulate the flow rate. In general, this technology shows a humble efficiency with a short hydraulic retention time. It is recommended in the case of diluted wastewater but high organic content (MoIT, 2013)

FIGURE 24. Operating covered lagoon building (MoIT, 2013)

Up-flow anaerobic sludge blanket (UASB) digestion

As a form of anaerobic digester, UASB digestion is normally used in the wastewater treatment. Its operating mechanism is basically described in the following figure:

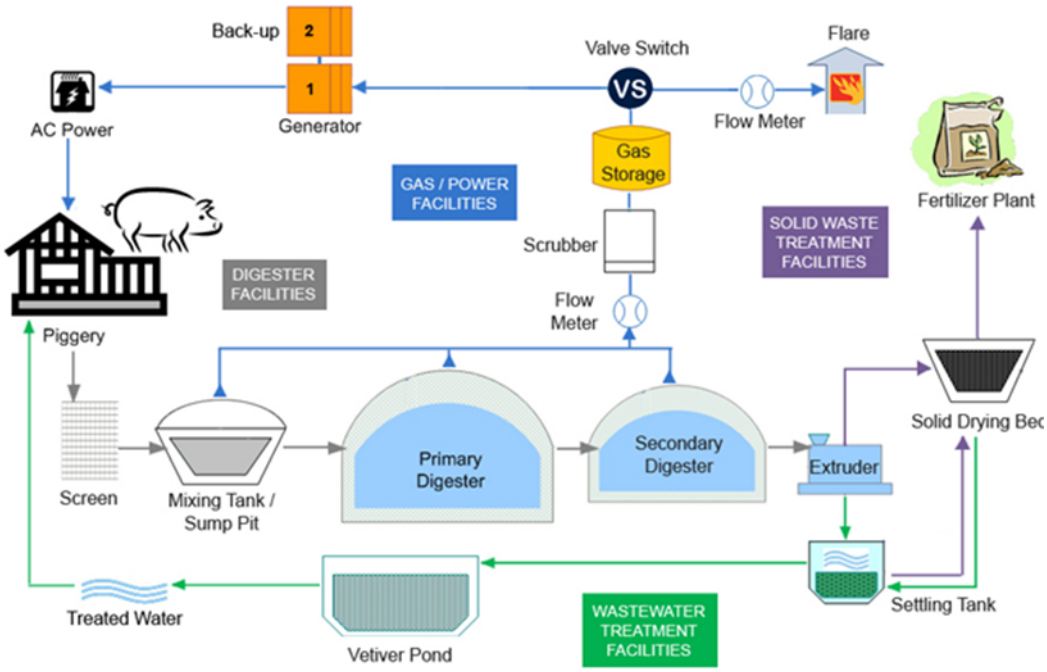


FIGURE 25. Operating mechanism of UASB reactor

Wastewater enters the reactor from the bottom, and flows upward. It flows through a suspended sludge blanket where the wastewater is filtered and treated. The main mission of the microorganisms in the sludge layer is to degrade organic compounds to release biogas (Akvpedia, 2013). The most important strengths of this technology are high organics reduction and low sludge production. Additionally, it is able to withstand wastewater with high organic and hydraulic loading rates.

Expanded granular sludge bed (EGSB) anaerobic biogas technology

Applied in high-technology-required projects, it is one of the most advanced anaerobic biogas system in Vietnam at the moment. Nguyen C. D. (2011) points out that this system had some dominant points compared to the others, such as higher organic load or more reliable operation. Energy is not being consumed because the sludge is mixed entirely with wastewater. In addition, there are no needs for filters and accurate chemical quantifications. Last but not least, it does not require much space as well as maintenance. The structure of an EGSB anaerobic tank is drawn in the figure:

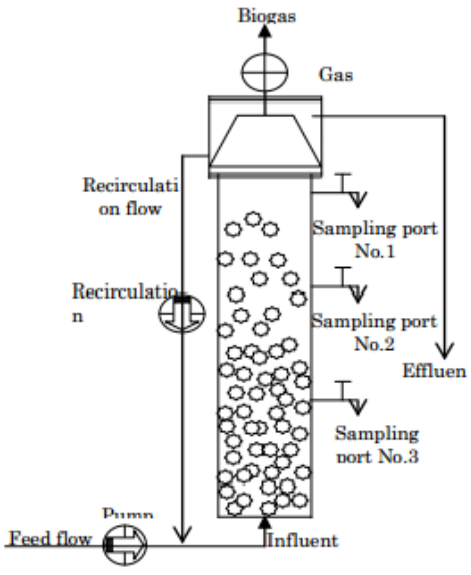


FIGURE 26. Schematic Diagram of an EGSB reactor

4.5 On-going projects

Biogas program for the animal husbandry sector in Vietnam project

First initiated by the Netherlands government in 2003, after about ten years of implementation, it is the most effective biogas project to date. The key stakeholders include the Department of Livestock Production (DLP) under the MARD, and SVN-an international not-for-profit development organization which was founded in the Netherlands nearly 50 years ago. The long-term of objectives of the project are:

- Improve the livelihood and quality of life of rural farmers in Vietnam through biogas exploitation
- Develop a commercially viable domestic biogas sector

To date, the project has gone through three different phases with specific objectives and achievements:

TABLE 12. Overview of biogas program for the animal husbandry sector in Vietnam project (adapted from Biogas Programme in Vietnam, 2014)

Phase	Objectives and achievements
2003-2005	-Implemented in 12 provinces nationwide
2006	-A bridging phase in which the project was implemented in 8 mores provinces -The Energy Globe Award 2006 in Belgium
2007-2014	-Deployed nationwide -By the end of 2012: • Over 125 000 biogas plants installed • Training courses for 953 provincial and district technicians, and 1 505 biogas mason teams • 140 000 promotion workshops organized for biogas users - The Humanitarian Award 2012 by The World Energy Forum in Dubai

By the end of 2018, the project is expected to archive the construction of 180 000 biogas plants. In addition, 2 500 permanent jobs will be created in rural areas, along with 2 000 people will be trained (Energy For All, 2013)

Quality and Safety Enhancement of Agriculture Products and Biogas Development Project

In this project, ADB is the biggest funder while MARD is the local stakeholder. Under a loan agreement, the cooperation was conducted between two parties in 2009. With a budget of USD 22.25 million, the project aims to accelerate the development of biogas in Vietnam, including support to the installation of 20 000 domestic biogas plants up to 2014. Through Vietnam Bank for Agriculture and Rural Development (VBARD) and Central Credit Fund (CCF), credit will be provided to a total of 40 000 households.

Under this project, there were 2 200 biogas plants installed by the end of 2010. In addition, a follow-up program on domestic biogas has been designed, targeting the installation of an additional 100 000 units over a five-year period (SNV, 2011)

Livestock Competitiveness and Food Safety projects

According to SNV (2011), the World Bank stared supporting biogas development in Vietnam in the framework of the Livestock Competitiveness and Food Safety project (World Bank, 2009).

The objectives of this project include:

- Increase the production efficiency of household-based livestock producers
- Reduce the environmental impact of livestock production
- Improve food safety in livestock product supply chains

There are three components to the project:

- Upgrade household-based livestock production and market integration
- Strengthen central-level livestock and veterinary services. Development and implementation of biogas lies in this component.
- Project management, monitoring and evaluation impact.

The project is closed at the end of 2015 with total project cost of USD 79.03 million.

Biogas expansion under the Low carbon agricultural support

Officially initiated by ADB (2012), Low carbon agricultural support project aims to reduce pollution from agricultural waste in 10 target provinces located in northern, central and southern parts of Vietnam. The time duration of the project is six years with an expected completion date of December 2018. During the project, more than 36,000 small, medium and large-sized biogas plants are expected to be built. Farmers and livestock enterprises can access financial resources to establish and improve biogas infrastructure while government and other stakeholders can benefit from technical support. The project is believed to help Vietnam to tackle with growing rural waste threat, as well as raise public awareness about climate-friendly waste management practices.

Since 2013, NDF participated in the project through a cooperation which aims to foster the utilization of biogas. By providing EURO 4.1 million out of a total cost of EURO 67.7 million, NDF is going to support the transfer and pilot testing of innovative biogas technologies in Vietnam (NDF, 2013). The official name of the project is Biogas Expansion under the Low carbon agricultural support project. The project is expected to end in 2017.

Market introduction of the medium-scale plug-flow biogas digester in Vietnam and Optimization of Household Composite Biogas Project (ended in 2012)

Both projects were under The Energy and Environment Partnership Program with the Mekong Region (EEP Mekong). First established in 2009, the program was funded by the Ministry for Foreign Affairs of Finland and the Nordic Development Fund in a 4-year period. With the purpose of supporting wider provision and use of renewable energy, as well as reducing negative impacts of climate change, the program provided funding for NGOs, companies, public and private initiatives, research centers and consulting companies (EEP Mekong, 2009).

Market introduction of the medium-scale plug-flow biogas in Vietnam and Optimization of household composite biogas were two most outstanding projects in field of biogas utilization development under the program. At the end of the projects 600 households were equipped with bio-digesters while the entrepreneurs could to sustain themselves as a result of increasing demand for biogas-digesters (EEP Mekong, 2011). In addition, 200 household composite biogas plants were installed and operated (EEP Mekong, 2012).

5 BIOGAS SMES IN FINLAND

Biogas in Finland has a long history back to 1902 (Lampinen, 2012). After a 30-year period, in 1932, biogas was first used for commercial purpose, including lighting, heating and cooking. The combined heat and power (CHP) model from biogas was developed and operated 4 year later. The first sewage sludge digester in the Nordic countries was built in the 1930s in Helsinki (Moller, et al., 2008, 21). In 1941, when there even was not concept of biogas in Vietnam, Finland started using biogas as a type of vehicle fuel. Hence, it can be said that Vietnam's biogas development is much far from the Finnish biogas sector.

