IIIEE Theses 2016:19

Windy Times in Emerging Economies

De-Risking Renewable Energy Investments

Case Study Vietnam

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Supervisor

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Thesis for the fulfilment of the

Master of Science in Environmental Sciences, Policy & Management

Lund, Sweden, June 2016

MESPOM Programme:

Lund University – University of Manchester - University of the Aegean – Central European University

Erasmus Mundus Masters Course in Environmental Sciences, Policy and Management

MESPOM

This thesis is submitted in fulfilment of the Master of Science degree awarded as a result of successful completion of the Erasmus Mundus Masters course in Environmental Sciences, Policy and Management (MESPOM) jointly operated by the University of the Aegean (Greece), Central European University (Hungary), Lund University (Sweden) and the University of Manchester (United Kingdom).

Supported by the European Commission's Erasmus Mundus Programme

Education and Culture

Erasmus Mundus

Published in 2016 by IIIEE, Lund University, P.O. Box 196, S-221 00 LUND, Sweden,
Tel: +46 – 46 222 02 00, Fax: +46 – 46 222 02 10, e-mail: iiiee@iiiee.lu.se.
ISSN 2016:19

Acknowledgements

The thesis is written, and suddenly it's done. 4 months of intensive work on this final graduate project with research and most writing in Vietnam and some fine tuning in beautiful Budapest.

Friends in Hanoi, thank you for having me! Moritz, once again: that was a crazy time, huh? Well, 5 years ago we met in Hanoi for the first time and ever since every 2 years in that lovely city. Thanks for your support and making my stay possible! I'm glad to have you as a friend and I'm looking forward to our travels and adventures in South East Asia in the next couple of years!

Axel Neubert, thank you so much for your support! I am glad we won't stop meeting and working together in the future in Myanamar and certainly also in Vietnam!

Anh Minh! You are a Hero! Thank you for your friendship, support and shelter! Don't worry, next time I will have more time for Hero Bar and certainly I will get Lost in Music!

Well, and suddenly that's it! The research project is over and with it my student life. What a mixed feeling! The last two years as a MESPOM student were unforgettable. I am very happy and grateful for the opportunity I got to study the program. Thanks Europe for this wonderful program that brings so many bright minds from all over the world together! We had a splendid time together! Europe, stay united and strong!

Guys, I will miss you: our breaks "on fire", coffee in the basement or just laughing together were every day highlights during the thesis time in Budapest. Isaac, Shamim, Simona- you rock!

Lars, thank you for being my supervisor, your advices and your help!

And Ramon, thank you for being Ramon and for your support!

And last but not least, thanks to all the interviewees for the time you took to give me insights and explain me the Vietnamese energy sector!

Abstract

In emerging economies, high investment costs hinder fast renewable energy (RE) deployment. Compared to industrial states, higher financial costs originate mainly from investment barriers and consequently risks. Using Vietnam as a case study for emerging economies, the objective of this thesis is to identify barriers and ways to remove risks by developing a de-risking policy mix that consequently helps to increase RE deployment rates. The study finds out that, even though Vietnam's climate are favorable for RE projects, however, the country's contextual policy settings are not conducive to investments. Additionally, an ex-post effectiveness analysis of current policies showed that they are not working effectively yet. Barriers were identified with the help of a newly developed analytical framework that has a higher usability than common ones. The main barriers are deep-rooted structural barriers, such as the permitting process and corruption. The policy recommendations developed in this thesis suggest to change the cornerstone instrument to a new auctioning system, the "One Stop Auctioning System" (OSAS), which was developed in this thesis. It minimizes the contact between investors and local authorities and with it the options for corruption and delays. This instrument, combined with secondary de-risk instruments, like capacity building on all relevant levels and sectors (public and private), the introduction of a university program on RE, or improved access to capital by introducing public loan guarantees, has high chances to make emerging economies like Vietnam a more attractive country for RE investments.

Keywords: Renewable Energy, De-Risking, One Stop Auctioning System, Barriers

Executive Summary

In emerging economies, high investment costs hinder fast renewable energy (RE) deployment. Compared to industrial states, higher financial costs originate mainly from investment barriers and consequently risks. Generally, investors are looking for stable investment environments with secured financial rewards, which is not given in most developing countries (Climate Policy Initiative, 2015). The United Nations Development Program (UNDP) and the Deutsche Bank Group developed a new approach to increase the diffusion of RE in developing countries. In 2011 they presented a de-risking approach (Schmidt, 2014; Frisari & Valerio, 2015). The right set of de-risking policies decreases the risks of RE investments and establishes a good investment climate that helps to increase the RE deployment rate (Deutsche Bank, Kahn, Mellquist, & Sharples, 2011; UNDP, Waissbein, Glemarec, Bayraktar, & Schmidt, 2013).

This thesis uses the case of Vietnam as a country in transition with high economic growth rates and energy demand. The literature on RE in Vietnam assesses the market (Pham Khanh, Nguyen Anh, & Quan Minh Quoc, 2012; ADB, 2015), the RE potential (Nguyen Ninh Hai, Dang Huy Cuong, & Pham Trong Thuc, 2015; Nguyen Ninh Hai et al., 2015; Asian Development Bank, 2015b) and energy policies (Minh Do & Sharma, 2011; Khanh Toan, Minh Bao, & Ha Dieu, 2011; UNDP, 2012a).

The new de-risk approach has been applied on few case studies only. These are from Kenya, Mongolia, Panama and South Africa (UNDP et al., 2013). No country in South East Asia has been assessed on de-risking yet. By applying the de-risking approach on Vietnam, this thesis closes a knowledge gap. Having more information on ways to reduce RE investment risks in emerging economies could help to increase their deployment.

This thesis aims to contribute to the diffusion of RE in emerging economies. With the case study of Vietnam, it intends to increase the deployment rate of large-scale RE projects in the country and in similar ones. The objective of this thesis is to present insights in reasons for slow deployment and how the de-risking approach can help to increase future deployment. This thesis analyzes the contextual settings as well as current policies. It further provides information for strategic de-risking approaches that lower the costs of RE projects by decreasing investors' risks.

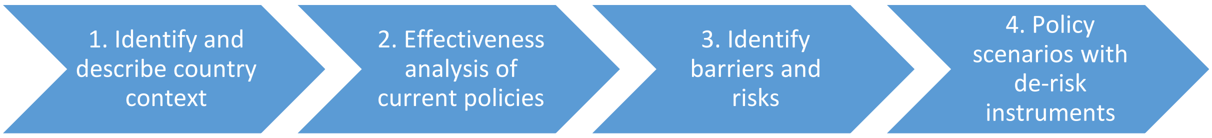
This thesis asks two questions:

1. How conducive is Vietnam's contextual setting to renewable energy investment?
2. What are possible ways to de-risk renewable energy investments in Vietnam?

Methodology

This thesis starts with a literature review of barriers and risk as well as of different de-risking approaches for RE investments to get an understanding of the theoretical approach. It follows a systematic collection of renewable energy-related information in Vietnam, which serves as a first step to get familiar with the country and its context. The chapter identifies and describes the country context. It gives an overview of Vietnam's current state and presents the energy sector in detail with a focus on RE and aspects that are crucial for investors like the permitting process of RE projects.

After the country context an ex-post effectiveness analysis of the current RE policies is assessed. This is followed by an ex-post analysis of RE investment barriers and risks in Vietnam. During the literature review it occurred that the common analytical frameworks have shortcomings. The UNDP framework has an approach that is not user-friendly. Therefore, a new analytical framework, inspired by the UNDP framework, was developed and applied to identify RE investment barriers. The foundation for the analysis was desk research and semi-structured interviews, that were conducted face-to-face. After the identification of barriers and risks policy scenarios with de-risk instruments were developed.



Main Findings

The identification of barriers showed that deep-rooted structural barriers are the main problem for slow RE deployment in Vietnam. The permitting process is complex & time consuming, the diffusion of information as well as the communication and cooperation among (public) actors is insufficient. An omnipresent barrier is corruption. The analysis further showed, that the access to capital for large-scale RE project is difficult. On the informational side, there is a lack of know-how and a lack of skilled labor. The current RE support policy mix, which includes a Feed-in tariff (FiT) does not remove the barriers.

Policy Recommendations

This thesis suggests to change the cornerstone instrument to an auctioning system. Unlike (high) FiTs, the "One Stop Auctioning System" (OSAS) developed in this thesis has the chance to remove deep-rooted investment barriers. An increased FiT, which is promoted by most international actor in Vietnam, could lead to higher deployment rates eventually. However, most likely it would come at the cost of the local population in Vietnam who would have to pay bribes in the RE permitting process with their electricity bills. The OSAS minimizes the contact between investors and local authorities and with it the options for corruption and delays.

This instrument, combined with secondary de-risk instruments, like capacity building on all relevant levels and sectors (public and private), the introduction of a university program on RE, improved access to capital by introducing public loan guarantees, has high chances to make Vietnam a more attractive country for RE investors. Furthermore, local governments should be (financially) incentivized to offer land to project developers.

This thesis gives an impulse to policymakers as well as international experts who fight (unsuccessfully) for higher FITs in emerging economies. The result of this thesis is in particular valuable for countries, that are ranked high in the Transparency International corruption index, because the OSAS has the chance to remove deep-rooted barriers like corruption.

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Abbreviations

ACT	Avoided Cost Tariff
AGECC	Advisory Group on Energy and Climate Change
BAU	Business as Usual
CDM	Clean Development Mechanism
CIT	Corporate Income Tax
COP	Conference of the Parties
CO_2	Carbon Dioxide
CSP	Concentrated Solar Power
DBCCA	Deutsche Bank Climate Change Advisors
DFI	Development Financial Institutions
DOC	Department of Construction
DOIT	Departments of Industry and Trade
ERAV	Electricity Regulatory Authority of Vietnam
EU	European Union
EVN	Electricity of Vietnam
FDI	Foreign Direct Investment
FiT	Feed-in Tariff
GDE	General Directorate Energy
GDP	Gross Domestic Product
GFiT	Global Feed-in Tariff
GHG	Greenhouse Gases
GIZ	German Agency for International Co-operation
GWh	Gigawatt-hour
IEA	International Energy Agency

INDC	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
JSC	Joint Stock Companies
KfW	Kreditanstalt für Wiederaufbau
kWh	Kilowatt-hour
LCOE	Levelized Costs of Electricity
MDG	Millennium Development Goal
MIGA	Multilateral Investment Guarantee Agency
MOIT	Ministry of Industry and Trade
MOF	Ministry of Finance
MPI	Ministry of Planning & Investment
MW	Megawatt
NIMBY	Not in My Back Yard
NPP	Nuclear Power Plant
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OPIC	Overseas Private Investment Corporation
OSAS	One Stop Auctioning System
O&M	Operation and Maintenance
PC	People's Committee
PDP	Power Development Plan
PPA	Power Purchase Agreement
PPC	Provincial People's Committee
PPM	Parts per million
PV	Photovoltaic
RE	Renewable Energy
RES	Renewable Energy Systems
R&D	Research and Development
SDG	Sustainable Development Goal
SOE	State Owned Enterprise
SPPA	Standard Power Purchase Agreement
TOE	Tons of Oil Equivalent
TWh	Terawatt-hour
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Program
UN-DESA	United Nations Department of Economic and Social Affairs
USA	United States of America
VGGS	Vietnam Green Growth Strategy
VND	Vietnamese Dong

1 Introduction

This chapter is an introduction into the topic and explains the connection between climate change and the energy sector, Vietnam's power development, financial aspects of energy transition and energy challenges in emerging economies. It further gives basic information about the research endeavour such as aim and research question.

The United Nations (UN) Conference of the Parties (COP) on Climate Change in Paris, held in December 2015, was a wakeup call for the global community to act unified in the fight against climate change (Nuccitelli, 2015). Greenhouse gas emissions (GHG), which are responsible for climate change are as high as never before and continue rising (Pachauri, Mayer, & Intergovernmental Panel on Climate Change, 2015; International Energy Agency, 2014b).

A continuation of today's amounts or an increase would have devastating impacts for people and ecosystems globally. Already today climate change can be noticed and measured: the atmosphere as well as oceans are warmer than in the past, which leads to melding glaciers (Pachauri et al., 2015). The 2014 IPCC report on mitigation of climate change highly recommends to keep the global temperature increase under 2 degrees Celsius over the 21st century (Edenhofer, Pichs-Madruga, Sokona, & Intergovernmental Panel on Climate Change, 2014). The report says, the concentration of GHG in the atmosphere must not get higher than 450 CO_2 parts per million (ppm).

In the year 2007 Sir Nicolas Stern's study on climate change, written for the British Government, received much attention globally. He argued that big investments have to be done in order to minimize the negative effects of climate change (Stern & Great Britain, 2007). Early and committed actions and investment would be financially cheaper than not acting, he states. Hence not acting and therewith allowing higher CO_2 concentrations to change the climate would have grave consequences on water supply, food production and would also lead to an increase of natural disasters. The report further states that the changes combined would lead to a global gross domestic product (GDP) loss of about 5% annually (Stern & Great Britain, 2007).