Founded in 1991, Finnish Biogas Association (Suomen Biokaasuyhdistys) is a NGO of companies, individuals and associations with interest in the biogas field. Due to the fact that the primary source material of interest is bio-waste, the association is thus known as a waste management organization rather than a renewable energy organization (Finnish Biogas Association, 2013). It started collecting data in 1994. Until now, there have been 16 biogas reactor plants in operation at different municipal wastewater treatment plants by the end of 2012 (Lampinen, 2012). In 2013, Finnish Biogas Association conducted a catalogue of most important enterprises and organizations operating in the biogas industry:

TABLE 13. Finnish Biogas Industry Catalogue 2013 (Lampinen & Rauhala, 2013)

Who is who?											
Organizations and their activity areas											
Organization	Planning and manufacturing of biogas	Biogas production	Financing	Digestate production	Consulting	Research, training and information	Plant components	Electricity/ Heat	Traffic	Waste/ Sewage management	Trans-portation of biogas
Ajanta Ltd			•								
Amomatic Ltd							•				
Aquaflow Ltd							•			•	
Autoliike Keijo Lehtonen Ltd									•		
Bioprocess Control Ltd					•	•	•				
Biovakka Suomi Ltd		•		•				•			
Dewaco Ltd					•	•	•				
Envor Biotech Ltd		•		•				•	•	•	
Forssan Vesihuoltoliikelaitos		•		•				•		•	
Gasum Ltd									•		•
Geo-Export Ltd/Ulvilan pumppupalvelu					•		•				
Goodtech Environment Ltd	•				•		•				
Haapajärvi vocational collage		•		•		•		•	•		
Höyrytys Ltd							•	•	•		
Oy Insalko Ltd	•				•		•				
Jeppo Biogas Ltd – Jepuan Biokaasu Ltd		•		•				•	•		
Kymen Bioenergia Ltd		•		•							
Lakeuden Etappi Ltd		•		•				•		•	
Puhas Ltd		•								•	
Sensorex Ltd							•				
Finnish Biogas Association						•					
Finnish Gas Association						•					
Stormossen Ltd		•		•				•		•	

5.1 Potential Finnish biogas partners

Through author's own observations, there are a few enterprises providing biogas equipment. Ms. Virtanen (2014) also believes that the majority of Finnish companies offer the solutions for biogas plants, mainly focusing on technology. Biogas equipment and facilities are usually imported from abroad such as German manufacturers, then being assembled. There are some biogas companies along with their key information taken into account in the below table:

TABLE 14. Finnish biogas enterprises

Biower Oy
-Helsinki -Main products and services: • solutions for biogas and waste water treatment plants • bioenergy and fertilizers -Raw material sources: biological wastes, wastewater
Biovakka
-Founded in 2002, Turku -Main products and services: biogas and fertilizers -Raw material sources: municipalities and cities; food industry; industrial companies; stores, restaurants and mass caterers; agricultural companies; septic tanks and enclosed septic tanks
Doranova Ltd
-Vesilahti -Main products and services focus on: • Contaminated soils • Water and waste management • Renewable energy : Biogas
Econect Group Oy
-Established in 2002, Helsinki -Main products and services: • Water treatment

• Wastewater treatment • Sludge treatment and biogas -The strongest in Finland Platinum 2007-2014
Envor Biotech Ltd
-Main products and services: High quality nutrient and soil products -Raw material sources: Municipal bio-waste, food industry, different process wastes and by-products, possibly perished food and sewage sludge
Metaenergia Oy
-Established in 2002, Haapavesi -Main products and services • Biogas plants • Design and manufacture equipment for bio-energy production
Metener Ltd
-Founded in 1998, Leppävesi -Main products and services: • biogas plant design, construction, automation, controlling and research • biogas upgrading unit • natural/biogas fuelling station
Sybimar Oy
-Founded in 2005, Uusikaupunki -Main products and services: • process equipment for food industry and energy sector • biofuels from food industry • equipment and processing of fish farming industry -Raw material resources of biogas production: Food industry

In this chapter, the author plans to investigate the three most outstanding companies in field of biogas production namely Biovakka Oy, Meneter Oy and Doranova Oy. Some core information, as their innovative technologies or achievements, is evoked and clarified.

Biovakka Oy

Founded in 2002, Biovakka Oy has its origins in environmental management (Biovakka, 2014). In 2004, Biovakka ran Finland's first large-scale biogas plant in Vehmaa. This plant is capable of processing 120 000 tons of organic raw material input from pig farms in the nearby areas, along with by-products from industry and municipalities (Lehtonen, 2010). It was followed by the second production plant which was opened in December 2008 in Turku. In addition, a number of plants are further on the drawing broad. In 2009, Biovakka became a partner of Gasum which controls the national natural gas market and owns the gas pipelines in southern Finland (Bayar, 2013). This action has showed Biovakka's enthusiasm in utilizing biogas as the vehicle fuel.

According to Lehtonen (2010), Biovakka's business model is based on developing a network of bioenergy plants which have to meet two criteria: highly technological efficiency and operating profit. Hence, it is in collaboration with the best experts in the field. At the moment, thanks to two large operational facilities, the company has asserted its position as a leading producer of biogas, being self-sufficient in electricity and heat.

Doranova Oy

As mentioned above, Doranova is known with three separate market lines: contaminated sites, water and waste management, and renewable energy. In renewable energy sector, the company mainly focuses on biogas plants. Doranova built 2 out 10 large-scale biogas plants existing in Finland. It accounts for around 20 percent of the market share. Regarding landfill gas, a form of biogas produced from landfill, the company provides measurements with sensor to monitor the amount of emission, along with computer modeling to design the most feasible collection options. According to Mr. Jarno Laitinen (2013), Deputy Managing Director at Doranova Oy, landfill technology is one corner stone of product portfolio.

With the basic principle of delivering experience and best performance, Doranova's approach is based on customer orientation. The company is not limited to provide only equipment but supporting the whole life cycle of a plant. Its biogas performance system is illustrated in the following figure:

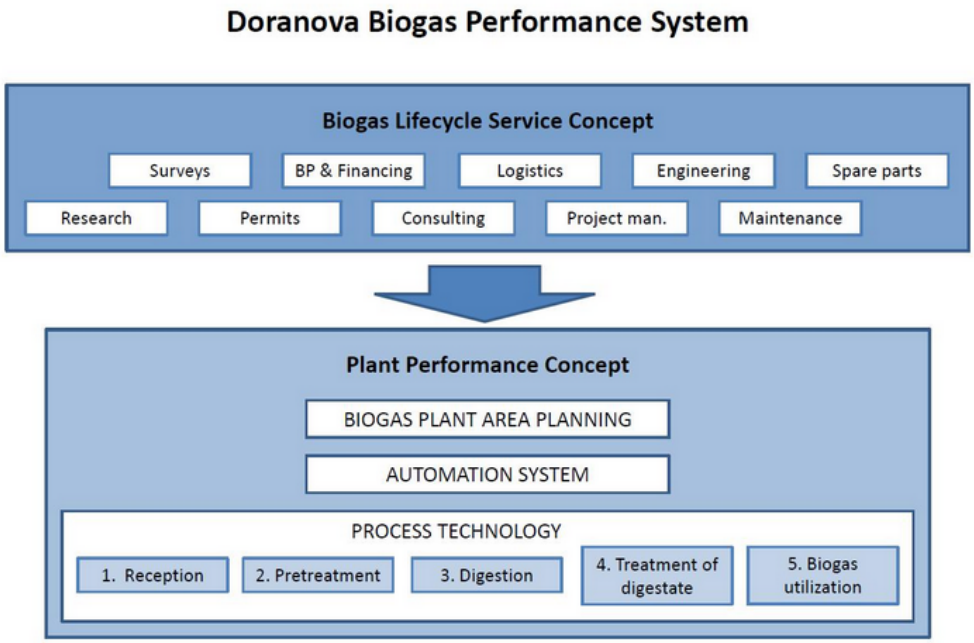


FIGURE 27. Doranova's biogas performance system (Doranova, 2014)

Doranova has an office in Estonia and some occasional projects in Russia. Working in Estonia in a period of time has prepared the company for its internationalization in other countries. However, experiences learnt from Estonia are difficult to directly apply to other parts of the world due to differences in culture, traditions and business operation environment (Laitinen, 2013).

Meneter Oy

Meneter Oy is one of the most innovative environmental and energy technology providers in Finland. It seems to be the only Finnish company which facilitated biogas plant and upgrading unit in Southern China. Pig manure is the main resource to produce biogas which is then upgraded and pressurizing into bottles. In this place, biogas is mainly utilized for heating and cooking.

FIGURE 28. Biogas reactors in Northern China (Metener Oy, 2012)

Owning over 15-year-experience in biogas production technology and biology, Metener Oy is the pioneer in field of biogas plant design, construction, automation, controlling and research. The plants are controlled by computer on site or via remote access by mobile phone or remote computer. Kalmari farm can be seen as one of the Metener's most successful stories of innovative use of biogas technology (Motiva Ltd, 2012).

FIGURE 29. The patented Metener biogas upgrading technology in Kalmari farm (Motiva Ltd, 2012)

Being one of the first farms producing biogas in Finland, it is now self-sufficient in electricity, heat and vehicle fuel.

TABLE 15. Parameters of the Kalmari biogas farm (Motiva Ltd, 2012)

Biogas reactor	Reactor volume	1000 m^3
	Cow manure	2000 m^3/year
	Confectionary by-products	200 m^3/year
	Fat	600 m^3/year
	Post-storage tank	1500 m^3
Biogas (raw)	CH_4 content	62–64 %
CHP		25 kW_{el} 50 kW_{th}
Gas boiler		80 kW_{th}
Upgrading to traffic fuel	Capacity	50 Nm^3/h of raw biogas
	Electricity consumption	1.2–1.4 kWh/kg
	Water consumption	10 liter/kg
	CH_4 content	95% ± 2%
End-products	Electricity	75 MWh/year
	Heat	150 MWh/year
	Biomethane for traffic fuel	1000 MWh/year

In 2011, excess electricity was even sold to the grid while vehicle fuel sales exceeded 1 000 MWh (Motiva Ltd, 2012).

Based on the investigation about these three companies, the external and internal analyses about the cluster of Finnish biogas enterprises are conducted. However, they are limited to a broad view.

5.2 External analysis

In this sub-chapter, Porter's Five Forces is used to facilities Finnish companies with deeper understanding about the factors affecting profitability in the Vietnamese biogas sector.