On a global level there is consensus about the need of actions against climate change. This is expressed by several agreements such as the Paris Agreement from December 2015. However, developing countries and in particular countries with rapidly emerging economies experience difficulties in achieving their climate goals, especially because their fast increasing energy demand. Policy makers, environmentalists and energy experts agree that the energy sector is key in the fight against climate change (DeMartino, LeBlanc, & others, 2010; International Energy Agency, 2014b, International Energy Agency, 2015). Numbers support this assessment: electricity and heat production is globally the largest contributor to GHG emissions and is responsible for about 25% of total anthropogenic GHG (Edenhofer et al., 2014). Global GHG emissions are steadily increasing, mostly due to economic growth and consequently increasing energy consumption (Edenhofer et al., 2014). World-wide, coal, the primary energy with the highest specific CO_2 emission, has the highest share in the energy mix. 2012 is was accountable for 40% of global energy supply (International Energy Agency, 2014b).

While acting towards a reduction of GHG in the energy sector it is important to note that under the current global political and economic system it is not an option to reduce global economic growth. Developing countries in particular aim to strengthen their economies. Energy is the fundamental base of economic development (Johansson, Patwardhan, Nakićenović, Gomez-Echeverri, & International Institute for Applied Systems Analysis, 2012). There is hardly any social, nor industrial, activities without it. With economic growth and industrial development, societies get richer and consequently start consuming even more energy (IEA, 2013; Chow, Kopp, & Portney, 2003). Today developing countries are going through a phase, most industrial countries went through in the late 19th century during the industrialization (Smil, 2010). During the industrialization of today's industrialized countries electricity was mostly generated by coal power plants and hydropower. Back then neither the consequences of higher CO_2 emissions on climate change, nor the consequences of SMOG on human health were known. Today, both negative consequences are well known.

However, as Goldemberg points out, developing countries do not necessarily have to follow the exact path of industrial countries (Goldemberg & others, 1998). Today technologies are improved and new technologies are available. Leapfrogging old technologies is an option developing countries can apply in the energy sector[1]. Nowadays there are renewable energy (RE) technologies that allow developing countries to skip the fossil fuel based power plants, that were used for the industrialisation in the 19th century. However, studies show that usually only after reaching a certain economic level the energy intensity[2] of an economy decreases (Sadorsky, 2013).

The global demand for coal power plants proofs this point. Maiy countries are in a dilemma between financially cheap energy and low carbon solutions. Due to lower initial investment costs, compared to RE technologies and lower fuel costs compared to gas-fired plants, there is still high demand for coal power plants worldwide (IEA & OECD, 2015; Viet Nam News, 2015a). Even though gas-fired power plants have advantages over coal-fired power plants (they emit less CO_2, have lower initial investment costs, are easier to regulate) in most countries, the operational costs are higher than the operational costs of coal-fired counterparts. Only in few countries e.g. in the United States of America (USA) gas is cheaper than coal (Pickering, 2012; Knittel, Metaxoglou, & Trindade, 2016; IEA & OECD, 2015).

An additional energy challenge in developing countries are regions that are not connected to a power grid yet. Worldwide there are still about 1.3 billion people without access to modern energy (electricity). About 3 billion people depend on wood, coal and other solid fuels for cooking and heating (AGECC, 2010; Edenhofer et al., 2014). Efforts to connect the billions of people without modern electricity were increasing in the last couple of years (Johansson et al., 2012). Number 7.1 of the UN Sustainable Development Goal (SDGs) is: "by 2030, ensure universal access to affordable, reliable and modern energy services" (United Nations, 2015, p. n.a.).

The Case of Vietnam

Vietnam is an example of a country with high economic growth rates and a fast growing energy demand. It is a country in transition. The country's economic growth rate has been more than 5% annually for over a decade already (KfW Development Bank, 2015). The development is beneficial for the population in many ways: the infrastructure betters, the health system improves, people can afford better food and the overall life expectancy increases, to name a few improvements (Lam, 2016).

However, with the development also many challenges arise. The fast increase in the energy demand leads to frequent energy shortages. The electricity demand increases by about 10% year after year. This is due to higher production of goods for the domestic and global market and

[1] A common example for "leapfrogging" can be found in the telecommunications sector (Goldemberg & others, 1998). Landlines used to be the standard phone technology in industrial countries. Only after many years of successful use the newer mobile phone technology was developed and proliferated. In developing countries, many people skip landlines and aquire a mobile phone right away. This is called leapfrogging a technology.

[2] Energy Intensity shows the energy efficiency of a country's economy

the use of more electric devices (electricity) by the Vietnamese population. The governmental answer is to quadruple the electricity supply capacity from an output of 19,735 Megawatts (MW) in 2010 to around 75,000 MW in 2020 (KfW Development Bank, 2015; Socialist Republic of Vietnam, 2015b). In 2015 the national power capacity was 34,000 MW, while in 2016 is expected to reach 38,000 MW (Vietnam Pictorial, 2015; Viet Nam News, 2016b).

The socialist government plans to meet most of the increased electricity demand by building new new coal power plants. A statement by the prime minister Nguyen Tan Dung from the begining of 2016 shows the importance of the energy development: "Energy is of paramount importance to Vietnam's growth and it is a decisive factor for the country's high and sustainable growth. It is difficult for Vietnam to realize growth targets if energy runs short" (Viet Nam Energy, 2016). To meet the demand some and to improve the electricity infrastructure Vietnam plans to spend US$130.64 billion in the period 2014-2030 (Socialist Republic of Vietnam, 2016).

Environmental and as well as health concerns are of secondary importance in the governmental plan. By relying mainly on coal power plants it will be difficult for Vietnam to achieve their CO_2 reduction goals. Prior to the climate conferences COP21 all countries had to submit their Intended Nationally Determined Contribution (INDC) (Sachs, 2015; Ji & Sha, 2015). Vietnam submitted a target to decrease the CO_2 emissions by 8% until the year 2030 (baseline year 2010) and offers to decrease the emissions by up to 20% in the same period if the global community helps financially (Socialist Republic of Vietnam, 2015c). Figure 1 shows the official projections of Vietnam's GHG emission in million tons CO_2 (not included industrial processes).

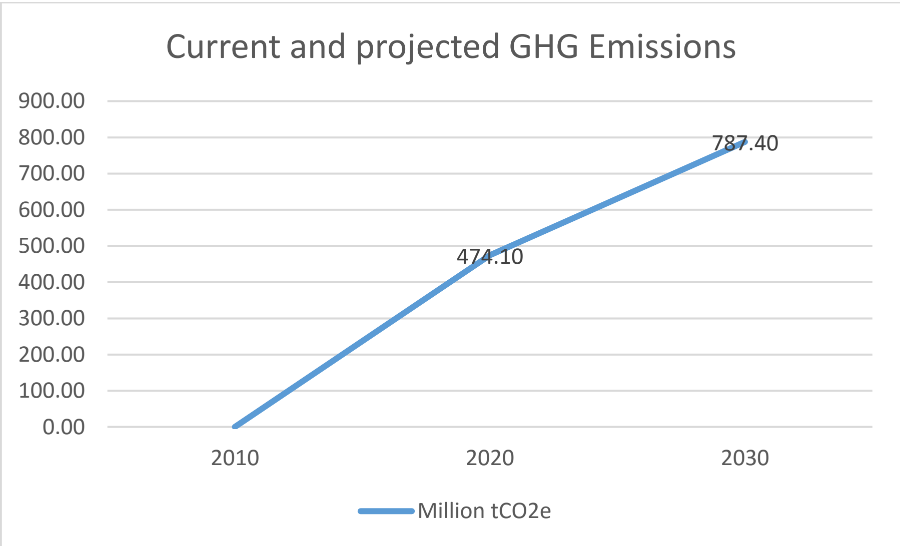

Figure 1: Current and Projected GHG Emissions

Source: (Socialist Republic of Vietnam, 2015d)

Additional to the increasing CO_2 emission, Vietnam faces an air quality problem. In Vietnam the air quality in many cities is notably getting worse year after year (Phung et al., 2016). The main reasons for the worsening are electricity generation from fossil fuels, increasing individual transport by cars and motorbikes and industrial emissions. The Vietnamese population is getting concerned about the negative impact on their health. In a global study by Yale University the country ranks 170 out of 178 (YCELP, 2014). A study by Harvard University found out that in 2011 4300 people died in Vietnam by pollution through coal power plants (Viet Nam News, 2015a). Recently, in April 2016 even mercury was found in the air of the capital city Hanoi. The discovery created big concerns among the population (Thanh Nien Daily, 2016). Most likely the mercury comes from coal power plants. Because of the severe health risk, caused by coal power plants citizens started to protest against the new deployment of them, which is a rare circumstance in socialist Vietnam where free speech is supressed (Big News Network, 2015).

Financial Aspects

The introduction showed the importance of the reduction of greenhouse gases in the energy sector globally, in order to mitigate climate change. Financial aspects make this aim difficult though. Yet, there is promising news. In the last couple of years, a higher demand of RE technology could be seen worldwide (IRENA, 2013). In 2014 US$270 billion were invested in renewable electricity capacity globally (REN21, 2015). In the same year 59% of all new installed capacity was RE (excluding large dams).

The higher demand led to a learning curve that, combined with economies of scale, allowed technology suppliers to offer solutions for less money (Climate Policy Initiative, 2014). This development happened with all RE technologies. The price decrease of solar photovoltaic (PV) panels was impressive. The cost per module decreased by nearly 98% from 1979 to 2012 (IRENA, 2013). Accordingly, in recent years, an enormous development took place. Between 2009 and 2014 the price dropped by three quarters for PV (IRENA, 2015b). Wind turbines, which are the most expensive part of wind power farms also decrease in prices. Between 2008 and 2014 the prices lowered by about 30% (IRENA, 2015b).

Even though technology is getting cheaper, researchers and policy makers agree on the fact that an energy transition is only possible with very large investments. The World Energy Investment Outlook by the International Energy Agency (IEA) estimates that the energy sector needs investments of about US$40 trillion until 2035 only to meet the global energy demand (International Energy Agency, 2014a). Figure 2 shows the costs in US$ trillion to meet the global energy demand. On top of the US$40 trillion another US$8 trillion are required for energy efficiency improvements.

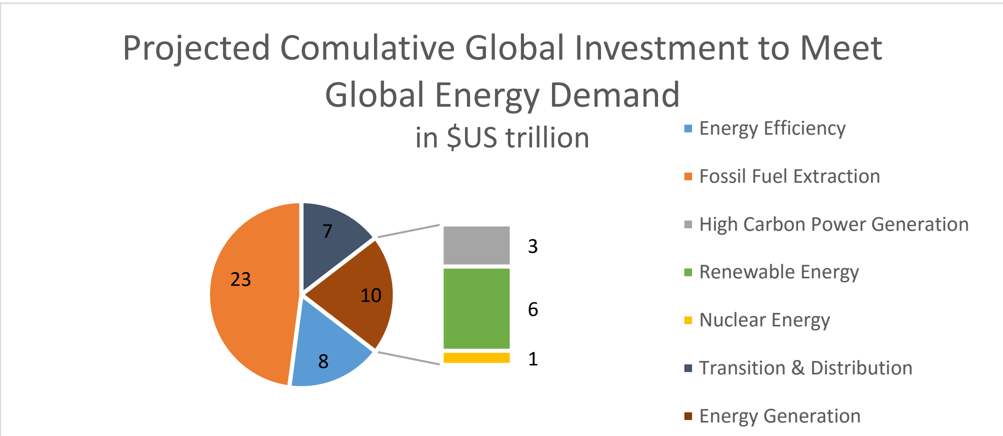

Figure 2: Projected Cumulative Global Investment to Meet Global Energy Demand

Source: (International Energy Agency, 2014a)

1.1 Energy Challenges in Emerging Economies

Other organizations have developed similar scenarios. The United Nations Department of Economic and Social Affairs (UN-DESA) has developed scenarios that include a Global Feed-in Tariff (GFIT) paid by industrial states. The subsidy would support all developing countries in their target to install new renewable electricity capacity offering their population a minimum of 10 kilowatt-hours (KWh) per day/ person. The report states that the costs for industrial states would be low in the beginning and peak by about US$250–270 billion annually after around 15 years (DeMartino et al., 2010; Hällström, Bhushan, Kumarankandath, & Goswami, 2014). In comparison: in 2015, total net official development assistance (ODA) from member countries of the Organisation for Economic Co-operation and Development (OECD) were US$131.6 billion (OECD, 2016).

The investments cannot be done with public money solely since the sum required is too high. Instead energy transitions towards low carbon energy supply can only happen with the help of private investors (Climate Policy Initiative, 2014). It is key to attract them. Until today, 2014 was the year with the highest investments in low carbon and climate resilient projects (Climate Policy Initiative, 2015). Global climate finance increased by 18% to US$391 billion from 2013 to 2014. In the transition process towards low carbon energy sectors, developing countries need a whole range of support from industrial states. Financial support, capacity building and technology transfer are the key support areas. In Paris at the COP21, delegates from industrial countries assured developing countries financial assistance for sustainable development projects in order to decrease the global GHG emissions (Robbins, 2016). That means that in the near future even more money will be spend on RE projects in the global south.

These recent developments make it central to know how to spend public money wisely. Even small public funding can help to mobilize both private and public investors and therewith leverage large investment sums (Brigham & Houston, 2007; International Energy Agency, 2014b; IEA & OECD, 2015).

1.2 Problem Statement

High investment costs for RE projects in developing and emerging economies occur because of high investment risks. Generally, investors are looking for stable investment environments with secured financial rewards, which is not given in most developing countries (Climate Policy Initiative, 2015). The United Nations Development Program (UNDP) and the Deutsche Bank Group developed a new approach to increase the diffusion of RE in developing countries. In 2011 they presented a de-risking approach (Schmidt, 2014; Frisari & Valerio, 2015). The right set of policies (de-risking instruments) decreases the risks of RE investments and establishes a good investment climate that helps to increase the RE deployment rate (Deutsche Bank, Kahn, Mellquist, & Sharples, 2011; UNDP, Waissbein, Glemarec, Bayraktar, & Schmidt, 2013).

This paper uses the case of Vietnam as a country in transition with high economic growth rates and energy demand. The literature on RE in Vietnam assess the market (Pham Khanh, Nguyen Anh, & Quan Minh Quoc, 2012; ADB, 2015), the RE potential (Nguyen Ninh Hai, Dang Huy Cuong, & Pham Trong Thuc, 2015; Nguyen Ninh Hai et al., 2015; Asian Development Bank, 2015b) and energy policies (Minh Do & Sharma, 2011; Khanh Toan, Minh Bao, & Ha Dieu, 2011; UNDP, 2012a). Despite the research and governmental deployment targets, solar and wind power have a neglectable market share.

The new de-risk approach has been applied on few case studies only. These are from Kenya, Mongolia, Panama and South Africa (UNDP et al., 2013). No country in South East Asia has been assessed on de-risking yet. By applying the de-risking approach on Vietnam, this thesis closes a knowledge gap. Having more information on ways to reduce RE investment risks in emerging economies could help to increase their deployment.

1.3 Aim & Objective & Research Questions

This thesis aims to contribute to the diffusion of RE in emerging economies. With the case study of Vietnam, it intends to increase the deployment rate of large-scale RE projects in the country and in similar ones.

The objective of this thesis is to present insights in reasons for slow deployment and how the de-risking approach can help to increase future deployment.

This thesis analyses the contextual settings as well as current policies. It further provides information for strategic de-risking approaches that lower the costs of RE projects by decreasing investors' risks.

This thesis asks two questions:

1. *How conducive is Vietnam's contextual setting to renewable energy investment?*

2. *What are possible ways to de-risk renewable energy investments in Vietnam?*

1.4 Methodology

This thesis starts with a literature review of barriers and risk as well as of different de-risking approaches for RE investments to get an understanding of the theoretical approach. De-risking instruments help to establish a good investment environment, that lower RE investments risks and consequently project costs.

After the literature review (chapter 2) the methodology is presented in more detail in chapter 3. After that the case country Vietnam and its context are presented in chapter 4. That chapter presents data collected through desk research. The focus is on i) the current state of the power sector, including demand and supply, prices and actors ii) RE potential and iii) policies, laws and regulations that effect potential RE investors. Assessed sources are official governmental releases such as strategies and bills, research papers, publications of international organizations and newspaper articles.

After presenting the country context an ex-post effectiveness analysis of the current RE policies is assessed. This is followed by an analysis of RE investment barriers and risks in Vietnam. For the analysis an analytical framework by the UNDP and Deutsche Bank was further developed (UNDP et al., 2013; Deutsche Bank et al., 2011). The literature on de-risking is relatively new and most studies use the analytical framework developed by these two organizations. However, during the literature review it occurred that the common analytical frameworks have shortcomings. The UNDP framework has an approach that is not user-friendly since it starts with the de-risking areas (policy, financial and direct financial incentives) instead of the the barriers. After identifying the area, options for de-risk instruments are given. However, the literature review on barriers and risks showed that RE investment barriers in emerging economies are diverse. This thesis classified the various barriers into five categories: technical barriers, political barriers, market barriers, informational barriers and administrative barriers. These new developed barrier categories build the foundation of the analytical framework of this thesis. Starting from the barrier categories, it is easy to find a specific barrier. From there it is possible to assign a de-risk instrument that allows the removal of a barrier or risk. This approach is problem-based instead of de-risk area/ instrument-based. It appears to be more practical since the question which de-risk area the chosen instrument belongs to is of secular importance for the removal of a barrier.

The foundation for the analysis was desk research and semi-structured interviews, that were conducted face-to-face. Most of the interviews were recorded (if the interviewee permitted). In one case an interviewee did not feel comfortable talking on the record. During the interviews the interviewer (author of this study) also took notes. After the interviews the author created documents with the main findings.

Interview partners were 16 stakeholders working for organizations involved in foreign aid with a focal point on energy. These are for example the German Development Aid Agency "Gesellschaft für internationale Zusammenarbeit" (GIZ), Delegation of the European Union and the German Bank for Reconstruction "Kreditanstalt für Wiederaufbau" (KfW). The interviews were tailored to the specific expertise of the expert with the objective to find the main reasons for the slow progress of RE deployment in Vietnam and how to change it with a de-risk approach. The final step of this thesis is an ex-ante policy analysis with policy scenarios that contain different de-risk instruments, which can work as alternatives to current ones. Figure 3 shows the four systematic steps of this thesis. The framework and research approach is explained in more details in chapter 3.

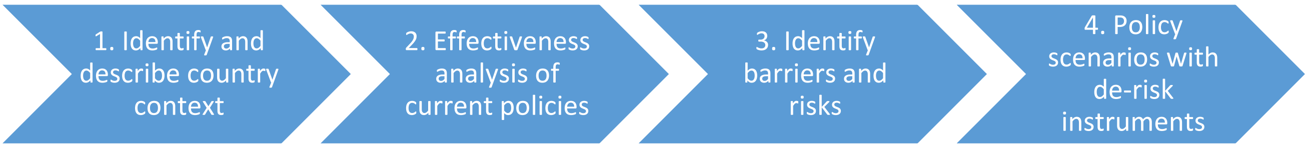

Figure 3: Analytical Steps

1.5 Scope and Limitations

The thesis analysis the contextual settings for RE deployment and de-risking mechanisms in the case of the Social Republic of Vietnam. The thesis analyses the electricity sector in Vietnam and gives a detailed insight in the current RE situation within the country. It further shows barriers and ways on how to remove them. The findings could potentially also be relevant to countries that are similar to Vietnam.

Technologies

The assessed technologies in this thesis are wind power, and PV solar power. However, many of the findings are applicable for biomass and other large scale RE technologies too. In Vietnam a Because the hydropower sector in Vietnam is well developed already, research on further development is not urgently needed and is not part of this thesis.

Limitations

There were several limitations during the work on RE in Vietnam. First of all, there was a difficulty to access Vietnamese official institutions since an official formal invitation is needed for interviews with any employer of the state-owned enterprises (SOE) or ministries. In Vietnam it is more difficult to get access to information than in other countries. Vietnam is not a democracy, but a country with a single communist party that does not allow free speech. For that reason, the author predominantly conducted interviews among international organizations, based in Vietnam.

An attempt to conduct interviews at a conference on RE in Vietnam was surprisingly unsuccessful: most participants (experts) did not have the required knowledge for answering questions or did not have high proficiency in English. The language barrier was another reason for conducting interviews mainly among international actors. Among the main actors that are involved in RE topics in Vietnam are several German organizations such as GIZ and KfW. For that reason, there is a higher share of interviewees from German organizations.

1.6 Ethical Considerations

A part of the research result is based on expert interviews. Before every interview several aspects were discussed with every of the interviewees. Firstly, the background and the research aim was explained and information about the research and the researcher's background provided. After the first introduction several steps were followed:

- Discussion of confidentiality of data
- Discussion of anonymity and protection of data
- Option of recording interview

In some cases, the author also received printed or digital confidential data. In these cases, the use of sensible data was discussed too. Furthermore, the author approached the research questions unbiased and reflected on the results frequently. The policy recommendations are only based on the research results and the authors experiences.

1.7 Audience

The research will be valuable for several actors working on topics related to RE deployment in emerging economies and in Vietnam in particular. The targeted and intended audience are academic scholars, decision makers within and outside the government as well as consultants and international and intergovernmental organizations who aim to increase the share of RE with a de-risk approach.

For researchers and potential investors who would like to have a quick overview of the Vietnamese market, the section "Vietnam Country Context" is of interest. For policy makers and consultants, the analysis, discussion and conclusion is of highest interest.

1.8 Disposition

Chapter 1 – Introduction

This chapter is an introduction into the topic and explains the connection between climate change and the energy sector, Vietnam's power development, financial aspects of energy transition and energy challenges in emerging economies. It further gives basic information about the research endeavour such as research aim and research question.

Chapter 2 –Literature Review

This chapter is a literature review on how to make RE projects more competitive and attractive for private sector investors by using a de-risking approach. It analyses the available literature with the aim to develop a de-risking framework that will be applied to the case of Vietnam. It further presents barriers that RE investors currently face.

Chapter 3 – Methodology

This chapter gives an overview about the methodology applied in the thesis. It explains the evaluation background, the analytical framework and methods for data collection.

Chapter 4 – Vietnam's Country Context
This chapter is a systematic collection of renewable energy-related information in Vietnam and serves as a first step to get familiar with the country. The chapter gives an overview of Vietnam's current state and presents the energy sector in detail with a focus on RE and aspects that are crucial for investors like the permitting process of RE projects. Furthermore, it describes energy-related policies.

Chapter 5 – Analysis
This chapter contains an ex-post effectiveness analysis of current RE policies and an ex-post analysis of investment barriers. It answers research question 1: *How conducive is Vietnam's contextual setting to renewable energy investment?* and identifies RE investment barriers.

Chapter 6 – Policy Scenarios
This chapter in an ex-ante analysis that answers research question #2: *What are possible ways to de-risk renewable energy investments in Vietnam?* Five policy scenarios were developed are presented. The scenarios work as alternatives to current policies. This section builds upon the findings of Chapter 5.

Chapter 7 - Conclusion
This chapter gives policy recommendation, shows the significance and impact of the research and indicates further research fields.

2 Literature Review

This chapter is a literature review on how to make RE projects more competitive and attractive for private sector investors by using a de-risking approach. It analyses the available literature with the aim to develop a de-risking framework that will be applied to the case of Vietnam. It further presents barriers that RE investors currently face.

The literature review provides information on ways of decreasing investment risks of RE projects. For answering research question 2: "*What are possible ways to de-risk renewable energy investments in Vietnam?*" it is important to understand the concept of de-risking thoroughly. Therefore, this chapter starts with background information on de-risking and explains the terms barriers and risks, which are crucial to understand to be able to identify them. It further explains different de-risking instruments. This knowledge is used to develop a policy mix of different de-risking instruments to remove or lower the barriers and risks identified. The most successful de-risking instruments are called "cornerstone instruments". Two of them, feed-in tariffs (FiT) and auctioning systems, are explained in detail.

Background

Even though RE technology is widely available today, the global energy transition is only slowly taking place. It is still expensive in many countries (T. Couture & Gagnon, 2010a) and in most developing countries it is therefore still financially more attractive for investors to invest in fossil-fuel power plants than in large-scale RE projects.

A way to compare the actual costs of different electricity generating technologies is to do Levelized Costs of Electricity (LCOE) calculations, which allow comparing life-cycle generation costs of different electricity generating technologies. To obtain the LCOE of a given technology the total cost over lifetime is divided by the electricity produced over lifetime. It unveils, that RE technologies have high upfront costs and (very) low to almost no running costs. On the other hand, high carbon energy generation projects are less capital intensive but have operating costs that are depending on fuel prices.

A large part of the high upfront costs of RE projects strives from risks, RE project developers face. The potential of cost reduction is immense and can be achieved by reducing risks, which consequently decrease financial costs since banks ask for lower interest rates or smaller shares for private equity. Waissbein states in a UNDP report from 2013, that investors can be attracted by: "reducing risks or by providing a financial incentive" (UNDP et al., 2013, p.31). The United Nations Secretary General's Advisory Group on Energy and Climate Change (AGECC) together with the Deutsche Bank Climate Change Advisors (DBCCA) worked out new ways to foster RE investments in developing countries, since they are currently more expensive than in industrial states (Deutsche Bank et al., 2011).

Wind energy projects for example are on average 40% more expensive in developing countries than in industrialized nations, due to the higher costs of equity and debt (UNDP et al., 2013). Paradoxically in the last decade large-scale RE projects did not get notably cheaper in most developing countries but in industrial states. Even though the costs for technologies did decrease, the financing costs stayed the same or increased because of higher (perceived) risks. The published report by the UNDP stresses these differences between industrial and developing countries and highlights that RE support instruments have to be country-specific.

In a further step the Deutsche Bank Group started a research partnership with the UNDP and developed a "de-risking" approach with the goal to establish a favourable investment environment for RE projects (UNDP et al., 2013; Deutsche Bank et al., 2011). Even though the term "de-risking" is new, the approach is not. In the financial sector there has always been risk management with the aim to minimize risks. However, for the first time a de-risking approach was developed with the specific goal to make large-scale RE projects more economical.

Since the approach is new there is still little literature on it (Deutsche Bank et al., 2011; Frisari & Valerio, 2015; Schmidt, 2014; UNDP et al., 2013, 2013). A de-risking framework for policy makers developed by the UNDP was only applied in a few countries so far: in Kenya, Mongolia, Panama and South Africa but in no South East Asian country(UNDP et al., 2013).

2.1 Barriers and Risks

This section has a closer look at barriers and risks RE project developers face in developing countries and early stage RE markets. The literature review will help to better understand and identify barriers and risks. Compared to the literature on de-risking, there is more literature on barriers available (Beck & Martinot, 2004; Painuly, 2001; Verbruggen et al., 2010). However, the literature is not consistent, nor is there are simple way to apply it in analysis due to the amount of barrier described. This section combines the work of different authors and makes their approaches more applicable.