FIGURE 30. Porter's Five Forces for Finnish biogas companies

***Competitive rivalry among existing competitors:* LOW to MEDIUM**

When it comes to biogas equipment suppliers, there are only several local companies providing services of biogas digesters and also related equipment such as power generators, filters, chemicals, etc. (Swedish CENTEC Vietnam, 2012). Among identified suppliers, most of them are from the north. Several companies are located in the south while there is only one company in the central area. At present, biogas equipment catalogue consists of cook-stoves (double and single), iron cast stoves, biogas lamp, poultry heating lamp, boiler, biogas rice cooker and electricity generator. Almost all producers sell cook-stoves and lamp (AMDI, 2012). Key companies and their main product lines are summarized in the table below:

TABLE 16. Biogas equipment providers (AMDI, 2012)

Company names	Biogas cook-stoves		Iron cast stoves	Biogas lamp	Poultry Heating lamps	Boilers	Biogas rice cooker	Electricity generator
	Single	Double						
NORTHERN AREAS								
Môi Trường Xanh	P	P	P	I	I	I	I	I
Hùng Vương	P	P	P	I	I	I	I	I
Việt Trung	I	I	P	I	I	I	I	
Nam Bộ	P	P	P	I	I	I	I	I
Thanh Trúc	I	I	I	I	I	I	I	I
Nhật Long	P		P		I		I	I
SOUTHERN AREAS								
Minh Tuấn	P	P	P		P	P	P	P

- Moi Truong Xanh produces only igniters. Other parts are imported from China, and then assembled into finished products.
- Hung Vuong manufactures all components of the cook except igniters which are imported from China.
- Viet Trung is the manufacturer of almost all parts of the cook-stoves. Other components are imported from China
- Nam Bo manufactures igniters, lids and all the chassis parts. Other parts are imported from China and Malaysia.
- Nhat Long produces all parts of the cook-stoves. It is also the only company producing cast iron stove with ignition knob.
- Minh Tuan manufactures all parts of a generator. Regarding other equipment, single components are imported from South Korea. The company also assembles all equipment except the lights.

Some additional big producers of biogas composite tank encompass Quang Huy, Cam Tuan Phat, Hung Viet, etc. They also sell other related equipment and facilities for the installment, which are imported from China or bought from Viet Trung Company (AMDI, 2012).

FIGURE 31. Common biogas composite tanks in Vietnam

In addition, there have been virtually no overseas companies in local markets. Some enterprises from Germany, Japan, or USA have operated simply as suppliers of power generators, filters, chemicals etc (Swedish CENTEC Vietnam, 2012).

Regarding biogas technology providers, there is no private company offering technological services. As can conducted in the previous chapter which is about available technology of biogas production in Vietnam, almost all common technology in use at the moment are designed and developed by governmental institutes and consultant agencies. For example, KT-2 model was first designed by Can Tho University, and then upgraded by the Energy Institute. Along with KT-1 which was also improved by the EI, model KT-2 was selected for the provinces participated in the 'Biogas for animal husbandry sector in Vietnam' program. Another excellent sample is VICVINA's biogas system which is considered the second most common technology in Vietnam. It was basically developed by Vietnam Horticulture Association.

Threat of new entrants: **LOW to MEDIUM**

As mentioned earlier in the previous part, there have been so far not so many domestic as well as foreign companies doing business in the biogas energy field. They almost act as the suppliers of biogas equipment or facilities. There is a lack of innovative companies who are able to offer a comprehensive solution for biogas plants. Hence, it is obvious that Finnish companies are more advantageous than those who are currently in the market due to the fact that they possess the

most advanced technologies, closed manufacturing system, and high-quality products. However, owning to the increasing demand on bio-energy and governmental open-door policies, Finnish companies will soon have to contest with other international competitors who see Vietnam as a potential of profitability and market expansion.

Threat of substitute products: **MEDIUM to HIGH**

There are a number of substitute products of other renewable energy technologies such as solar panels, wind turbines, or small-scale hydropower plants. Mr. Nguyen Ninh Hai (2013) expressed in the in-depth interview that in spite of huge potential for biogas production, it is not the most favorable RE technology in Vietnam at the moment. It is somehow in the early nascent stage. Meanwhile, solar and wind energies are attracting more attention and investments from both domestic and foreign enterprises. On account of the geographical position, solar systems are believed to be one of the most feasible options to electrify rural areas in Vietnam. However, he added that each of RE had its own pros and cons and biogas was asserting its importance in the Vietnam's RE roadmap.

Bargaining power of suppliers: LOW to MEDIUM

As mentioned in the previous parts, most of Finnish companies concentrate on offering technological services rather than specific products. It does not mean there are no innovative product suppliers. However, their products are mostly imported from Germany where production costs are much cheaper than those in Finland. Therefore, it can be said that the power of suppliers of product components does not affect much in the Vietnamese market. In the case when Finnish companies make their decisions to do business in the target market, they can find alternative suppliers in China or Thailand to reduce the distribution costs. Although the quality of products offered by Chinese supplier is much of questionable, it remains the reasonable suggestion for Finnish enterprises.

Bargaining power of customers: MEDIUM to HIGH

Customers have power over purchasing decision of the products. In rural areas, biogas is utilized as an alternative energy in daily life and agricultural activities.

In some places, it is generated to electricity to prevent unexpected power shortage. Despite of increasing demand for bio-energy products, some challenges are identified when Finnish companies introduce their products and services to Vietnamese customers. First and foremost, due to the fact that biogas is mainly focused and utilized in rural areas where the majority of the population is poor and not well-educated, the advanced technologies, together with high-price products require time to work well. In addition, a difficulty of how to approach target customers will arise as a results of cultural differences and language barrier. The companies are expected to spend huge amount of money on marketing activities, after-sales services and maintenance cost. Hence, in order to reduce bargaining power of customers, Finnish companies are suggested to cooperate with governmental institutes and consultant agencies. This solution will be discussed later in chapter 6.

5.3 Internal analysis: SWOT analysis

In this sub-chapter, SWOT is used to analyze the internal and external factors of Finnish companies to have deeper understanding about their situation upon entering the target market. Below is the table summarizing Finnish companies' SWOT analysis:

TABLE 17. Finnish companies' SWOT analysis

Internal	**Strengths** -Good image -Innovative technologies and high-quality products	**Weaknesses** -Lack of information and experiences in Asian market -Lack of business contact -Physical distance -High price -Cultural differences, language barrier
External	**Opportunities** -Support from the government -High demand for biogas technology in Vietnamese market -Few players on the market	**Threats** -Untruthful local partners -Lack of appropriate data -Policy, regulatory and institutional barrier -Lack of economic and financial barrier

Strengths

Ms. Maarit Virtanen (2013) expressed that the strong diplomatic relationship between the two countries has laid the foundation of bilateral cooperative partnerships between Vietnamese and Finnish enterprises. In Vietnam, almost all Finnish companies are known with good images and reputations. The second biggest strength of Finnish biogas enterprises lies on its innovative solutions and product quality. As mentioned in the external analysis, almost all biogas companies operating in Vietnam only supply some specific equipment. Meanwhile, Finnish companies are able to offer a wide selection of products and services. It means most of enterprises in Finland can support their customers from a very early stage of designing biogas according to their needs until installation and maintenance. In addition, the plants can be controlled by computer or mobile phone. Doranova's biogas performance system which was mentioned above can

be seen as an excellent example. The picture below illustrated a commonly closed system in a biogas plant offered by western companies:

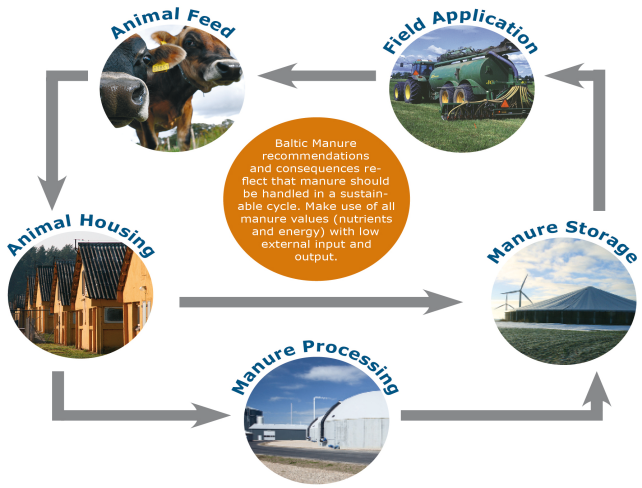


FIGURE 32. Biogas plant system provided by enterprises in Baltic Sea region (BE sustainable, 2013)

When it comes to the technology, although biogas upgrading and CHP model have been applied worldwide for a long time, they are quite unfamiliar with Vietnam. In this country, biogas is simply utilized for cooking, lighting or heating, while biogas in Finland is upgraded and pressurized into bottles for further use. In this western country, biogas is commonly seen as transport fuel or generated to electricity. In general, opportunities for Finnish biogas technology providers are promising.

Weaknesses

The most important weakness for not only Finnish companies but also other overseas enterprises when entering Vietnam is the lack of knowledge and experiences with domestic market. At the moment, not so much Finnish companies in field of biogas production has so far had contact with the this emerging market. Through author's observation, almost all Finnish companies' international markets are limited to Baltic Sea Region and some provinces of Russia. In Asia, besides biogas plant in the Northern China installed by the Metener Oy, Econect Group is becoming familiar with Vietnamese market by participating in Backan Town. Began on the middle of 2013, however, the project is about water and wastewater treatment (Econect Group, 2013).

Secondly, products and services offered by Finnish companies are unaffordable for people living in rural areas. At the moment, the majority of the farms and families using biogas digester tanks have received support from government and other NGOs. Therefore, it is very difficult for them to afford high quality products or services from Finnish providers. Physical distance between the two markets is foreseen as one of the main reasons to boost the price. In addition, low education level will restrain people in these rural areas from approaching Finnish advanced technologies.

Last but not least, cultural differences and language barriers will cause the companies trouble when introducing their products and services into the new market. Particularly, without translators, physical contacts with end-users, the farmers, seem to be impossible.

Opportunities

In spite of large demand for biogas technology in Vietnam, it is limited to no competent player in the market. Heinze & Zwebe (2012) thus suggest some of biogas technology opportunities for potential foreign investors:

- Landfill gas
- Low-cost biogas technologies
- Downstream equipment for biogas treatment, usage, etc.
- Household biogas involvement
- Etc.

The companies providing biogas equipment and technology in Vietnamese market have received supports from both Finnish and domestic government. However, what they can benefit will be evoked and discussed later in chapter 6.

Threats

Every foreign company entering new market has to bear a certain number of threats. All experts in biogas energy field believe that the first and foremost barrier for Finnish companies is to find a trustful local partner. With no experience in the target market, the local partner plays the most important role in

Finnish companies' success in the foreign market. Secondly, Finnish companies have to face a threat coming from Vietnamese administrative system which is reported with high rates of bribery, bureaucracy, and corruption. When discussing about legal framework, Mr. Nguyen Hai Ninh (2013) agreed that foreign enterprises would have to challenge with incoherent policies and incentives for clean energy development. There are some certain unexpected changes in law that have not yet mentioned or updated officially. The next threat is that foreign companies have to deal with how to find accurate source of data. In the email exchange with the author, Mr. Dao Xuan Hoc, Former Deputy Minister of Agriculture and Rural Development, stated that Vietnam's general statistics system is sadly ineffective, causing a lot of difficulties in collecting data. In reality, some of Vietnamese big biogas equipment suppliers even do not have their own websites. Last but not least, although the commercial loan interest in Vietnam is relatively high with the possibility of over 20 percent a year, investors report a lack of information about creditors who provide funding for RE projects. Even when they know, it is difficult for them to acquire loans from financiers (Nguyen C. D., 2011).

6 MARKET ENTRY

The research is built under the form of a market entry plan. However, due to the fact that most of Finnish biogas companies act as providers of technologies and services, entry modes play the dominant role. In this chapter, the distribution channel, pricing strategies and customer segmentation are not taken into account. Besides suggested entry modes, the author concentrates on clarifying the investment conditions in Vietnam, the main stakeholders in the biogas market, along with support tools from Finland.

6.1 Suggested entry modes

The Law on Foreign Investment adopted by the Vietnamese government suggests three approaches for foreign investors to enter the Vietnamese market, including:

- Business cooperation on the basis of a business cooperation contract,
- Joint venture enterprise, and
- Enterprise with 100 percent foreign owned capital.

As mentioned in the previous parts, almost all Finnish biogas enterprises see Vietnam as an unfamiliar market. Hence, the form of wholly foreign-owned enterprise is not touched upon at the moment, or at least not at the very early stage of the internationalization process. Based on Vietnamese investment conditions and the companies' actual situation presently, some entry modes are given and combined to propose four recommendations.

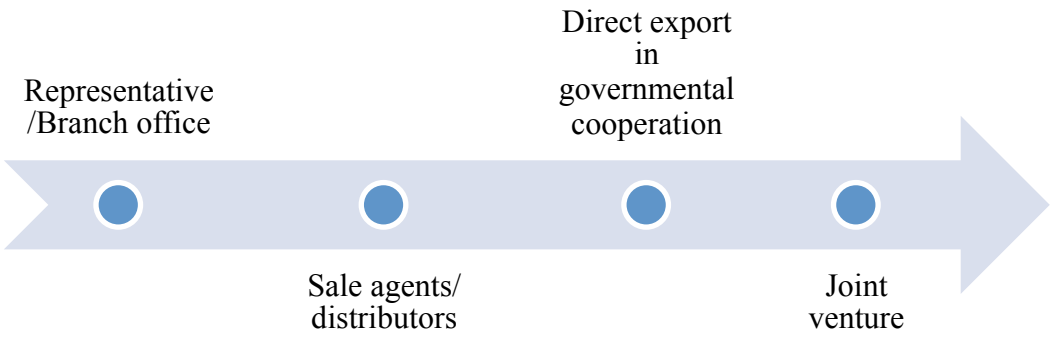


Figure 33. Suggested entry modes

Recommendation 1: Establishing a representative office/ branch office

Aside from establishing a private limited company, a representative office or brand office is the first and foremost alternative recommended option.

Prior to the actual trading activities in Vietnam, Finnish companies are advised to take time for deep understanding about the target market. Hence, at the early stage of entry plan, representative office is the most feasible solution. Being one of the fastest and most cost-effective ways to create a presence in a new market, Finnish companies can do market research, marketing plan, as well as promotion activities legally. It is also able to seek for business opportunities and make agreements in some business contracts on behalf of the parent company in Finland. Furthermore, this representative office can participate in some trade fair for environmentally friendly products, services and technologies; or open showrooms to introduce its innovations to Vietnamese clients.

A representative office possesses attractive advantages to be considered as a promising entry mode. First of all, its license is one of the easiest licenses to be obtained, being valid for five years and able to extend (VietnamBriefing, 2013). Secondly, a minimum amount of capital to run a representative office is not required. Most importantly, it is exempt from corporate tax auditing requirement. However, the representative office's direct business engagement with local companies is limited. In other words, revenue generating activities are strictly prohibited.

Regarding a branch office, unlike representative office, it is allowed to conduct a much broader range of activities. That means Finnish companies able to engage in revenue generating activities such as purchases and sales of goods. As a consequence, this brand office is fully liable for Vietnamese taxes on its assets and activities. The license duration of brand office is the same with representative office, but the time of legal procedure is a little bit longer.

Recommendation 2: Cooperate with government institutions and NGOs

Generally speaking, in Vietnam, biogas has not attracted much attention from private investment compared to wind or solar technologies (Nguyen H. N. ,2013).

Almost all important biogas projects in Vietnam are under partnership between governmental institutions and foreign organizations. Mr. Nguyen Ninh Hai expressed in an interview that Vietnamese government welcomes all cooperative opportunities with Finnish enterprises in field of either technological exchange or business collaboration. He concurrently asked for a list of Finnish biogas companies which consider Vietnam as a potential market, along with their innovative technologies and products. Hence, according to this in-depth interview, the author believes that for Finnish biogas providers of technology and services, the partnership with Vietnam's governmental organizations and other NGOs is the most feasible.

First and foremost, the companies can make contact directly with some of the governmental organizations which are responsible for on-going biogas projects such as MARD, MONRE, MoIT or MOC to introduce their products. Or they can use CONNECT project as an intermediate. Mr. Laitinen (2013) thought that finding university partners would be a wise idea for the project leaders. With the enthusiasm for a cooperative relationship with new innovative partner, it is believed that Finnish companies will gain some certain achievements. The prospective relationship between Finnish companies, CONNECT and Vietnamese government is designed as the following figure:

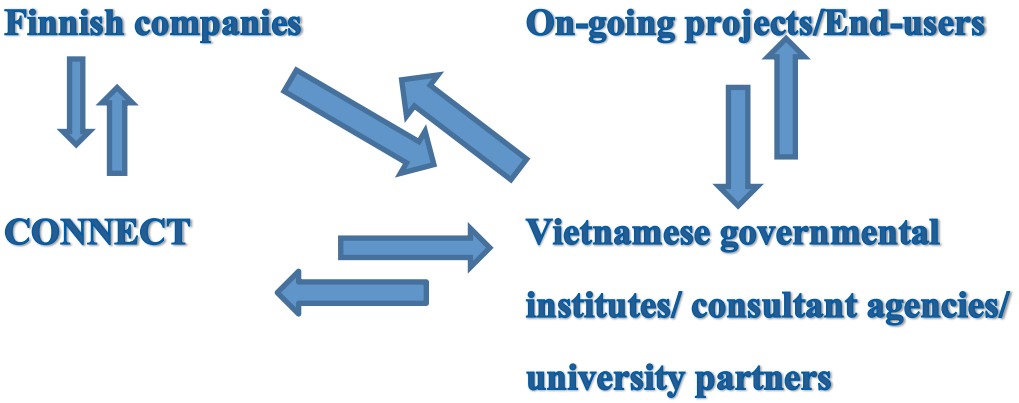


FIGURE 34. Cooperation between Finnish enterprises and Vietnamese government

Secondly, Finnish companies can be engaged in the project ***'Biogas expansion under the Low carbon agricultural support project'.*** As mentioned above, NFD, the joint development finance institution of the five Nordic countries, is one of the main stakeholders involved in the project. Therefore, it is easier for Finnish companies to approach the target market through this prestigious organization. Otherwise, Finnish companies can create a link between themselves and The Netherland's organizations which play the key role in the project ***'Biogas program for the animal husbandry sector'*** or ADB for instance.

Recommendation 3: Using sales agent/ distributor

When being asked about the suitable market entry mode for Finnish companies to penetrate Vietnamese market, Ms. Virtanen (2014) gave the answer of local partners. Mr. Laitinen (2013) also stated that Doranova was willing to internationalizing if they could find a motivated partner in the target market. Thus, one more possible solution is using sale agent or distributor with whom Finnish companies agree in advance on a set commission. The agent and distributor may be either a domestic or foreign one. This entry mode is recommended for Finnish providers of biogas equipment and facilities.

The sale is basically accomplished between the parent companies in Finland and local buyers in Vietnam. The sale agent only has responsibilities in some specific filed such as: market intelligence, identifying sales leads, pursuit of sales leads, sales promotions, sales closing, product warranty and after-sales services, etc (Global Trade, 2011). The specific responsibilities of sale agent in Vietnam depend on the bilateral agreement between the two parties. According to the Law on Trade approved by Vietnamese government, foreign suppliers have the right to appoint sale agent, however, the scope of business and involved activities have to be registered. In addition, they have to bear the risk of non-payment caused by their agent's activities.

Under a distributorship arrangement, there is more transparency in legal protection and recourse. Due to the fact that the biogas equipment are imported directly from Finland for resale in the Vietnamese market, sale distributors thus are fully liable for the amount of the goods purchased. In some typical situations

that the local buyer wants to purchase directly from the foreign suppliers, sale distributor also acts as an agent. It usually occurs in the case of high-value contract (Global Trade, 2011).

An agent or a distributorship arrangement is a good way to avoid the complicated and unclear administrative process in Vietnam. According to CONNECT (2013), this mode of entry is also being used successfully by many Finnish companies operating in Vietnam. However, parent companies in Finland may confront with trouble in controlling the direct relationship with clients in Vietnam.

Recommendation 4: Joint venture establishment

When Finnish companies have foothold in the market, it is recommended to choose joint venture as a market entry mode to make more investment, earn more profits and reinforce their presence in the target market. Joint venture can be through transferring of technology, building new manufacturing facilities, or owning some kinds of equity. Inevitably, how to find a truthful local partner is set as the priority.