The definition of "risk" is: "the possibility that something unpleasant or unwelcome will happen" (Oxford Dictionary, 2016, p. n.a.). For example a policy risk occurs if there is the *possibility* that a national government changes policies in a way that the financial stability of an investment is not given any more (Micale, Frisari, Hervé-Mignucci, & Mazza, 2013). Risks are a result of barriers. That specific policy risk would originate from a *political barrier*. Barriers are man-made and "can be overcome or attenuated by a policy, programme, or measure“ (Verbruggen et al., 2010, p.852). Verbruggen further says that they are contextual and dynamic, like potentials, and have to be analysed in every country-case specifically. In the energy sector barriers "are often deeply embedded, reflecting long-held practices centred on fossil-fuels and monopolistic market structures" (UNDP et al., 2013, p.24).

In the literature on barriers, it can be noticed that different authors have found similar RE investment barriers. However, different authors have named and categorized them differently (see table 1) (Verbruggen et al., 2010; Deutsche Bank et al., 2011; Painuly, 2001; Beck & Martinot, 2004). For example "lack of information" is considered a "market-related barrier" by the UNEP, while it is an "informational barrier" in the UNDP report (UNEP, 2004; UNDP et al., 2013). Another example is "Access to finance", which can be a market-related barrier, a political, institutional or even informational barrier, depending on the author. The different categorization of barriers and risks can also be noticed by comparing the UNDP report to other literature. The report states: "barriers related to policymakers, which concern policies and regulation of power markets, can be grouped into a risk category called 'power market risk'“ (UNDP et al., 2013, p. 48). Other authors would put policy related barriers into "institutional barriers" (Painuly, 2001), "legal and regulatory barriers" (Beck & Martinot, 2004) and "political instability" (Deutsche Bank et al., 2011). There are also some cross cutting issues. For example the UNEP report (2004) states that political barriers are "associated with regulatory and policy issues and governmental leadership" while market barriers are "associated with (a) lack of financial, legal and institutional frameworks" (UNEP, 2004). This example shows that "market barriers" are partly "political barriers" since it is arguable that institutional frameworks are shaped by governments.

Analysing the literature showed that there is no literature-wide coherence in the categorization of barriers. Instead there are different categories depending on the author and the variety of categories makes it difficult to use them. To make the information operational for succeeding chapters and to reduce the number of groups, the author has divided the barriers into five thematic groups, depending on the content of the barrier. The new groups contain related barriers found in literature. Some of them are merged to simplify the work. For example the barriers: financial barriers (UNDP et al., 2013), market barriers (UNEP, 2004), market failure/ imperfection, market distortions, economic and financial barriers (Painuly, 2001), cost and pricing barriers (Beck & Martinot, 2004), access to finance and import tariffs (Deutsche Bank et al., 2011) are all covered in the barrier category *market related barriers*. In table 1 all categories and barriers are explained. The five barrier categories are: market-related barriers, political barriers, administrative barriers, informational barriers and technical barriers. In the following section each of them will be defined.

Table 1: Barriers Found in Literature

Category	UNDP (2013)	UNEP (2004)	Painuli (2001)	Beck (2004)	Deutsche Bank (2011)
Market Related Barriers	Financial Barriers	Market Barriers	Market Failure/Imperfection Market Distortions Economic and Financial Barriers	Cost and Pricing Barriers	Access to finance Import tariffs
Political Barriers	Regulatory Barriers	Political Barriers	Institutional Barriers	Legal and Regulatory Barriers	Political instability
Administrative Barriers	Administrative Barriers				Administrative barriers Land title uncertainties
Informational Barrier	Informational Barriers	Analytical Barriers Cognitive Barriers	Social, Cultural and Behavioural		Lack of technical skills
Technical Barriers	Technical Barriers		Technical Barriers		

Source: (Beck & Martinot, 2004; Deutsche Bank et al., 2011; Painuly, 2001; UNDP et al., 2013; UNEP, 2004)

Market Related Barriers

Market-related barriers are those related to the market in a broader sense. Financial barriers (UNDP et al., 2013), access to finance (Deutsche Bank et al., 2011), cost and pricing (Beck & Martinot, 2004) as well as market failure/ imperfection (Painuly, 2001). Examples for market related barriers are a controlled energy sector with no or only little competition (UNDP et al., 2013; Painuly, 2001), subsidies for fossil fuels, no/little or difficult access to capital (Painuly, 2001).

Political Barriers

Political barriers are barriers related to regulatory and policy issues and missing "governmental leadership" (UNEP, 2004). The government sets an institutional/ regulatory framework investors base their business plans on. Therefore, a government has to be reliable and trustworthy when it comes to regulations. Investors seek investment stability and look for countries with official (governmental) RE *strategies and targets* that give planning security (UNDP et al., 2013).

A Power Purchase Agreement (PPA) coupled with a Feed-in Tariff (FiT) is a crucial policy instrument for the support of RE deployment. A missing or *poorly designed PPA* and/or tendering procedures is a barrier. If a government cannot *secure a PPA* over the contracted time, it is a risk for investors (Deutsche Bank et al., 2011; UNDP et al., 2013).

Administrative Barriers

The administrative body of a country puts regulations into place and carries them out. If the administration does not work effectively, it results in risks for investors. Possible shortcomings in the administration related to RE investments are complex and time consuming licensing and permitting processes (UNDP et al., 2013), bad or no communication among different actors (Painuly, 2001), different interests among actors, little or no research and development (R&D), no professionalism in public institutions, no institutions that diffuse information and corruption (UNEP, 2004).

Furthermore, in new markets, different actors still have to learn how to work together efficiently. Actors such as national institutions, businesses, networks and investors will go through a learning process that takes time (learning by interacting). While interacting is still time-consuming at the beginning, it can become faster and more efficient overtime.

Informational Barriers

Informational barriers go back to "quality and availability of information" (UNEP, 2004, p. 16). For example, if there is no information on wind speed or the information available is of poor quality, it is a barrier for potential investors. Informational barriers can also mean a lack of awareness and can result in denial of RE technology among the people (Painuly, 2001). Literature calls this little or no "social acceptance" (UNEP, 2004). An example is "Not In My Back Yard" (NIMBY) initiatives of people who don't want to live close to RE projects (Burningham, Barnett, & Walker, 2015; Devine-Wright, 2014). Informational barriers can also mean a lack of skilled labour, a lack of Operation and Maintenance (O&M) skills or entrepreneurs (UNDP et al., 2013).

Technical Barriers

Technical barriers are barriers that arise because of technical drawbacks. They for example occur if there are different standards or no standards for RE projects, electricity transmission or feeding in electricity (Painuly, 2001). They also appear if an energy system cannot cope with volatile energy supply.

2.2 De-Risking

In the last section of this thesis several RE investment barriers and risks were explained. This section focuses on an approach to lower risks and remove barriers in order to make RE investments more attractive. It is called the de-risking approach

As seen in the literature on barriers, there are several categories with different barriers. To remove more than one barrier, a mix of different de-risk instruments has to be implemented. In policy making it is known that a single instrument cannot overcome all barriers (Tinbergen, 1952). The task of policymakers is to analyse barriers in a first step and to decide what policy instruments can be used to remove them (Verbruggen et al., 2010).

The UNDP has divided de-risk instruments into three different de-risk areas: policy de-risking, financial de-risking and direct financial incentives. Figure 4 shows the de-risk areas and the associated instruments found in literature. In the next section, the most commonly used ones are explained.

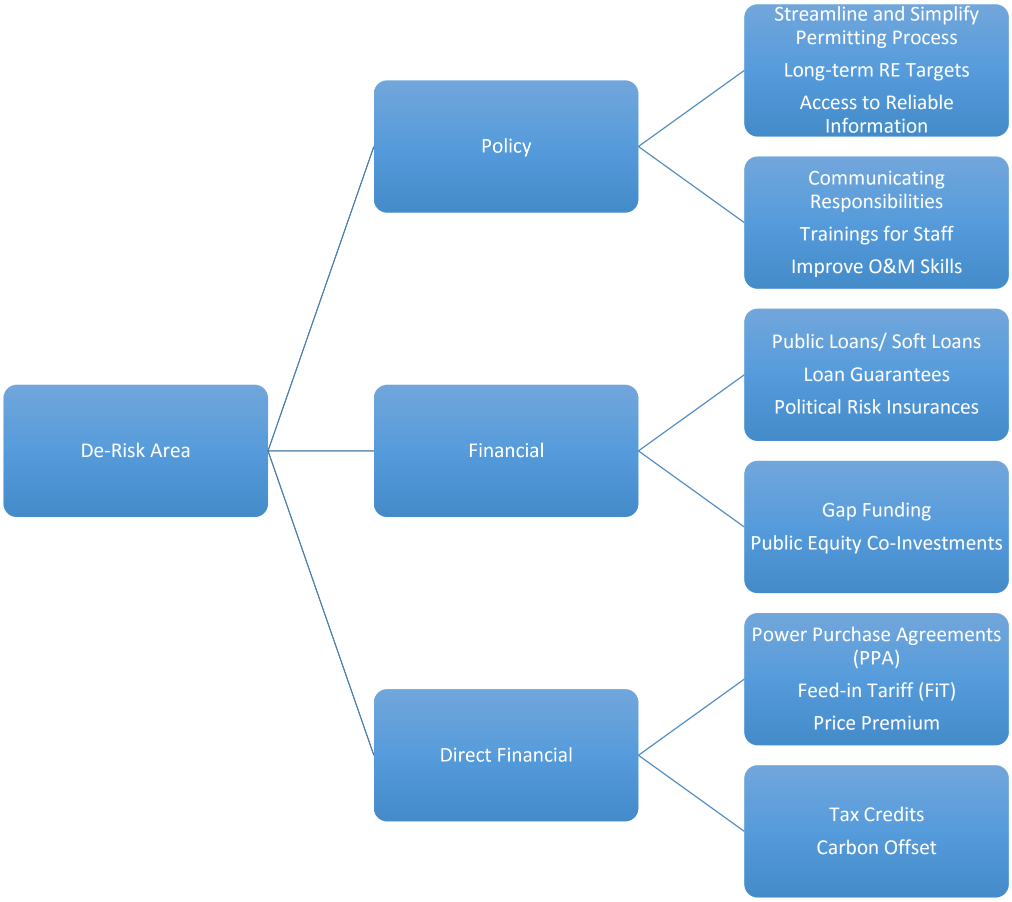

Figure 4: Most Commonly Used De-Risking Instruments

Source: (Beck & Martinot, 2004; Deutsche Bank et al., 2011; Painuly, 2001; UNDP et al., 2013; UNEP, 2004)

Policy De-Risking

Policy de-risking tools aim to smoothen processes and remedy underlying barriers (Beck & Martinot, 2004; Deutsche Bank et al., 2011; Painuly, 2001; UNDP et al., 2013; UNEP, 2004). They go to the root cause of investment risks and try to remove it. In this section the most used policy de-risking instruments are presented.

In general, policy de-risking instruments are more complex than other de-risking options like financial de-risking. Furthermore, they start lowering risks with a delay since it takes time to achieve structural changes and to change processes as well as behaviours. After the implementation, it also takes time to build up trust and make stakeholders such as banks and investors acknowledge the changes (UNDP et al., 2013). However, because policy de-risking allows taking a barrier/ risk away permanently, it is more cost-efficient than financial de-risking. That means that money for this de-risking approach has to be spent only once while many can profit from the change. Especially for developing countries this is an important fact since it prevents them from long-term dependency of international donors.

A prominent example of policy de-risking is to improve the process of obtaining permits and approvals for RE projects. In many cases the procedures are cumbersome and it happens that several permits have to be obtained from different institutions before a developer is allowed to carry out a project. The responsibilities among the institutions are neither obvious, nor clear-cut. Every time a developer has to obtain a permit, there is a risk that problems occur, which lead to delays in the development and construction of projects. Since delays are expensive, even the risk of having one increases the financing costs. In order to reduce the risks for investors a *streamlined and simplified permitting process* can be introduced. This approach consists of reducing the number of actors in the permitting process, *communicating responsibilities* of different actors clearly and *providing trainings for staff* working on the permitting processes in the public sector.

There are several additional policy de-risking approaches that can be applied. For example, improving investors' confidence can be achieved by establishing *long-term renewable energy targets*. This gives investors certainty that the government takes RE deployment seriously and commits its resources for many years.

A lack of fundamental investment information makes it impossible to make knowledgeable investment decisions. Since decisions that are not based on knowledge/ information bear high risks it is crucial to assure the availability of RE related information and data for investor (e.g. wind speed measurements or data on sun hours). The *access to reliable information* helps to reduce risks since developers do not need to spend much time on acquiring information and the information is officially proven and reliable.

The possibility to hire skilled labour is essential for every investor, while the absence of it is a burden of risk. For example, if the energy system experiences disruptions and no experienced personal can be found, it can cause long operational stops. In the worst case expensive experts from outside the country have to fly in to repair and operate the system. To avoid that situation, *technical assistance* and *trainings for local staff* (*improved O&M skills*) is essential.

Financial De-Risking

This section explains the financial de-risking approach. The difference between policy and financial de-risking instruments is that financial de-risking does not aim to change the underlying barriers (Schmidt, 2014; Micale et al., 2013). Instead it shifts risks from the private investor to public actors, such as governments and ministries, bilateral aid agencies, export credit agencies and Development Financial Institutions (DFI).