6.2 Main stakeholders

'He who sees through life and death will meet most successes'-Idiom

One of the most crucial keys to success for Finnish companies in the target market is to know who the main stakeholders present in the business battle are. Stakeholders are basically divided into four groups:

- **Institutional agencies**. These institutes is currently managing and developing almost all important biogas projects. Besides, they sometimes act as the authorities which provide incentives and supports for enterprises operating in field of RE and environmental protection
- **Donors and financial institutes.** Being the second most important stakeholders, they are currently providing a huge amount of money for biogas projects in Vietnam
- **Domestic suppliers of biogas equipment and composite tank**

- **R&D and consultants.** This category is comprised of several universities which have their own research on biogas technology, or be involved in important biogas projects.

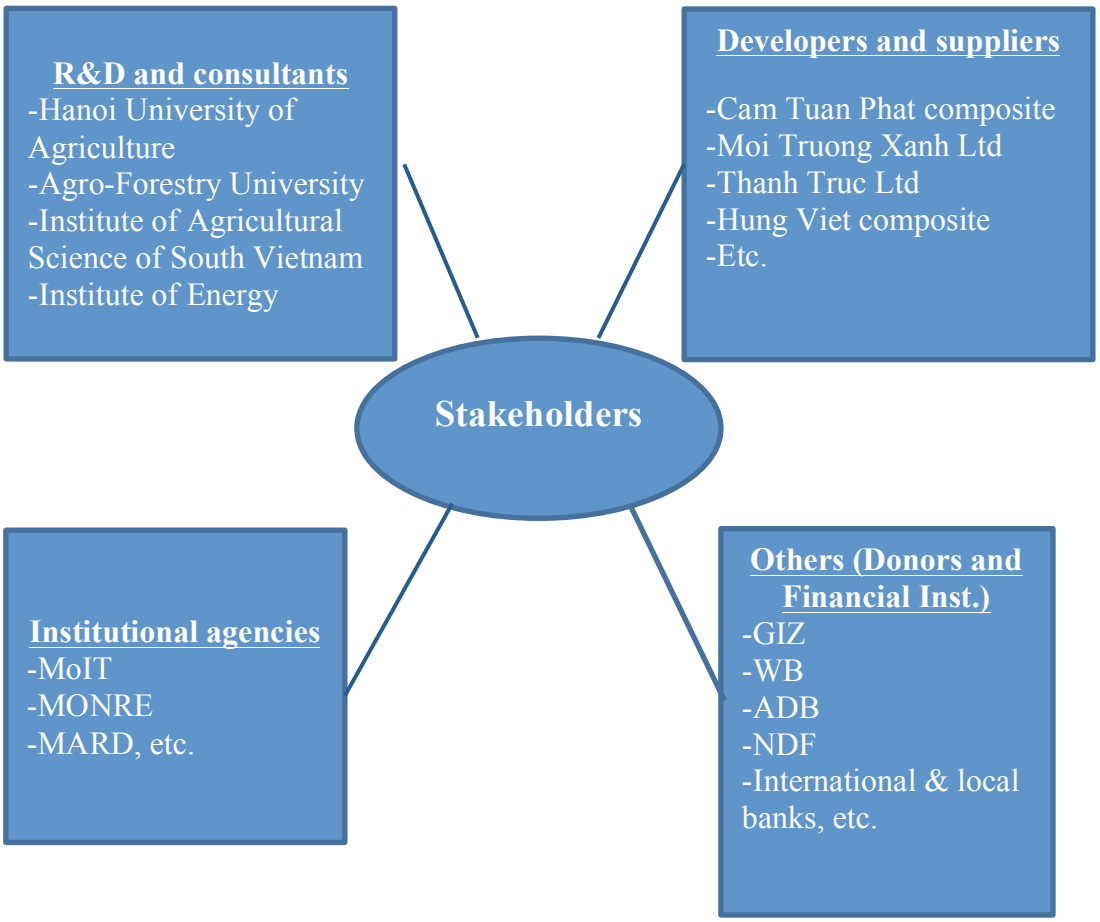


FIGURE 35. Main stakeholders

6.3 Investment condition in Vietnam

Finnish biogas enterprises can profit from a number of incentives offered by the Vietnamese government. Beyond specific targets for renewable energy production, how to create a favorable investment condition for investors is taken in to account. Circular 230/2009/TT-BTC approved by the Ministry of Finance on December8, 2009 is one of the most important references for organizations and individuals investing on environmental protection activities. This document is the guidance of Decree 04/2009/ND-CP dated 14/01/2009, which was mentioned above. The main fiscal and financial incentives include:

Enterprise income tax incentives:

- The income tax rate of 10 percent is applied for enterprises implementing environmental protection investment projects
- Newly-founded environmental protection enterprises in special difficult geographic areas are exempted from income tax in a 4 year period, from the first profit making year. A tax reduction of 50 percent is then followed. However, it varies from 5 to 9 years, depending on how difficult the area is.

Value-added tax incentives

Imported environmental protection machinery and equipment which is used in scientific research and technological development and yet to be manufactured in Vietnam are not subject to value-added tax. However, Finnish enterprises have to prove whether the product is qualified for exemption.

7 CONCLUSION AND SUGGESTION FOR FUTURE STUDIES

This chapter is divided into three sub-chapters in compliance with two main objectives. The first one briefly synthetizes answers to all the research sub-questions at the beginning of the thesis. In the second sub-part, the author assesses the reliability and validity of the research. Some recommendations are put forward and further research is suggested finally.

7.1 Main findings

In the table below, the main research question and other sub-research questions are evoked, and the main findings are summarized:

TABLE 18. Main findings

Research question	***Research findings***
Is Vietnam a promising market for Finnish companies Company to expand its internationalization?	
How does the Vietnamese biogas market function?	-High potential but not fully tapped -No competent players
What are potentials for biogas production?	-Development of animal husbandry sector -Increasing demand on energy security, RE capacity -Support from government for environmental protection activities
What are the obstacles for foreign companies to do business in the Vietnamese market?	-Complexity and slowness of administrative procedure -Unclear legal framework -Lack of concrete incentives and support from the government -Cultural differences and language barrier
What are Finnish companies' core competences? How innovative its	-Innovative, high-quality services and

products are when being compared to current ones in the market?	products -Biogas upgrading, CPH model
How Finnish companies can successfully find its way to enter the target market?	
Who are the main players and the most important stakeholders in the market?	-Government institutes: MoIT, MONRE, MARD, etc. -R&D and consultancies -Donors and financial institutes -Domestic suppliers
What are the favorable investment conditions in Vietnam	-Corporate income tax incentives -VAT incentives
How do the biogas on-going projects function?	-On-going projects: • Biogas program for the animal husbandry sector • Quality and Safety Enhancement of Agriculture Products and Biogas Development Project • Livestock Competitiveness and Food Safety projects • Biogas expansion under the Low carbon agricultural support -Partnerships between Vietnamese governmental institutional agencies and foreign NGOs
What is the most appropriate entry mode?	-Representative/ Branch Office -In cooperation with Vietnamese government -Sales agent/ distributor -Joint venture

It can be said that Vietnam is a promising market for Finnish enterprises which are judged as the masters in the field of biogas technology and services. Although Vietnam is favorable with plenty of agricultural and animals wastes, and residuals,

the potentials are poorly tapped. At present, there is no competent player in the promising market. Along with the increasing demand of renewable energy in the future, Vietnam will soon be the investment destination of many foreign biogas companies in the future. In order to attract more enterprises providing environmental friendly products and services, there are a number of incentives offered by Vietnamese government.

In spite of a promising international market, there are still some existing obstacles hindering the market potential such as the complexity and slowness of administrative procedure or unclear legal framework. Furthermore, the cultural differences and language barriers will cause Finnish companies a lot of trouble when penetrating the market.

By analyzing and synthesizing a number of multidimensional information sources, it is concluded that it is the time for Finnish companies to consider seriously about expansion to Vietnam. Four suggested market entry modes are then made. However, it is wiser to approach other studies before the final decision is made.

7.2 Proposals for future studies

This study aims at giving Finnish companies an extensive view of the potential of the Vietnamese biogas market with a main focus on animal wastes. Further research should be carried out in order to create a comprehensive plan to penetrate into the target market. Some recommendations for further research are as follows:

- Exploring biogas opportunities with main focus on municipal waste or industrial waste, for example, waste from treatment processes in special food, foodstuff, and beverage industries
- Electricity generated from biogas
- Business opportunities for biogas technology providers at the industrial scale

7.3 Validity and reliability

In order to make the thesis sound, it must be free of bias and distortion. Validity and reliability are thus crucial concepts that contribute to the research's accururacy. In the empirical parts, the background of the Vietnamese biogas sector is mostly collected from an interview with Mr. Nguyen Ninh Hai. The results of the interview are consistent with the author's observation which is obtained from updated secondary sources including books, reports, articles, academic journals, earlier studies and other electronic sources. When it comes to Finnish biogas enterprises, almost all data is researched, analyzed and summed up based on the in-depth interview with Ms. Maarit Virtanen. The interview with Doranova, which was made by Ms. Virtanen on July 27, 2013, equips the author with common technologies in Finland at the moment, along with their prospective view in the international markets. Therefore, it can be said that the research is a highly reliable and valid secondary reference for Finnish biogas enterprises which aim to expand internationally to Vietnam.

8 SUMMARY

The thesis is designed to assist Finnish companies which provide biogas technologies or equipment in their decision whether to enter the Vietnamese market. An introduction of the research background, research question and objectives are given along with the research methods, scope and limitations, and thesis structure.

The research is divided into two parts: theoretical framework and empirical examination.

The theoretical content is collectively presented in chapter 2. Due to the research nature of a market entry plan, no specific field of knowledge is touched upon. Only some important analyzing tools and market entry modes are taken into account.

In the empirical part, analyzing tools are applied in practice. This part covers two main objectives in compliance with four chapters. Chapter 3 and 4 concentrate on revealing the potential of the Vietnamese biogas market with the focus on animal excrement. In these chapters, common technologies and on-going projects are among the most vital issues. Chapter 5 demonstrates the main functions and competences of Finnish enterprises. The three most outstanding companies are analyzed to generalize the broader view of Finnish biogas industry. Most importantly, the main domestic suppliers of biogas equipment are inspected. Last but not least, four recommendations of market entry modes are made. Among these, using representative or branch office, along with partnership with the Vietnamese government are the most feasible for companies which are going to make a decision of internationalization in the near future.

In conclusion, the thesis shows a certain number of promising opportunities for Finnish companies in the Vietnamese biogas market. However, there are still some existing obstacles hindering the market potential. From the author's perspective, this thesis should be considered as a secondary reference. Some further studies should be carried out before a final decision is made.

REFERENCES

Published References

Business Research Methods. (2008). Copenhagen: Ventus Publishing ApS.

Allen, M. (2001). *Analysing the Organisational Environment.* Select Knowledge Limited.

Anthony Ba, S. (2011). *"P.E.S.T.L.E" REPORT ON VIET NAM 2011.* Alberto Hurtado Center.

BMI. (2014). *Vietnam Information Technology Report Q1 14.* London: Business Monitor International Ltd.

Cherunilam, F. (2010). *International Business: Text and cases.* New Delhi: PHI Learning Private Limited.

Creswell, J. (2003). *Research Design: Qualitative, Quantitative, Mixed Methods Approaches.* Saga Publications,Inc.

Datamonitor. (2011, August). *Pestle Vietnam*. Datamonitor.

Do, M. T. (2011). *Analysis of future energy pathways for Vietnam.* Sydney: University of Technology, Sydney.

F.Hyde, K. (2000). Recognising deductive processes in qualitative research. *Qualitative market research: An international journal*, 80.

Greener, S. (2008). *Business Research Methods.* Ventus Publishing ApS.

Hartline, M., & Ferrell, O. C. (2012). *Marketing Strategy.* Cengage Learning.

Heinze, C., & Zwebe, I. (2012). *Biomass Business Oppotunities Vietnam.* NL Agency.

Henry, A. (2008). *Understanding strategic management.* New York: Oxford University Press Inc.

Hollensen, S. (2007). *Global Marketing: A Decision-oriented Approach.* Essex: Pearson Education Limited.

Johnson, B., & Christensen, L. (2008). *Educational Research: Quantitative, Qualitative, and Mixed Approaches.* California: SAGE Publications.

Kachru, U. (2005). *Strategic Management: Concepts and Cases.* New Delhi: Excel Books India.

Luiki, P. (2010). *Joint Ventures in the International Arena.* Chicago: American Bar Association.

Mangaliso, M. P., & Lewis, A. O. (2012). *Making Strategic Management Research Relevant to Emerging Market Countries.* Bingley: Emerald Group Publishing Limited.

Moller, H., M.Nielsen, A., Murto, M., Christensson, K., Rintala, J., Svensson, M., et al. (2008). *Manure and Energy Crops for Biogas Production: Status and Barriers.* Denmark: Nordic Council of Ministers.

Nguyen, C. D. (2011). *Exploring biogas market opportunities in Vietnam.* Berlin: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Nguyen, T. D. (2014). *Vietnam at a glance.* Hong Kong: The Hongkong and Shanghai Banking Corporation Limited.

Office, S., & Murray-Webster, R. (2010). *Management of risk: guidance for practitioners.* The Stationnery Office.

Orcullo, N. (2008). *Fundamentals of Strategic Management' 2007 Ed.* Rex Bookstore, Inc.

Paley, N. (2005). *Manager's Guide to Competitive Marketing Strategies.* London: Thorogood.

Peng, M. (2010). *Global Business.* Mason: Cengage Learning.

Punch, K. F. (2013). *Introduction to Social Research: Quantitatie and Qualitative Approaches.* London: Sage Publications.

Saunders, M., Lewis, P., & Thornhill, A. (2007). *Research Methods for Business Students.* Harlow: Prentice Hall, Pearson Education.

Sevilla, C. G., Ochave, J. A., Punsalan, T. G., Regala, B. P., & Uriarte, G. G. (1992). *Research Methods.* Philippine: Rex Printing Company.

Singh, N. (2012). *Localization Strategies for Global E-Business* . New York: Cambridge University Press.

Stanton, Emms, & Sia . (2011). *Vietnam Livestock Genetics: A review of the Market and Opportunities for Canadian Livestock Genetics Exporters.* Singapore: Agriculture and Agri-Food Canada.

Thompson, J. A., & Strickland, I. A. (2001). *Strategic Management: Concepts and Cases.* McGraw-Hill School Education Group.

World Bank. (2013). *Doing Business 2014: Understanding Regulations for Small and Medium-Size Enterprises.* The World Bank.

Electronic sources

ADB. (13. December 2012). *ADB-Funded Biogas Plants to Tackle Viet Nam's Growing Rural Waste Threat*. Retrieved 25. March 2014, from Asian Development Bank: http://www.adb.org/news/viet-nam/adb-funded-biogas-plants-tackle-viet-nams-growing-rural-waste-threat

ADB. (2013). *Economy Vietnam*. Retrieved 20. March 2014, from Asian Development Bank: http://www.adb.org/countries/viet-nam/economy

Akvpedia. (26. September 2013). *Upflow Anaerobic Sludge Blanket Reactor.* Retrieved 21. March 2014 From akavopedia.org: http://akvopedia.org/wiki/Upflow_Anaerobic_Sludge_Blanket_Reactor

AmCham Vietnam. (27. September 2011). *Vietnam's electric power shift*. Retrieved 14. March 2014, from American Chamber of Commerce

Vietnam: http://www.amchamvietnam.com/4908/vietnam-s-electric-power-shift/

AMDI. (12 2012). *BÁO CÁO :KHẢO SÁT THIẾT BỊ SỬ DỤNG KHÍ SINH HỌC.* Retrieved 29. March 2014, from Biogas Program for the animal husbandry sector in Vietnam: http://www.biogas.org.vn/vietnam/getattachment/Thu-vien-phim,-anh/An-pham/%C4%90ieu-tra-su-dung-thiet-bi-su-dung-Khi-sinh-hoc-201/Khao-sat-thiet-bi-su-dung-KSH-VN-2012.pdf.aspx

An, K. (1. March 2013). *Nang luong xanh*. Retrieved 24. February 2014 from Petrotimes: http://petrotimes.vn/news/vn/nang-luong-xanh/tiem-nang-khi-sinh-hoc-chua-duoc-tan-dung.html

Argowiki. (28. Januray 2013). *SWOT analysis*. Retrieved 28. March 2014, from Argowiki: http://www.argowiki.com/index.php?title=SWOT_analysis

Bayar, T. (22. July 2013). *Finland looks to the future of Bioenergy*. Retrieved 30. March 2014, from Renewable Energy World: http://www.renewableenergyworld.com/rea/news/article/2013/07/finland-looks-to-the-future-of-bioenergy

BE sustainable. (2. December 2013). *Biogas potentials in the Baltic Sea Region*. Retrieved 30. March 2014, from BE sustainable: http://www.besustainablemagazine.com/cms2/biogas-potentials-in-the-baltic-sea-region-2/

Biogas Programme in Vietnam (2014). *Project Overview*. Retrieved 24. March 2014 from Biogas program for the animal husbandry sector in Vietnam: http://www.biogas.org.vn/english/Gioi-thieu-du-an.aspx

Biovakka. (2014). *Bovakka overview.* Retrieved 30. March 2014 from Biovakka: http://biovakka.fi/en

Bloomberg News. (23. December 2013). *Vietnam GDP Rises 5.42% in 2013; Estimate 5.3% Gain.* Retrieved 20. March 2014 from Bloomberg News: http://www.bloomberg.com/news/2013-12-23/vietnam-gdp-rises-5-42-in-2013-estimate-5-3-gain.html

BloombergNews. (7. January 2014). *Vietnam Raises Foreign Bank Ownership Caps to Aid System*. Retrieved 20. March 2014, from Bloomberg News: http://www.bloomberg.com/news/2014-01-07/vietnam-raises-foreign-bank-ownership-limits-to-bolster-system.html

Bockel, L. (2011). *EASYPol.* Retrieved 6. Octorber 2013, from Food and argiculture organization of the United Nations: http://www.fao.org/fileadmin/templates/ex_act/pdf/case_studies/draft_aout 2012-clear.pdf

Bui, C. V. (21. December 2012). *Some results on development of covered lagoons (medium biogas plants) in Vietnam.* Retrieved 21. March 2014, from http://www.biogas.cn/UpLoadEditor/file/20121221/20121221171507_157 5.pdf

Burney, S. (6. March 2008). *Inductive-Deductive research approach.* Retrieved 24. February 2014, from www.drburney.net: http://www.drburney.net/INDUCTIVE%20&%20DEDUCTIVE%20RESE ARCH%20APPROACH%2006032008.pdf

Chi, M. (12. December 2013). *Seven forecasts for Vietnam's economy in 2014*. Retrieved 20. March 2014, from Vietnamnet English version: http://english.vietnamnet.vn/fms/special-reports/91248/seven-forecasts-for-vietnam-s-economy-in-2014.html

CIA. (2014). *Vietnam*. Retrieved 19. January 2014, from The World Factbook: https://www.cia.gov/library/publications/the-world-factbook/geos/vm.html

CONNECT. (2013). *Vietnam Fact Sheet.* Retrieved 13. March 2014, from Laurea University of Applied Scicens: http://www.laurea.fi/en/connect/results/Documents/Vietnam%20Fact%20 Sheet.pdf

Converse Energy Future. (2014). *Advantages and disadvantages of biogas*. Retrieved 13. March 2014, from Converse Energy Future: http://www.conserve-energy-future.com/advantages-and-disadvantages-of-biogas.php

Dang, D. (23. December 2008). *Market Economy with Socialist Orientation in Vietnam and the Concept of the Social and Ecological Market Economy*. Retrieved 18. January 2014, from giz.de: http://www2.gtz.de/wbf/4tDx9kw63gma/3_08_Le%20Dang.pdf

Do, T. K. (2011). *Overview of Biogas Technology in Vietnam.* Retrieved 21. March 2014, from Global Methane: https://www.globalmethane.org/expo-docs/china07/postexpo/ag_vietnam.pdf

Doranova. (2014). *Business from biogas*. Retrieved 30. March 2014, from Doranova Oy: http://www.doranova.fi/index.php/en/products-and-services/renewable-energy/biogas

Duiker, W. J. (19. November 2013). *Agriculture,forestry and fishing in Vietnam*. Retrieved 26. February 2014, from Global Encyclopaedia Britannica : http://global.britannica.com/EBchecked/topic/628349/Vietnam/52704/Agriculture-forestry-and-fishing

Eco Village. (5. January 2012). *Advantages and Disadvantages of Biogas*. Retrieved 13. March 2014, from Govardhan Eco Village: http://www.ecovillage.org.in/ecopedia/alternate-energy/advantages-and-disadvantages-of-biogas/