Shifting the risks leads to an almost immediate decrease of risks for the private investor and consequently lowers interest rates (UNEP, 2004; Climate Policy Initiative, 2015; Climate Policy Initiative, 2014). There are several financial de-risking instruments policy makers can choose from. In the following section the most used ones are presented. There are public loans/ soft loans, loan guarantees, political risk insurances, gap funding and public equity co-investments.

Public loans/ soft loans are usually loans with a lower interest rate and longer repayment period than commercial ones. They can be specifically designed for sustainable or even RE projects. Limited and unlimited *loan guarantees* are another way of financial de-risking. A public actor, for example the government assures a bank to pay for a loan (partially/fully) if an investor fails to do so. This can happen if a contract partner such as a power utility breaks a contract and does not buy electricity anymore. Loan guarantees increase the security for banking institutes and therewith decreases the interest rate. *Political risk insurances* help investors to lower risks in countries with instable political systems and in those with volatile policies. The insurances cover various risks such as currency exchange losses, governmental expropriation and changes due to wars and revolutions. Most typical political risks covered are changing policies that lead to losses like breaking a PPA or FiT contract (Polzin, Migendt, Täube, & von Flotow, 2015). *Gap funding* and *public equity co-investment* are two financial de-risk approaches that involve public actors directly into an investment. G*ap funding* is used to close a financial gap. In this case a public actor can cover it to make an investment viable. If a public actor de-risks an investment with a p*ublic equity co-investment* the public entity becomes a (minority) co-investor.

Direct Financial Incentives

Policy de-risk instruments try to take away barriers, while financial de-risking instruments shift the risk from a private investor to a public actor. However, there are also some barriers that cannot be taken away, nor shifted to another actor. For these cases there are direct financial incentives that incentivise investors to invest even if there are still risks and barriers remaining (Micale et al., 2013).

Due to learning effects, it is usually significantly cheaper to support RE technologies at the beginning than supporting them half-hearted over a long time (UNEP, 2004). Once the costs of RE deployment decrease, (direct financial) de-risking instruments can decrease too. That makes it cheaper to install more RE capacity and to reach RE targets.

Waissbein et al. (2013) argue that FiT is both a policy and a financial de-risk instrument (UNDP et al., 2013). In this thesis they are categorized as direct financial incentives because investors directly receive money for generated electricity. The cornerstone instruments *Power Purchase Agreements (PPA), Feed-in Tariff (FiT)* and *Price Premium* are shortly explained in this section and in more detail in the next section (cornerstone instruments).

Tax credits help investors to spend less money on their equipment. In some countries there are tax exemptions for all products and instruments related to RE projects. *Tax credits* can also mean that the company developing a project and selling electricity after the development does not have to pay income or corporate tax. *Carbon offset* is an additional way for RE project developers to earn money. By selling carbon offset certificates developers can diversify their incomes. That way their income does not entirely rely on selling electricity, which reduces risks. *A Power Purchase Agreement (PPA)* is a contract between the seller (generator) and the buyer (power utility/ network provider) of electricity. It is a mechanism that guarantees, that generated electricity will be purchased at a fixed price for a certain amount of time. Furthermore, it declares that the seller has access to the electricity grid. A contract is usually signed for a period of 10-20 years. A *Feed-in Tariff (FiT)* is a special tariff for electricity generated in RE plants. The electricity seller receives a certain amount of money for every kWh sold. Because the remuneration is pre-set and does not depend on the market, it is called a market-independent remuneration. The FiT can either be set by a regulator or can be the result of an auctioning system (the differences are described in the section "Cornerstone Instruments"). On the other hand, a *Price Premium* is a market-dependent support instrument. A seller receives a certain amount of money per kWh on top of the average spot market. Because the amount of money a project developer receives per kWh depends on the market prices, it is called a market depended remuneration.

Cornerstone Instruments

Cornerstone instruments are the base of a well-designed support scheme (del Río, 2012; UNDP et al., 2013). They focus on the main investment risks and build the foundation for a whole policy de-risking mix that also includes other policy and financial de-risking instruments (Deutsche Bank et al., 2011). There is evidence that some instruments were more successful in achieving high deployment rates than others. The most successful ones are called cornerstone instruments and they help investors to feel more confident about RE investments. Del Rio (2014) calls cornerstone instruments primary instruments and other instruments (tax reduction, soft loans, subsidies etc.) secondary instruments, which further highlights the importance of "cornerstone" instruments. The most often-used cornerstone instrument is a feed-in-tariff scheme that couples a fixed price with a PPA long-term contract. Other cornerstone instruments are quotas, net metering and auctions.

This section presents two successfully used cornerstone instruments in detail, FiTs and auctions. Knowing different instruments and their design options helps to choose the right instrument for a specific country. Del Río points out that the right design of an instrument is as important as the choice of the instrument itself (del Río, 2012).

Feed-in Tariffs

Feed-in-tariff schemes are the most successful and most widely used instrument to support RE deployment worldwide (Kongnam & Nuchprayoon, 2009a). The European Union (EU) states that "well-adapted feed-in tariff regimes are generally the most efficient and effective support schemes for promoting renewable electricity" (European Commission, 2008, p. 1). Germany's success in the fast deployment of RE is highly based on support mechanisms with a FiT scheme as a cornerstone instrument (Kongnam & Nuchprayoon, 2009b; Butler & Neuhoff, 2008; Jacobsson & Lauber, 2006). In 2015, the country had a RE share in its electricity mix of 32.5% (Resch et al., 2006). Today, alone in the EU there are 23 countries using feed-in laws (Agora Energiewende, 2016; REN21, 2015). A total of 108 states have implemented a FiT on national or provincial level.

FiTs are a fixed price per kWh for generated electricity from RE, coupled with a long-term contract (PPA). The contract is between RE project developers (electricity sellers) and electricity buyers (del Río & Linares, 2014). Instead of paying the normal price per kWh, developers of RE projects receive a higher remuneration, that is closer to the cost of generation. Depending on the technology (wind, solar, biomass etc.) and the region, the set price can vary.

Advantages

FiT schemes give a high level of investment security to investors of RE projects due to long-term contracts, cash flows, and transparent remuneration. Because of a steadily growing market, often manufacturers start setting up factories too, which creates jobs in the country that implements a FiT (Aguirre & Ibikunle, 2014; T. Couture & Gagnon, 2010b). Another advantage is, that money is only transferred to already electricity generating projects. Therefore no money "gets lost" on unsuccessfully developed projects (T. D. Couture, Cory, Kreycik, & Williams, 2010). Since different prices can be set for different technologies, immature technologies can be supported too. Furthermore, it is possible to adjust FiT over time and once project development gets cheaper, the remuneration for new projects can decrease too.

Disadvantages

FiT schemes also carry disadvantages. Some of them go back to the price-setting process of FIT (Moner-Girona, 2009; T. Couture & Gagnon, 2010b). Governmental officials set the price without involvement of developers, which makes it difficult to set "the right" tariff and does not allow (price) competition among investors/ developers. Therefore, FiT can be set too high or too low. Furthermore, it is difficult for policy makers to know how much the total policy support will cost.

An example of a FiT that was set too high could be seen in Spain (T. D. Couture et al., 2010; Delrio & Unruh, 2007). The FiT attracted many developers and the share of RE increased. The government missed the chance to adjust the tariffs fast enough. Consequently, the costs for electricity surged, which led to decreasing public support. Ultimately, the possibility of changing policies made developers worry about their investments.

Design

As mentioned above, there are different design options for FiTs. For example, policy makers have to consider who pays for the support mechanism and how to set it up. The costs can either be covered by the government or by consumers. The tariff can be market-independent or market-dependent. While the monetary questions (who pays/ how much) are of high importance, the general design of FiT is crucial too. The main difference between the two models is that market independent FiTs offer a *fixed price* for electricity from renewable energy systems (RES) while market dependent FiT *fluctuate* as much as the market does. Both design aspects -who pays for it and how to set up a tariff system- are discussed in the following section "Government" and "Consumers".

Government

The government has the option to allocate a certain amount of the state's budget for the support of renewable energies. FiT paid by the government do not impact the electricity tariff and therewith assures industrial competitiveness. It might make it also easier to achieve and keep public support, since consumers do not directly see a connection between higher shares of RE and higher costs.

However, if the government covers the costs, there are several risks too. There is the possibility that the allocated budget is exhausted after a time of high RE deployment. That happens, if the support policy is "too" successful and results in a high deployment rate, which could mean the end of the policy with devastating consequences for investors. Another risk is that an initially allocated budget does not get renewed due to elections or other political circumstances.

Consumers

The second option is that consumers pay a RE levy on top of their electricity price. If the support policy works well and leads to higher deployment rates, consumers (private and industry) have to pay more for their electricity consumption. For industrial actors that can result in negative impacts on their global competiveness. However, industrial exemptions can be granted. The fact that customers carry the costs has positive and negative aspects for investors. It can higher and lower their risks: higher consumer prices can be a risk for investors, if consumers start to complain about the price. The moment consumers are unhappy about price developments the financing model becomes a risk. Governments might start to react because of their complains and change the FiT model. However, developers do not have to fear that an allocated budget does not get renewed or gets exhausted. An advantage of this model is that consumers know exactly what their money is spend on, instead of paying tax into a "black box".

Market-independent FiT

In this section, the most common market-independent (*fixed price model)* and market-dependent (*premium price models*) support designs are presented. The design options for market-independent are the *front-end loaded tariff model* and the *fixed price model with inflation adjustment.* The options presented for market-dependent FiTs are the *variable premium FiT policy design* and the *percentage of the retail price model.*

The most basic way to design a FiT is to set a *fixed price model* with a set price that is not linked to the market price of electricity. It is a minimum price with an assurance over a certain period of time (usually between 10-20 years). Since the price does not change, the remuneration can be calculated before the investment is carried out, which assures high investment security. That also makes RE investments more attractive for risk-adverse small-scale investors and for the support of immature technologies. However, that also means that there is no incentive for project developers/ operators to link the electricity generation to the demand (market independent) which can negatively impact the electricity market and grid stability.

The standard fixed price model does not take any market changes into account. However, inflation can be a risk factor and for this reason, there is another model called *fixed price model with inflation adjustment.* The price usually gets adjusted annually or quarterly, which assures investors to also receive a high remuneration towards the end of a project and therefore offers high security, especially in countries with high inflation. If the premium does not get adjusted to the inflation the real value of the premium declines. For policy makers it might be easier to get public support for this model due to lower initial costs. In some countries with high inflation the support scheme is not linked to the local currency but to the US$ instead, which assures low inflation.

The opposite model is a *front-end loaded tariff model***.** This model starts with higher remuneration that decrease incrementally over time. Usually there is a higher tariff for the first 10 years and a lower one for the next 10 years. Since investors usually depend on loans and equity, they have a high interest in paying them back as fast as possible. Higher FiT in the beginning helps them to do so. After loans are payed back, the real costs for developers are also lower since they mainly consist of operational costs. Therefore, the *front-end loaded tariff model* reflects the declining project costs. This allows developers to receive higher net profits hence interests are paid back faster while the total received premium is the same as in a fixed price model.

Market-dependent FiT

Market-dependent FiTs (also called *premium price models)* offer a premium payment that is given on top of the regular market price. In this model the electricity generated from RES is sold on the (spot) market and has to compete with the electricity from regular energy sources. For this reason, there is usually no power-purchase agreement that could lower risks. On top of the spot market price, the supplier receives a premium. However, the regular market price usually fluctuates and can be positively and negatively influenced by market changes such as global oil or gas price developments and electricity demand & supply changes. Since it is hard to predict such changes for an investment period (10-20 years), market-dependent FiT tends to contain higher uncertainties. However, it can also have positive results: A market dependent FiT encourages electricity suppliers to generate electricity when it is most needed (prices are highest) and thereby helps to create grid stability. However, this is only possible with biomass and hydropower, which can easily be regulated. Furthermore, studies show that the higher uncertainties are reflected in higher remuneration. Premium Price Models tend to have higher total costs than market independent FIT (del Río & Mir-Artigues, 2012).

Basic *premium price models* contain high uncertainties for developers as well as for the party that pays since market prices are not foreseeable and can sky rock as much as descent. An option to lower the risks for both is to install a cap or a floor. This model is called a *variable premium FiT policy design*. It makes sure that developers receive a minimum amount of money, which increases their investment security. However, if the price on the spot market reaches a certain retail price, the premium is not paid anymore. It serves as a floor that does not let the price sky rock, nor to crash.

Another market-dependent model is the *percentage of the retail price model.* The model also depends on the market price for electricity. However, it assures developers an additional fixed percentage of the retail price on top of the retail price. For example, in the 1990s when Germany still used this model RE developers received 90% of the retail price for electricity generated by wind and solar.

Auctioning System

Another cornerstone instrument to support RE deployment are auctioning systems. Just recently a trend to implement more auctioning systems began worldwide. In 2005 auctioning systems were used in six countries only, in 2009 in 21 countries already and in 2015 the number increase to at least 60 (IRENA, 2015a); (IRENA, 2015). Figure 5 shows the countries that introduced a RE auctioning systems by 2015 (in blue). It can be seen that the application of auctioning systems is not limited to one geographical region but that auctioning systems are used all over the world. However, there are also a few examples of countries that changed from an auctioning system to a FiT such as Ireland, China and the United Kingdom (UK) have changed their support mechanisms from auctioning schemes to FiTs, there are also examples of countries that change the other way around.