Econect Group. (2013). *Water and wastewater treatment project started in Backan town, Vietnam*. Retrieved 30. March 2014, from Econect Group: http://www.econetgroup.fi/news21

Economist. (2014). *Country: Vietnam*. Retrieved 20. March 2014, from The Economist-Intelligence: http://country.eiu.com/Vietnam

Economist. (ei pvm). *Vietnam Economy: Long-term outlook*. Retrieved 20. March 2014, from The Economist-Intelligence Unit: http://country.eiu.com/article.aspx?articleid=1850996369&Country=Vietnam&topic=Economy&subtopic=Long-term+outlook&subsubtopic=Summary

Economist, T. (27. July 2011). *Global Livestock Counts*. Retrieved 26. February 2014, from The Economist: http://www.economist.com/blogs/dailychart/2011/07/global-livestock-counts

EEP Mekong. (2009). *Energy and Environment Partnership with the Mekong Region*. Retrieved 27. March 2014, from EEP Mekong at a glance: http://www.eepmekong.org/about_us/eep_overview.php?reload

EEP Mekong. (2011). *Market introduction of the medium-scale plug-flow biogas digester in Vietnam.* Retrieved 27. March 2014, from Energy and Environment Partnership with the Mekong Region: http://www.eepmekong.org/eep_projects/EEPflyers/2ndCall/2-V-061_SNV.pdf

EEP Mekong. (2012). *Optimization of Household Composite Biogas Project (OHCB).* Retrieved 27. March 2014, from Energy and Environment Partnership with the Mekong Region: http://www.eepmekong.org/eep_projects/EEPflyers/2ndCall/2-V-010_SEDDC.pdf

Embassy of Finland, Hanoi. (7. April 2013). *Finland and Vietnam*. Retrieved 17. March 2014, from Embassy of Finland, Hanoi: http://www.finland.org.vn/public/default.aspx?nodeid=35321&contentlan=2&culture=en-US

EnDev. (2014). *Vietnam*. Retrieved 16. March 2014, from EnDev: http://endev.info/content/Vietnam

Energy For All. (8. March 2013). *Vietnam Biogas Programme receives 1st voluntary gold standard project*. Retrieved 27. March 2014, from Energy for all: http://www.energyforall.info/vietnam-biogas-programme-receives-1st-voluntary-gold-standard-project/

Energypedia. (9. January 2014). *Vietnam Energy Situation*. Retrieved 26. February 2014, from Energypedia: https://energypedia.info/wiki/Vietnam_Energy_Situation

Finnish Biogas Association. (2013). *Finnish Biogas Association Overview.* Retrieved 29. March 2014, from Finnish Biogas Assiciation: http://www.biokaasuyhdistys.net/index.php?option=com_content&view=section&layout=blog&id=13&Itemid=102

FinPro. (2011). *Vietnam country profile*. Retrieved 17. March 2014, from FinPro: http://www.finpro.fi/maaprofiilit/vietnam#c

Formin Finland. (15. April 2013). *Publication: Country Strategy for Development Cooperation with Vietnam 2013–2016.* Retrieved 17. March 2014, from Ministry for foreign affairs of Finland: http://formin.finland.fi/public/default.aspx?contentid=274544&nodeid=15452&contentlan=2&culture=en-US

GIZ. (2011). *Biogas*. Retrieved 26. February 2014, from GIZ Renewable Energy Project: http://www.renewableenergy.org.vn/index.php?page=biogas

Global Trade. (4. March 2011). *Using an Agent or Distributor in Vietnam*. Retrieved 24. March 2014, from Global Trade: http://www.globaltrade.net/f/business/text/Vietnam/Selling-Sales-Representitive-Office-Using-an-Agent-or-Distributor-in-Vietnam.html

GSO. (2014). *Số lượng gia súc và gia cầm tại thời điểm 1/10 hàng năm.* Retrieved 10. March 2014, from General Statistics Office Vietnam: http://www.gso.gov.vn/default.aspx?tabid=390&idmid=3&ItemID=13907

Harjani, A. (23. December 2013). *The emerging market to watch in 2014*. Retrieved 20. March 2014, from CNBC: http://www.cnbc.com/id/101294392

Heritage Foundation. (2014). *Vietnam*. Retrieved 17. March 2014, from The Heritage Foundation: http://www.heritage.org/index/country/vietnam

Hoang, A. P. (2012). *Vietnam Feed Industry.* Retrieved 21. February 2014, from Switzerland Global Enterprise: http://www.s-ge.com/en/filefield-private/files/41388/field_blog_public_files/8181

IIPA. (7. February 2014). *Country reports-Vietnam.* Retrieved 27. February 2014, from INTERNATIONAL INTELLECTUAL PROPERTY ALLIANCE: http://www.iipa.com/rbc/2014/2014SPEC301VIETNAM.PDF

Koch, A. (2000). *SWOT does not need to be recalled: It needs to be enhanced.* Retrieved 25. March 2014, from Swineburne University of Technology: http://www.westga.edu/~bquest/2000/swot1.html

Lampinen, A. (9. Octorber 2012). *Biogas in Finland – Present situation, experiences, future-potentials to increase the biogas production and consumption.* Retrieved 27. March 2014, from WSP Group: http://www.wspgroup.com/upload/documents/Finland/2012/Biogassys/04_Lampinen_Biogassys_Helsinki091012.pdf

Lampinen, A.;& Rauhala, A.-M. (2013). *Finnish Biogas Industry Catalogue 2013.* Retrieved 29. March 2014, from Biokaasuyhdisys: http://www.biokaasuyhdistys.net/media/Finnish_Biogas_Industry_Catalogue_2013.pdf

Le, A. (2. January 2013). *Tin nổi bật*. Retrieved 24. February 2014, from Tietkiemnangluong.com.vn: http://www.tietkiemnangluong.com.vn/home/tin-noi-bat/viet-nam-co-tiem-nang-lon-ve-khi-sinh-hoc-1-14446.html

Lehtonen, J. (2010). *A cleaner environment for future generations*. Retrieved 20. March 2014, from HighTech Finland: http://www.hightechfinland.com/direct.aspx?area=htf&prm1=843&prm2=article

Mayer Brown. (1. September 2011). *Vietnam Power Development Plan for the 2011-2020 Period*. Retrieved 12. March 2014, from Mayer Brown JSM: http://www.mayerbrown.com/files/Publication/7eb02f45-1783-4f14-8565-bf5120e1ea08/Presentation/PublicationAttachment/5dcbbea1-2d9f-42ae-8cbd-dab97456c4c5/11556.pdf

Metener Oy. (2012). *References: Northern China*. Retrieved 30. March 2014, from Metener Ltd: http://en.metener.fi/16

Motiva Ltd. (2012). *Success story Kalmari.* Retrieved 30. March 2014, from Motiva: http://www.motiva.fi/files/7682/success-story-kalmari2012.pdf

NDF. (7. March 2013). *Biogas Expansion under the Low Carbon Agricultural Support Project [NDF C53]*. Retrieved 26. March 2014, from Nordic Development Fund: http://www.ndf.fi/node/144

Ngoc, K. (9. December 2013). *Vietnam, Finland Boosting Business Cooperation*. Retrieved 17. March 2014, from Vietnam Chamber of Commerce and Industry News: http://vccinews.com/news_detail.asp?news_id=29727

Nguyen, C. D. (2. May 2012). *Tổng quan về hiện trạng và xu hướng của thị trường năng lượng tái tạo của Việt Nam*. Retrieved 13. March 2014, from Institute of Energy: http://ievn.com.vn/tin-tuc/Tong-quan-ve-hien-trang-va-xu-huong-cua-thi-truong-nang-luong-tai-tao-cua-Viet-Nam-5-999.aspx

Nguyen, V. C.;Phan, T. H.;& Vo, H. N. (2012). *Review on the most popular anaerobic digesterin Mekong region* . Retrieved 31. March 2014, from Technische Universitat Dresden: http://www.openaccess.tu-dresden.de/ojs/index.php/jve/article/viewFile/24/14

Paksc. (01. November 2012). *VACVINA biogas Plant information and Construction Video*. Retrieved 30. March 2014, from Pakistan Science Club: http://www.paksc.org/pk/biogas-plant-design/1014-vacvina-biogas-model-construction-video

QuickMBA. (2010). *Porter's Five Force: A model for industry analysis*. Retrieved 27. March 2014, from QuickMBA: http://www.quickmba.com/strategy/porter.shtml

Quincy, R. (September 2012). *SWOT analysis: Raising capacity of your organization.* Retrieved 25. March 2014, from Rutgers School of Social Work: http://socialwork.rutgers.edu/Libraries/Huamin/Brochure_2.sflb

Shaffer, L. (27. February 2014). *If Vietnam's banks are troubled, why are its shares up?* Retrieved 20. March 2014, from CNBC: http://www.cnbc.com/id/101451118

SJ, B. A. (20. March 2012). *Suggested piorities Vietnam*. Retrieved 18. January 2014, from Jesuit Asia Pacific conference: http://asiapacificjesuits.org/content/suggested-priorities-vietnam

SNV. (2011). *Brief report 2010 and plan 2011 of the Working Group on Domestic Biogas under the Energy for All Partnership*. Retrieved 26. March 2014, from SNVWorld: http://www.snvworld.org/download/publications/brief_report_2010_and_plan_2011_of_the_working_group_on_domestic_biogas_under_the_e4all.pdf

SVN. (June 2011). *Biogas user survey Vietnam 2010-2011.* Retrieved 19. March 2014, from Netherlands development organisation SNV: http://www.snvworld.org/files/publications/biogas_user_survey_vietnam_2010-2011.pdf

Swedish CENTEC Vietnam. (28. February 2012). *Swedish Environmental Technologies for Vietnam.* Retrieved 20. March 2014, from Summary: Market Brief on Biogas in Vietnam: http://swedishcentec.se/wp-content/uploads/2012/03/Summary-Market-Brief-on-Biogas.pdf

Thompson, M. A. (02. June 2013). *Vietnam's Emerging Jobs Market*. Retrieved 27. February 2014, from GoinGlobal: http://www.goinglobal.com/articles/1221/

Trading Economics. (February 2014). *Vietnam Inflation Rate*. Retrieved20. March 2014 From Trading Economics: http://www.tradingeconomics.com/vietnam/inflation-cpi

VBN. (9. April 2012). *Vietnam second most attractive investment destination in asia*. Retrieved 18. January 2014, from Business Times: http://businesstimes.com.vn/vietnam-second-most-attractive-investment-destination-in-asean/

VietnamBriefing. (31. May 2013). *Establishing a representative office in Vietnam.* Retrieved 23. March 2014, from Vietnam Briefing:

http://www.vietnam-briefing.com/news/establishing-representative-office-vietnam.html/

Vietnamnet. (11. 12 2013). *EVN power monopoly to be short-circuited.* Retrieved 31. March 2014, from Vietnamnet: http://english.vietnamnet.vn/fms/business/91110/evn-power-monopoly-to-be-short-circuited.html

Vietnamnews. (2. December 2013). *Viet Nam, Finland enhance trade*. Retrieved 18. March 2014, from Vietnam News: http://vietnamnews.vn/economy/248360/viet-nam-finland-enhance-trade.html

Vietnamplus. (29. November 2013). *Vietnam, Finland promote trade ties*. Retrieved 18. March 2014, from Vietnamplus EN version: http://en.vietnamplus.vn/Home/Vietnam-Finland-promote-trade-ties/201311/42687.vnplus

Vietnamplus. (19. March 2014). *Lower interest rates aim to improve national economy*. Retrieved 20. March 2014, from Vietnamplus English Version: http://en.vietnamplus.vn/Home/Lower-interest-rates-aim-to-improve-national-economy/20143/47669.vnplus

VOA News. (10. July 2013). *Report: Corruption growing in Vietnam*. Retrieved 19. January 2014, from Voice of America: http://www.voanews.com/content/report-corruption-growing-in-vietnam/1699090.html

VOV. (3. May 2013). *Promoting Finland-Vietnam trade cooperation*. Retrieved 17. March 2014, from The voice of Vietnam: http://english.vov.vn/Economy/Promoting-FinlandVietnam-trade-cooperation/259930.vov

VOV News. (25. March 2013). *Vietnam, Finland foster trade links*. Retrieved 17. March 2014, from The Voice of Vietnam: http://english.vov.vn/Economy/Investment/Vietnam-Finland-foster-trade-links/256663.vov

World Bank. (2009). *Vietnam Livestock Competitiveness and Food Safety*. Retrieved25. March 2014 From The World Bank: http://www.worldbank.org/projects/P090723/vietnam-livestock-competitiveness-food-safety?lang=en

World Bank. (12. July 2013). *An Update on Vietnam's Recent Economic Development July 2013: Key Findings*. Retrieved 20. March 2014, from World Bank: http://www.worldbank.org/en/news/feature/2013/07/12/taking-stock-july-2013-an-update-on-vietnams-recent-economic-development-key-findings

World Bank. (2013). *Vietnam Overview*. Retrieved 19. January 2014, from The Word Bank: http://www.worldbank.org/en/country/vietnam/overview

World Bank. (29. November 2013). *Vietnam's Workforce Needs New Skills for A Continued Economic Modernization, Says Vietnam Development Report 2014*. Retrieved 16. March 2014, from World Bank: http://www.worldbank.org/en/news/press-release/2013/11/29/vietnams-workforce-needs-new-skills-for-a-continued-economic-modernization-says-vietnam-development-report2014

Zhang, M. (3. January 2014). *Vietnam Economic Outlook 2014: Exports, FDI To Support Growth*. Retrieved 19. March 2014, from International Business Times: http://www.ibtimes.com/vietnam-economic-outlook-2014-exports-fdi-support-growth-1525182

Unpublished sources

MoIT (2013). Tổng quan về phát triển điện năng lượng tái tạo & điện khí sinh học. Provided by Mr. Nguyen Ninh Hai

Laitinen (2013). Interview with Doranova. Provided by Ms. Maarit Virtanen

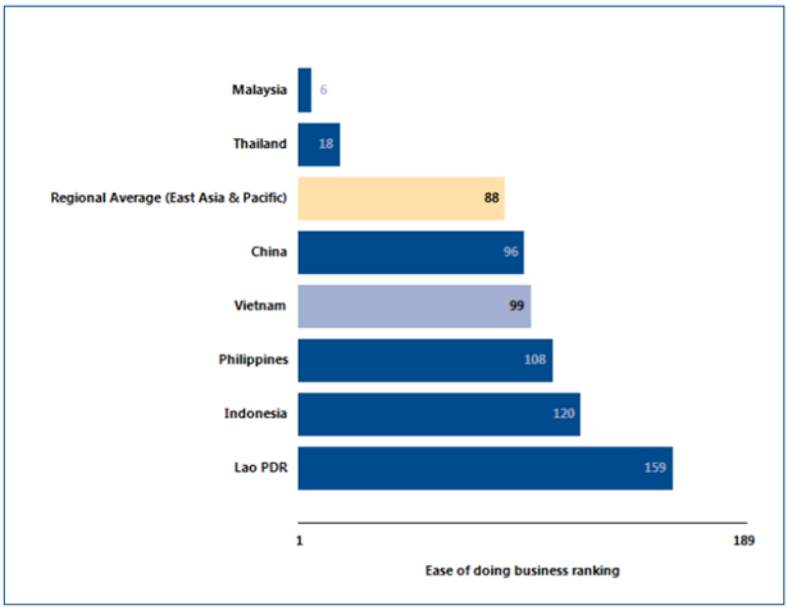
Interview

1. Nguyen N. H. (2013). Mr Nguyen Ninh Hai, Deputy Director of New and Renewable Energy Department, General Directorate of Energy, Ministry of Industry and Trade, interviewed by author, 17.12.2013
2. Virtanen (2014). Mrs. Maarit Virtanen, Connect Project Manager, interviewed by author, 25.03.2014

3. Laitinen (2013). Mr Jarno Laitinen, Deputy Managing Director at Doranova Oy, interviewed by Maarit Virtanen & Agunbiade A. Charles, 23.07.2013

APPENDICES

APPENDIX 1. How Vietnam and comparator economies rank on the ease of doing business



APPENDIX 2. Key indicators of Vietnam economic

GDP (purchasing power parity)	$358.9 billion
GDP (official exchange rate)	$170 billion
GDP growth rate	5.3%
GDP per capita	$4 000
GDP per sectors	
Agricultures	19.3%
Industry	38.5%
Services	42.2%
Inflation rate	6.8%
Labor force	
Agricultures	48%
Industry	21%

Services	31%
Unemployment rate	1.3
Population below poverty	11.3%
Public debt	48.2% of GDP
Export	$128.9 billion
Import	$121.4 billion

APPENDIX 3: Vietnam's GDP growth rate, 2010-2013

APPENDIX 4. Legal document concerning RE

Legal document	***Time approval***	***Related contents***
Decision 1208/QDTTg, by Prime Minister	21/07/2011	Title: **National Power Development Plan period 2011-2030 (Master Plan VII)** ***Objectives and targets:*** - Increase the share of renewable energy in total commercial primary energy from 3% in 2010 to 5% in 2020 and 11% in 2050 - Increase the share of electricity generated from renewable resources such as wind and biomass from 3.5% of total electricity generation in 2010 to 4.5% in 2020 and 6% in 2030
Decision 37/2011/QD -TTg	29/06/2011	Title: **Mechanisms to support wind power** ***Contents:*** - 20 year power purchase agreement - Investment incentives, taxes, fees, land

		infrastructure - Support for electricity prices (grid): purchase price equivalent to 7.8 US cents / kWh - The application of CDM6
Decision 2149/QDTTg by Prime Minister	17/12/2009	Title: **National strategy on comprehensive management of solid wastes for period up to 2025, vision to 2050** ***Objectives and targets concerning recycling, reuse and energy recovery of solid waste:*** - By 2015: 60% - By 2020: 85% - By 2025: 90% - By 2050: 100%
Decision 1855/QDTTg	27/12/2007	Title: **National energy development strategies for Vietnam up to 2020, outlook to 2050** ***Objectives and targets:*** - Share of RE is 3% of total primary energy supply in 2010; 5% (2020), and 11% (2050). - Completion of RE, mountainous program. Share of households using RE in cooking is 50% (2010) and 80% (2020). By 2010, 95% rural households have electricity, by 2020, 100% HHs have electricity - Considering establishment of RE development fund
Decision 18/QD-BCT	18/07/2008	Title: **Promulgation of regulation on avoided cost tariff and standardized power purchase agreement for small renewable energy power plants** ***Objectives and targets:*** Regulation on conditions, procedures and construction of small RE power plants connected to the national power grid (Small Power Purchase Agreement) SPPA
Circular 58/2008/TT LT-BTCBTN&MT	04/07/2008	Title**: Guideline on implementation of some articles of Decision No.130/2007/QD-TTg on financial incentives for CDM projects** ***Objectives and targets:*** Regulation on price subsidy for products from CDM projects, including: - Electricity produced from wind, solar, geothermal and tide - Electricity produced from recovered methane gas (landfill, coalmining) - (Grant amount/kWh = Production cost/kWh + reasonable profit / kWh - the selling price / kWh – selling prices CERs from CDM) For instance: the 30MW Tuy Phong wind farm gets 4US Cent/kWh as subsidy for the CDM

		project. (CDM UNFCCC, 2009)
Decision 177/2007/QD-TTg	20/11/2007	Title: **Bio-energy development study report for period up to 2015, outlook to 2025** ***Objectives and targets:*** - 2010: development of models for experimenting and using of bio-energy, meeting 0.4% of gasoline and oil demand in country - 2015: production of ethanol and vegetable oil is 250,000 tons, meeting 1% of gasoline and oil demand in country - 2025: production of ethanol and vegetable oil is 1.8 million tons, meeting 5% of gasoline and oil demand in country
Decree 151/2006/ND-CP	20/12/2006	Title: **The state's investment credit and export credit** ***Contents:*** - Project owner (investors or exporters) have access to loan or credits of the Vietnam Development Bank - The loan capital level for a project shall be at most equal to 70% of the total investment capital level of that project - The interest rate applicable to investment loans in Vietnam dong shall be equal to the interest rate applicable to the government bonds of a five-year term plus 0.5%/year - The loan capital level shall be equal to 85% of the value of a signed import or export contract or the L/C value for a loan provided before goods delivery or the value of valid drafts for a loan provided after goods delivery
Decision 79/2006/QD-TTg	14/04/2006	Title: **National Energy Efficiency Program** ***Objectives and targets:*** Saving 3 -5% for the period of 2006-2010 Saving 5 -8% for the period of 2011-2015