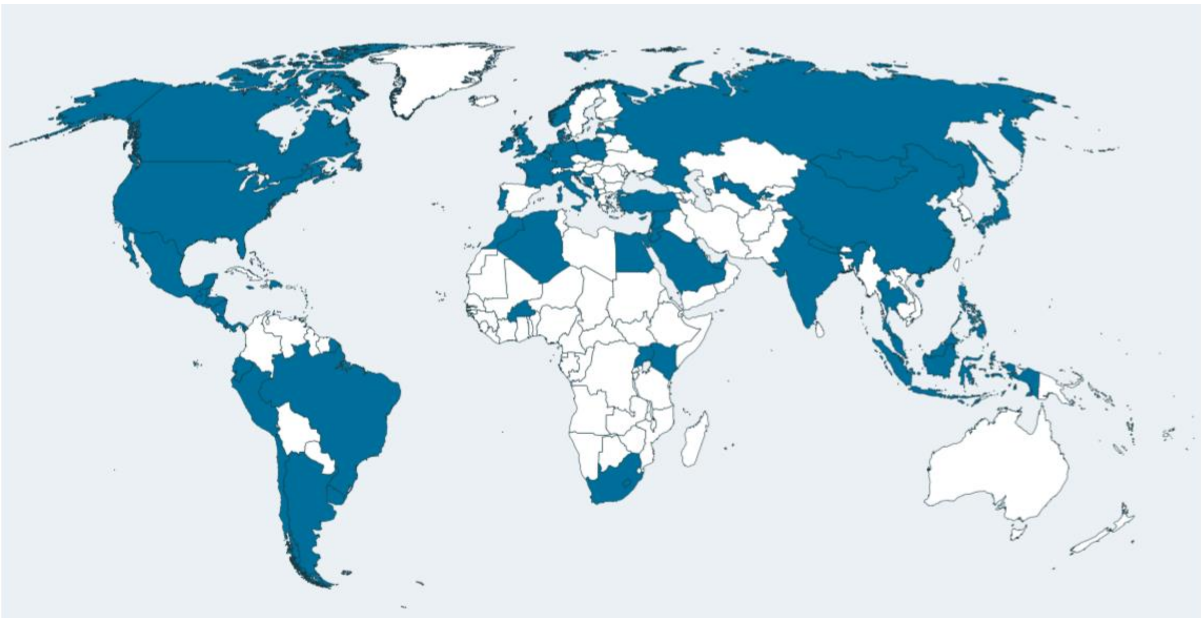

Figure 5: Countries with RE Auctioning Systems

Source: (IRENA, 2015a)

Key for a successful auctioning system is to design it according to the local needs and circumstances. If this is done, it can be an highly efficient and effective instrument for supporting RE deployment (IRENA, 2015); (del Río & Linares, 2014).

This chapter explains the instrument, its functioning and describes advantages and disadvantages of it. Additionally, it describes the central design aspects for policy makers. In particular, it gives options on the *bidding process*, the *price setting* and *possible penalties* for project developers.

Functioning

If a government decides to use auctioning systems as a cornerstone instrument for RE support, the authority calls for tenders (IRENA, 2015a). The bidding process starts for a certain capacity (in MW) or generated electricity (in kWh) of RE projects in (usually) a set area. It follows a bidding process among project developers who submit a price per MW/ kWh they can develop a project for. The authority evaluates the bids and nominates the winning developer, which is the one with the lowest price bid per MW/ kWh. The winning project then can be supported via a FIT, a premium price model, investment grants or a one-time support that reflects the bid.

Advantages

In an auctioning scheme developers are included in the price-finding process through their bids (IRENA, 2015). They show how much money they plan to spend per MW/kWh. The competition among developers lowers the price and the price setting in auction systems is therefore transparent and usually close to the real costs. Studies have shown that auctions on average are more cost-efficient than other support schemes like normal FiTs.

Every auction is for a specific project of a specific size, calculated in MW. Through that setting the government knows exactly how much money it will spend. Sudden electricity price hikes cannot happen in such a system. At the same time the government also knows that previously set deployment targets will be achieved since they offer support for exactly the capacity that is needed. Another advantage is on the legal side: it is a contract between two parties that shows commitment from both sites. Project developers therefore have higher regulatory certainty; hence they don't have to worry about policy changes or a change of remuneration. Similar to other support schemes, the price per kWh usually decreases after a couple of successfully implemented projects due to learning effects.

Disadvantages

Before developers can bid, they have to calculate the expected costs, which increases the upfront planning and drives up the transaction costs. The higher initial barriers can lead to an exclusion from the bidding process of smaller developers. In some cases, this can lead to a bidding process with few participants, which can lead to a higher price. If the higher a priori costs are passed on to the final bid price the instrument can be more expensive than a different support instrument (like a FiT). Another potential issue is "underbidding", which means that developers submit a bid that is too low to cover their expected costs. Even though they win the auction with the lowest bid, they won't start carrying out a RE project, since their income per MWh wouldn't cover their expenses. Underbidding can be an even bigger concern if state owned enterprises (SOE) are involved in the bidding process. Cases from China have shown that especially SOEs tend to underbid since they can easily deal with deficits for some time. Strategic underbidding can happen, if developers wait until technologies get cheaper.

Another disadvantage mentioned in literature is the unlikeliness of building up a proper manufacturing industry for RE technologies. Most countries that use an auctioning system do not have national RE technology manufacturing, but mainly import technology from abroad. Another aspect to consider is that auctions usually promote technologies that are already mature. New technologies are generally not supported by auctioning systems.

Design

The design of any policy instrument is crucial. Therefore, this part of the thesis shows different design aspects that should be considered and applied if an auctioning system is used. Following, the *bidding process*, *price setting* options and *possible penalties* for project developers are explained.

Bidding

A bidding price that is clearly defined and communicated to all parties involved is essential. The number of bidding rounds as well as the time between the rounds has to be communicated in advance. The breaks between the rounds should not be too long to avoid bidding processes that take several years.

There should be a *minimum* number of bidders for every auction in order to have some competition that decreases the final price. Another way to avoid exaggerated bids is to set a maximum price. If that price is exceeded, the auction can be cancelled (for example, Denmark did this for offshore wind power projects). There are two bidding system options:

a) Sealed-bid: Bidders only know their own bid
b) Descending-clock auction: bidders know other bids too

Del Rio (2014) suggests that a good design is a mix out of the two bidding designs (del Río & Linares, 2014). In the beginning bidders should know about other bids in order to get an idea about the prices. Later on, the bidding should be sealed.

Price Setting

There are several ways of setting a support level for developers who won an auction:

c) Uniform Pricing: The last bid sets the price for all bidders/ winners
d) Pay as bid: The winning developers receive the price they submitted
e) Vichrey: The winner receives the price of the bid of the second, the second of the third etc.
f) Median: The median of the bids sets the price for all winners

Furthermore, the guaranteed support time has to be set in advance. Depending on the length, auctions can become more or less attractive. If a developer wins a project, a 10-20 years' contract is usually signed between the project developer and the entity that purchases the electricity. The support period has to be clear and should not be too short. A short period inclines the price per kWh, a lower price per kWh is achieved by longer support periods.

The remuneration model has to be chosen too. It can either be a feed-in premium (in US$/MWh) or a capacity payment (US$ per MW and year). A capacity payment is comparable to an investment grant that is paid over the length of the contract. Worldwide, there are more projects that are supported by a feed-in premium (del Río & Linares, 2014).

Penalties

As described in the section "disadvantages" developers can win an auction with an offer that is too low and would not cover the costs. Developers will therefore no start carrying out the won project. To avoid that, there should be a penalty that avoids project hold-ups. There are different options to design a penalty scheme. It can either be:

a) **a fixed amount of money**
   per MW / MWh/ linked to the investment sum
b) **a price increasing over the time of the delay**
   e.g. a fixed amount per month

The amount of money should not be too high, since developers might get discouraged to bid at all. However, it should not be too low either since developers would not care about the penalty at all in that case. Additionally, there should be a penalty for developers who entirely fail to develop a project. A deadline for starting constructing a project should be put in place, too. The time between winning an auction and starting to build a project should not be too long. Del Rio and Linares suggest to further set a deadline for the completion of the project (Ragwitz et al., 2014). A short deadline is preferred, since it avoids underbidding (over optimisms about price developments). However, there can also be delays due to external factors. Often developers have to wait for a permit. Therefore, there should be a penalty exception for delays caused by official authorities.

2.3 Summary Cornerstone Instruments

The two cornerstone instruments presented, the feed-in tariff and the auctioning system have advantages and disadvantages. This section helped to understand different design options. Knowing differences help to choose the right instrument for a specific country context. Table 2 show the advantages and disadvantages of auctioning systems and FiT.

Table 2: Advantages & Disadvantages of Auctioning Systems and FiT

Auctioning System		**Feed-in Tariff**	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
Inclusion of developers in price finding	High transaction costs	High level of investment security	Price setting insecure (overcompensation possible)
Transparent price setting	High initial barriers for developers	Long term contracts	Can lead to increased electricity prices
Cost efficient	Can reduce competition and increase price	Transparent remuneration	Difficult to know total policy costs
Good plannability of expenses	Possibility of underbidding	Job creation in manufacturing	No price competition
Good plannability of deployment rate	Less likely to attract manufacturers	No support of unsuccessful project	High initial investment not addressed
High regulatory certainty for developers	Mainly support of mature technologies	Possible to support immature technologies	
		Option of adjusting tariffs	

2.4 Conclusion

This chapter gave an overview about risks and barriers for large-scale RE investments. Especially in developing countries there are many investment barriers and risks that drive up the project costs. The chapter described barriers found in literature and categorized them in five groups: market related barriers, political barriers, administrative barriers, informational barriers, and technical barriers.

The chapter further explained ways of removing barriers. This can be achieved by applying a policy mix with de-risking instruments from three de-risking categories: policy de-risking (removing a barrier), financial de-risking (shifting a barrier from a private to a public actor) and direct financial de-risking (incentivising investors despite of barriers).

The most successful instruments (cornerstone instruments), feed-in tariffs and auctioning systems were explained in detail. They have helped to increase the RE deployment rate in many countries worldwide. Depending on the country context, auctions or FIT can be the more promising instrument. This chapter showed design option and advantages as well as disadvantages of the instruments. It furthermore provides information for policymakers to analyse barriers and to decide what policy mix can work to remove barriers and risks.

3 Methodology

This chapter gives an overview about the methodology applied in the thesis. It explains the evaluation background, the analytical framework and methods for data collection.

This thesis analyses Vietnam as a case for de-risking RE investment by using an ex-post and an ex-ante analysis. In this section the research method and the analytical framework to identify barriers and risks and to remove them is presented and explained. This chapter starts with background information on policy evaluation in general. It then explains shortcomings of other frameworks and the advantages of the analytical framework that was specifically created for this thesis. The chapter ends with a section on methods on data collection.

3.1 Evaluation Background

Evaluating policies is a way to help policymakers to make knowledgeable decisions in policy making (Vedung, 2000). There are different ways of evaluating policies. An evaluation can be carried out after the implementation of a policy (ex-post) or before the implementation of a policy (ex-ante). Following, the main aspects of both methods are explained.

Ex-post evaluation

In ex-post evaluations the effectiveness of already implemented policies in the aim of reaching their objectives can be assessed (Vedung, 2000; European Parliament & Council, 2002). For the assessment firstly available data and information has to be collected and in a further step assessed. Ex- post evaluations are a way to give feedback and information about the impact of a policy. It also shows if the expected objectives are reached. Policymakers can learn from previous mistakes and successes through the evaluation. If the result of an ex-post analysis is negative, an adjustment of the evaluated policy is recommended.

Ex-ante evaluation

Ex-ante evaluations on the other hand assess prospected effects of future policies. With the use of models and or scenarios different options can be assessed (Vaz & European Environment Agency, 2001). Article 10 of the 6th Environmental Action Program for the European Union (1600/2002/EC) says: ex ante evaluation is the "evaluation of the possible impacts (..) of new policies including the alternative of no action" (European Parliament and the Council, 2002, p. 242/14).

In the evaluation of policies experts recommend to described the following elements: actors, inputs, outputs and outcomes, impact and effectiveness (European Parliament and the Council, 2002; Mickwitz, 2003).

Actors are all bodies that are involved in the policymaking or are effected by the implemented policy (intended or unintended). These are for example authorities, NGOs, citizens, businesses.

Inputs are all resources used in the making and implementation/ delivery of outputs. That includes finances, working hours, equipment etc.

Outputs are the final product the target group faces, for example de-risking instruments like a streamlined permitting process.

Outcomes are the reaction of the targeted group on the Outputs, for example the investment in renewable energy projects.

Impacts are the result of Outcomes such as higher renewable energy deployment.

Effectiveness describes the capability of achieving a desired result.

The analysis carried out in this thesis will not cover the elements actors and inputs due to a lack of information and difficulties obtaining them as an outsider.

3.2 Analytical Framework

After familiarising the reader with the background of evaluation, this section explains the analytical framework. In the de-risking literature there are predominately two analytical frameworks used that were developed by the UNDP and Deutsche Bank (UNDP et al., 2013; Deutsche Bank et al., 2011).

Collecting and analysing de-risking literature in the literature review showed that current analytical frameworks have shortcomings. The UNDP framework as well as the framework by the Deutsche Bank have approaches that are not user-friendly. The approaches start with de-risking areas (policy, financial and direct financial incentive) and then give options of de-risk instruments (UNDP et al., 2013; Deutsche Bank et al., 2011). However, the section 2.1 on barriers and risks showed that RE investment barriers in emerging economies are diverse. Depending on different authors they are categorized in different categories (see chapter 2 literature review)

The framework used in this thesis uses the barrier categories developed in the literature review (see chapter 2) and lists all barriers and instruments found in literature. The newly established categories of the plentiful barriers are: technical barriers, political barriers, market barriers, informational barriers and administrational barriers.

These categories form the foundation of the analytical framework. From there it is possible to find and assign a de-risk instrument that allows the removal of a barrier or risk. This approach is problem-based instead of de-risk areas/ instrument-based. It appears to be more practical since it focuses on barriers and instruments. The question which de-risk area the chosen instrument belongs to is of secular importance for the removal of a barrier and is therefore not in the front.

Additional to de-risk instruments found, the instrument “restructure responsibilities” was added. Even though it is similar to the instrument “streamline permitting process”, it can further help to de-risk. The administrative barrier “Complex & time consuming permitting processed” as well as the market-related barrier “Controlled Market” are written in bold letter. That visualizes that they are *main barriers* with *sub-barriers*. Also the sub-barriers can be addressed with specific instruments. Table 4 shows the framework: Reading the table from the left starting from the barrier categories, to the right, finding a specific barrier, it is easy to select the right de-risk instrument.

Table 3: Barrier Categories, Barriers and Corresponding De-Risk Instruments

Barrier Category	**Barrier**	**Instrument**
Political	Insufficient cornerstone instruments	Power Purchase Agreements (PPA) Feed-in Tariff (FiT) Price Premium
	Volatile policies	Long-term (RE) Targets
	Insufficient R&D	Increase R&D efforts
Administrative	**Permitting process**	**Streamline and simplify permitting process** Restructure responsibilities and processes Trainings for staff Communicate responsibilities
	Diffusion of information	
	Communication among actors	
	Cooperation among actors	
	Corruption	
Market Related	**Controlled Market**	**Liberalize market**
	Fossil fuel subsidies	Remove fossil fuel subsidies
	Access to capital	Gap funding Public equity co-investments Trainings Public loans/ soft loans Loan guarantees Carbon offset Tax credits
Informational	Availability of know-how	Increase R&D Improve access to reliable information Communicate responsibilities Restructure responsibilities Improve RE social acceptance/ support Trainings for staff Improve O&M skills
	Access to reliable information	
	Skilled labour	
	Social acceptance	
	Missing diffusion of information	
Technical	No national wide standard	Implement national wide standard
	Old infrastructure	Improve infrastructure

The further analysis of this thesis is divided into four steps 1) identifying and describing the country context 2) analysing the effectiveness of current RE policies 3) developing policy scenarios with different policy de-risk instruments. Figure 6 visualises the approach used in this thesis.

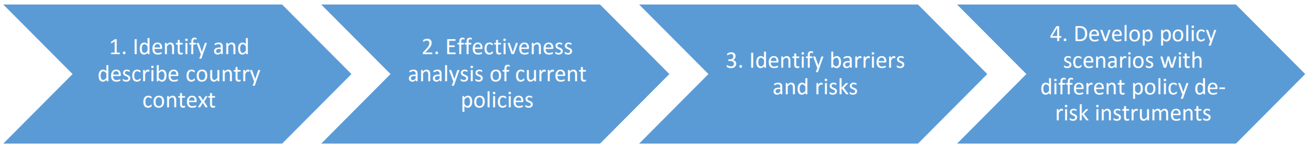

Figure 6: Analytical Steps

Identify and describe country context

The first step, to identify and describe the country context helps to get familiar with the country and builds the foundation for both analysis, the ex-post and the ex-ante, carried out in next steps. Chapter 4 "Country Context" is a systematic collection of RE related information in Vietnam. The data includes information on the energy sector, the RE environment and RE policies.

Effectiveness analysis of current policies

After the description of the context the effectiveness of the current policies were analysed.

Identify barriers and risks for renewable energy investment

In order to answer research question #1 *"How conducive is Vietnam's contextual setting to renewable energy investment?"* the RE context in Vietnam was analysed. This is an ex-post analysis that was conducted by a review of policies & reports and other sources of information as well as by conducting interviews. Part of this analysis is the assessment of the currently used de-risk instruments. It shows which de-risk instruments are already used and how they influence barriers and risks. Furthermore, it assesses which barriers and risks are not sufficiently covered yet. A structured approach uses grades 1-3 to rate the successful application of de-risk instruments.

Developing policy scenarios with different policy de-risk instruments

In order to answer research question 2 "*What are possible ways to de-risk renewable energy investments in Vietnam?"* an ex-ante analysis was conducted. In the analysis five scenarios, that use different de-risk instruments, were created and advantages as well as disadvantages are described.

3.3 Methods for Data Collection

Different sources were used in order to obtain data for a thorough evaluation that made it possible to answer the research questions. The sources are:

A. Journal articles and reports e.g. on de-risk, barriers, renewable energy, Vietnam, policies and policy evaluation
B. Official governmental documents on (renewable) energy, support mechanisms and sustainable development

C. Internet websites e. g. that cover news in Vietnam and energy developments
D. Vietnamese newspapers (online and offline)
   Newspapers have a special function in Vietnam, since there is no free press in Vietnam. Newspapers are therefore are an organ for public announcements
E. Semi-structured face-to-face interviews with 16 experts (see appendix) in Vietnam. The author could get in touch with experts through his previous work in Vietnam and with the help of his network. Furthermore, he attended the conference "The First International Workshop on Renewable Energy for the Mekong Delta" in the south of Vietnam, in the city Can Tho, where he interviewed several participants. The semi-structured interviews allowed to get answers to the questions asked while the experts could also talk about their specific field of expertise and their experiences.

4 Vietnam Country Context

This chapter is a systematic collection of renewable energy-related information in Vietnam and serves as a first step to get familiar with the country. The chapter gives an overview of Vietnam's current state and presents the energy sector in detail with a focus on RE and aspects that are crucial for investors like the permitting process of RE projects. Furthermore, it describes energy-related policies. This chapter helps to answer research question #1 *How conducive is Vietnam's contextual setting to renewable energy investment*. At the end of this chapter, based on the desk research, an ex-post analysis of the effectiveness of current policies is presented. It shows barriers and risks as well as opportunities for RE developers.

4.1 General Information

Figure 7: Map of Vietnam

Source: (Vietnam.nz, 2016)

Vietnam is a country located in South East Asia with a territory of more than 330.000 square meters and a population of about 90 million. Figure 7 is a map of Vietnam showing the location and the bordering countries. The population in Vietnam is rather young with an average age of 29.6 years (C.I.A., 2016). About 65% of the total population lives in rural areas, with a trend towards more people living in cities. Since the opening of the country's economy with the introduction of a market-based economy (Doi Moi) in 1986, the country had remarkable economic growth rates. In 1988 the agricultural sector accounted for 46.3% of the GDP. Since then other sectors gained importance. Today, the most important sectors are the industrial and service sector. In 2014 the agricultural sector accounted for only 17% of the GDP, while the service sector accounted for 44% and the industrial sector for 39%. Due to the constant economic growth of about 6.2% per annum since Doi Moi, the GDP per capita increased from US$699 to US$2052 in nominal terms in the period from 2005-2014 (C.I.A., 2016). Consequently, Vietnam officially made the step from a low-income country to a lower middle-income country in 2009.

The strong economic growth of the country allowed Vietnam to take the Millennium Development Goals (MDGs) seriously and to strive to solve some of the most pressing issues in the country. Internationally Vietnam is considered as one of the top countries in the achievement of the MDGs, which were planned to be achieved by 2015. It managed to make substantial improvements in most of the goals and fully achieved the goals (World Bank, 2016):

- #1 Eradicate Extreme Poverty and Hunger
- #2 Achieve Universal Primary Education
- #3 Promote Gender Equality

Especially in the achievement of goal #1 "Eradicate Extreme Poverty and Hunger" big advances were made. The poverty rate dropped from 15.5% in 2005 to 8.4% in 2014. Furthermore, Vietnam made advances in health-related goals. However, goal # 7 "Ensure Environmental Sustainability" was not achieved even though international reports rank Vietnam among the 10 countries most affected by climate change. In the last 50 years the temperature increased by 0.5°C to 0.7°C, which led to a sea level rise by about 20 cm (Socialist Republic of Viet Nam, 2015). Along the enormous coastline the effects can already be seen. Beaches are diminishing and in some regions (for example in the Mekong Delta) the groundwater is getting saline.

Even though MDG goal #7 was not achieved yet, there are new strategies and regulations to decrease Vietnam's environmental impact. In 2012, the government introduced a green growth strategy (VGGS) that supports sustainable development (ISPONRE, 2009). The objective of the National Green Growth Strategy is: "to achieve the low carbon economy and to enrich natural capital, (…) which requires that mitigation of greenhouse gas emissions (…)" (Viet Nam News, 2015c). The strategy aims to reduce GHGs in the energy sector by 10-20% in the period 2011-2020 in a business as usual (BAU) scenario (baseline 2010). 10% of the reduction goal is voluntary reduction and 10% will depend on the financial help of international donors.

Additionally, Vietnam submitted, prior to the Climate Conference in Paris in December 2015, Intended Nationally Determined Contributions (INDCs) stating the country will decrease it's GHG by 8% by 2030, respectively by up to 25% by 2030 (baseline 2010) if international actors support the development (Socialist Republic of Vietnam, 2012).

However, Vietnam faces a big obstacle: corruption. In a 2015 survey about corruption by Transparency International Vietnam ranked 112 out of 167 countries on (Transparency International, 2015). In a state visit in May 2016 the president of the United States of America, Barack Obama pointed out, that development agencies as well as private companies frequently have to bribe. They have to pay officials to be able to carry out and finish projects. The amount of the bribes are usually between 20% and 50% of the project costs (Harris, 2016).

4.2 Energy Sector

This section gives an overview about the energy sector in Vietnam, which is fast changing. Following are up-to-date information on Vietnam's primary energy resources, electrification, electricity demand and supply, energy security, energy infrastructure and electricity tariffs.

Primary Energy Resources & Power Challenges

This section provides information about Vietnam's domestic primary energy resources, on wind and solar potential and current and future power challenges.

Primary Energy Resources

In Vietnam several primary energy resources can be found. These are coal, oil, natural gas, uranium and water for hydropower. Furthermore, there is a high potential for other renewable energies such as biomass, geothermal, wind and sun (Massmann, 2011).

Wind

In terms of wind power potential Vietnam profits from two aspects. Firstly, it has a costal line of more than 3000 km. Secondly, the country is located in a monsoon area. For the two reasons Vietnam has good climate conditions for wind energy. In the last couple of years several organizations undertook studies and wind speed measurements. A study conducted by MOIT measured that there are good to excellent wind speeds on 8.6% of the Vietnamese territory (MOIT & AWS Truepower, 2011). Some sources say the total technical[3] potential for wind power projects in Vietnam is around 27 GW with an average wind speed starting from 6 m/s (MOIT & AWS Truepower, 2011). However, others claim that there are not reliable studies about the wind power potential in Vietnam yet. The data available on total wind power technical potential contains figures from under 2000 MW to up to 100,000 MW (MOIT & AWS Truepower, 2011).

Solar

Since the country is located in a subtropical area, close to the equator, the conditions for solar energy are generally good. A report by a Spanish consortium came to the result that the theoretical potential for concentrated solar power (CSP)[4] systems lies between 60-100 Gigawatt-hours (GWh) per year, while the theoretical potential for PV systems is between 0.8-1.2 GWh/year (Massmann, 2015). The intensity of solar radiation is similar to Spain's and Italy's (Nguyen Ninh Hai et al., 2015). The potential is similar to locations in Thailand and the Philippines (Asia Biomass, 2015).

Power Challenges

Despite the rich primary energy source the country is standing at a crossroad. The country's electricity demand is increasing fast and the primary energy sources, coal, oil and natural gas are almost exhausted. Since energy-intensive industry is the core of the economic growth, the government is highly concerned about energy security. A statement by the prime minister Nguyen Tan Dung from the begining of 2016 shows the importance of the energy development: "Energy is of paramount importance to Vietnam's growth and it is a decisive factor for the country's high and sustainable growth. It is difficult for Vietnam to realize growth targets if energy runs short" (Viet Nam Energy, 2016).

Currently Vietnam plans to cope with the increasing electricity demand mainly by building new coal power plants. This brings the country into a new dependency of coal exporting countries and has a negative impact on the national trade balance sheet (Viet Nam Energy, 2016). Until the 1990s most of the fossil fuels extracted within Vietnam were exported. This has changed drastically in the last two decades. With increasing energy demand, the domestically available resources were used within the country. That led to a decreasing export of natural resources to neighbouring countries. Today the coal extracted in Vietnam does not meet the national demand anymore. In order to meet the increasing demand of coal, the fossil fuel has to be imported. In 2016 the country imports several millions of tons already, by 2020 it will be about 20-30 million tons of coal per annum (Viet Nam Energy, 2016).

Additional to the shrinking coal reserves, the gas and oil reserves are declining too. Experts say, that they will be exhausted within 20-30 years (Viet Nam Energy, 2016). Much of the reserves

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[3] Technical potential does not take into account any economic or market concerns but only system/topographic constrains, land-use constraints and system performance (Delegation of German Industry and Commerce in Vietnam, 2015).

[4] By using mirrors or lenses, large areas of sunlight are concentrated onto a small area that results in high temperatures which are used for running a generator

will not be exported but used domestically. The government published a strategy to "actively seek for the replacement of gas sources which shall be declined and depleted in the near future" (Socialist Republic of Vietnam, 2016). Additionally, the government is looking for countries to have long-term coal import contracts with (Massmann, 2015).

Especially during hot summer month there are frequent power shortages in Vietnam. There are two reasons for it (Viet Nam News, 2016a; Viet Nam News, 2016): firstly, hot weather leads to an intensified use of cooling technology such as air conditioning systems that lead to an increased electricity demand. Secondly, rivers contain less water in hot summer months. This phenomenon is getting even stronger with climate change. As a consequence, the pattern of precipitation is changing and temperatures are increasing. Since a high share of more than 37% of electricity is generated by hydropower plants, the changes in the water flow are noticeable (Viet Nam News, 2010).

Electrification & Energy Infrastructure

This section provides information on the state of electrification and on the energy infrastructure in Vietnam.

Electrification

In terms of electrification Vietnam has made strong and fast progress (IEA, 2016b). In 1998 only 77% of all households were connected to the power grid, compared to 96% in the year 2010 (Khanh Toan et al., 2011). An improvement of the rural electrification could be achieved too. While in 1976, one year after the reunification of North- and South Vietnam, only 2.5% of the rural population had access to electricity, is was 98% of them in 2013 (WB 2015b).

Most of the 9,120 communes in Vietnam are already connected to the power grid (World Bank, 2012). However, 41 of them (0.5%) get electricity from local power production. In another 41 communities, mainly in mountainous regions and on islands there are off-grid solutions, instead of a costlier connection to the national grid. About 1 million Vietnamese in 189 communities remain without access to electricity until today.

However, in Vietnam there are constant power cuts, especially in rural areas but also in urban areas (USAID, 2014). Consequently, being connected to the power grid does not mean to have a constant access to electricity (World Bank, 2013). Thus, a large number of factories, offices, hotels and high-class homes prepared for these circumstances by installing diesel power generators.

Energy Infrastructure

The constant power cuts show that the electricity infrastructure is in poor conditions with high electricity losses in transmission and distribution (IEA, 2016a). However, the losses were already considerably lowered in the last decade. In 1990, losses were still 25.4% while in 2012 they were drastically reduced to about 8.9% (Asian Development Bank, 2015a).

Improving the infrastructure is expensive: huge investments have to be carried out. Alone in the last five years, the State Owned Enterprise (SOE) Electricity of Vietnam (EVN, which is the owner of the electricity grid, spent 480,000bn (US$22.3bn) on power plants and the electricity grid (Asian Development Bank, 2015a). A big and important project was a new transmission line that improves the north-south electricity exchange. For the period 2016-2020 another investment package of Vietnamese Dong (VND) 600.000bn (US$27.9bn) is planned to be spent in the electricity sector with the help of international partners and development assistance loans (Enerdata, 2015). The revised PDP VII states that total needed investment in the electricity sector for the period 2014-2030 is US$130.64 billion (US$55.46 billion for 2014–2020, US$35.86 billion for 2021–2025, and US$39.32 billion for 2026–2030) (Socialist Republic of Vietnam, 2016). The power sector will need investments between US$94.12 billion for generation expansion (including private investments) and US$36.52 billion investments for improving the transmission and distribution network (Socialist Republic of Vietnam, 2016). Investment costs are often amplified by the lack of basic infrastructure. Bridges and streets that can stand heavy vehicles and machinery are often missing and have to be built before any energy-related projects can be carried out.

One obstacle in the endeavour to update the infrastructure is EVN’s shortage of money. In the last couple of years, the SOE made major losses. Alone in the year 2014 the company reported a loss of VND16.8 trillion (US$789.6 million), even though it had increased the electricity prices steadily (Socialist Republic of Vietnam, 2016). EVN will not be able to get enough funding for improving the whole infrastructure on its own but needs the help of international partners and private investors.

Electricity Demand & Supply

This section provides information on the electricity demand and supply.

Electricity Demand

In Vietnam the energy demand increases steadily. However, compared to other countries, Vietnam’s per capita energy consumption is still low: in 2013 Vietnam consumed 0.67 tons of oil equivalents[5] (toe) per capita (Pham Khanh et al., 2012). The international average is 1.9 toe/cap. Yet, when it comes to CO_2 emissions per GDP (energy intensity) Vietnam ranks 19 (1 is worst) in a global comparison with more than 140 countries (data from 2013) (IEA, 2016b). It emits 1.41 kg CO_2-equivalents per US dollar of GDP. For comparison: in Germany the ration is 0.24 kg/US dollar of GDP.

The national electricity demand is projected to drastically increasing too (see figure 8). The official governmental Power Development Plan (PDP) VII by the Vietnamese government projects an annual demand increase of 9.9% for the period 2016-2020, of 8.1% in the period 2021-2025 and 7.2% between 2026-2030 (IEA, 2015). The increase goes back to several changes (Socialist Republic of Vietnam, 2011c). First of all, the population is still growing, which results in more electricity users (Asian Development Bank, 2015a). Secondly, fast urbanization is happening with more people living in cities, using more electricity. However, the most important change is the economy. The fast-growing economy and a consequently wealth-gaining population consumes more electricity. However, also within Vietnam and its society there are big disparities. While big parts of the population in cities start using devices that consume high amounts of electricity, such as air conditioning systems, freezers, fridges and washing machines, the rural population remains poor on average and consumes a lot less electricity (C.I.A., 2016); (Anandarajah & Tomei, 2015). In the period between 1990 and 2014, electricity demand increased by 12-15% annually (Asian Development Bank, 2015a). In 2014, the main electricity consumer was the industry with a share of 53.9%, private households consumed the second most electricity with a share of 35.6% followed by the commercial sector with a share of 4.8% (Viet Nam Energy, 2016). The agricultural and forest sector together had a share of 1.5% and other sectors consumed 4.5% of total electricity in Vietnam.

[5] Tonne of oil equivalent (toe) is a unit of energy defined as the amount of energy released by burning one tonne of crude oil.

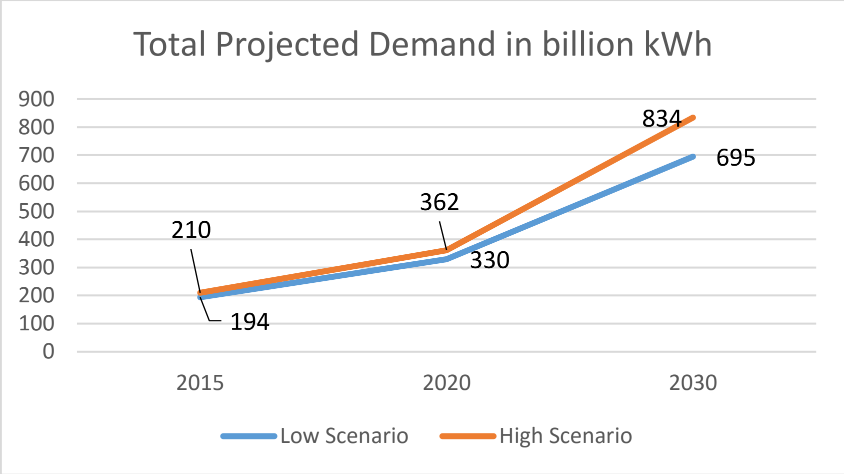

Figure 8: Total Projected Demand in billion kWh 2015-2030

Source: (Socialist Republic of Vietnam, 2011c)

Electricity Supply

In order to meet the demand increase, the supply increased too. Since 1990, electricity generation increased from 8.6 Terawatt-hours (TWh) to 145.5 TWh in 2014. In 2014, the total installed capacity was 34 GW (Socialist Republic of Vietnam, 2011c). 37.62% of electricity was generated by hydropower plants. Second most electricity was generated by gas power plants with a share of 30.89%, followed by coal (25.86%) (Viet Nam Energy, 2016). In figure 9 the electricity generation capacity can be seen from the period 1971-2013. The governmental response to the increasing energy demand is to quadruple the installed power generation capacity from 19,735 MW (2010) to around 75,000 MW in 2020 (ADB, 2015).

The current plan foresees to mainly install new coal power plants. EVN, the state-owed electricity utility, expands fast: 10 new coal power plans are currently under construction with a capacity of more than 5.000 MW (KfW Development Bank, 2015; Socialist Republic of Vietnam, 2015b). Additionally, it plans on developing another 34 coal power plants with a total capacity of 9,853 MW.

Furthermore, there are plans to build nuclear power plants (Enerdata, 2015). However, the construction of them were already delayed several times (Socialist Republic of Vietnam, 2011c). Today, sources say the construction would start in 2019 or 2020 (Thanh Nien Daily, 2015); (Thanh Nien Daily, 2015). An agreement to cooperate in the development and construction of a nuclear power plant (NPP) was already signed with Russia (World Nuclear Associatoin, 2016).

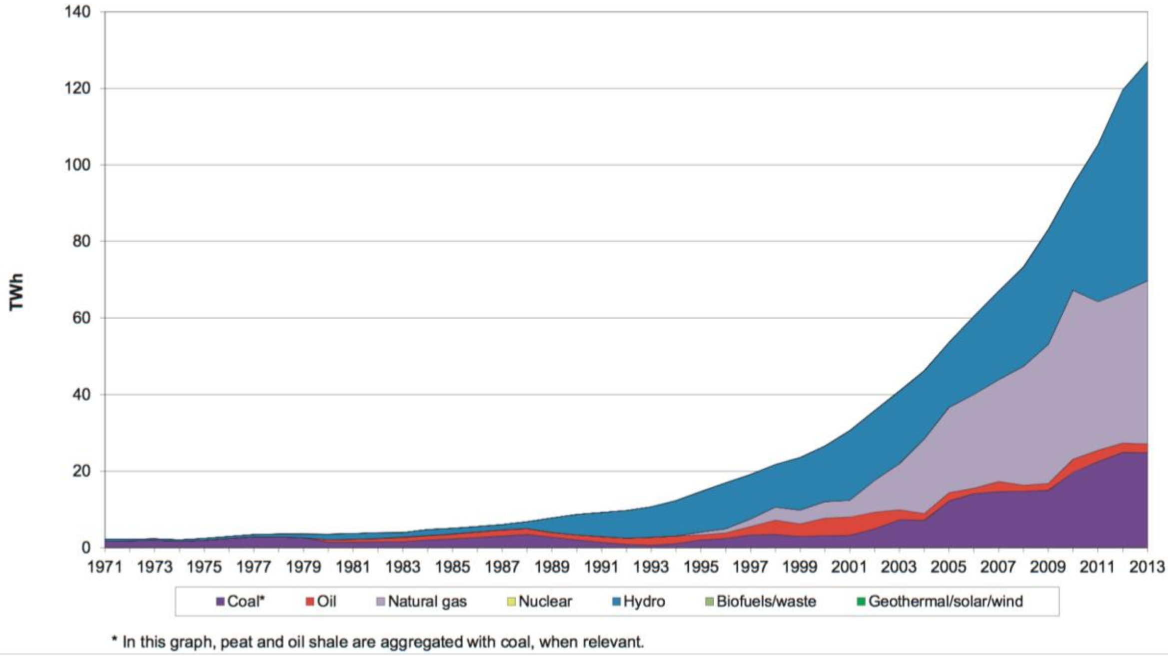

Figure 9: Electricity Generation by Fuel in Vietnam

Source: (IEA, 2016a)

Electricity Tariffs

The electricity market in Vietnam is not a free, liberalized market but highly regulated by the state. Hence electricity prices are set by the government and do not reflect the actual costs for generation and distribution. At present, the average electricity price is VND1,622/kWh (incl. tax) (abt. 7.2 US$ cents) on-grid and up to VND3,772/ kWh on islands and in mountainous rural areas (MOIT, 2015).

The SOE, Electricity of Vietnam (EVN), is not allowed to set the electricity prices independently. Instead, the price-setting process depends on three organizations: the General Directorate Energy (GDE), which is the energy department of the Ministry of Industry and Trade (MOIT), the Electricity Regulatory Authority of Vietnam (ERAV) and Electricity of Vietnam (EVN) (MOIT, 2015).[6] For tariff-increases between 2-5% EVN has to get an approval by MOIT/ the GDE. If an increase exceeds 5% the MOIT reviews the proposition and forwards it to the prime minister who has to approve the decision. For the national grid, the Ministry of Industry and Trade (MOIT) sets different electricity prices for different consumer groups and consumption times. Prices in off-peak hours are distinctly lower than in peak hours to relieve pressure on the network. For example, the retail price of electricity to the productive sectors (voltage level from 110 kV and above) is 869 VND/kWh in off-peak hours ("low hours") and VND2,459/kWh in peak hours.

The decision No. 2256/QD-BCT on electricity prices, dated 12 March 2015, contains eight different price categories with various sub categories, such as amount of consumption (level 1: 0- 50 kWh up to level 6: 401- kWh), region (urban, rural), time (normal, low, peak) and voltage levels (MOIT, 2015). The eight categories are:

1. Retail price of electricity to productive sectors

[6] The responsabilities of the actors are further explained in the section "actors".

2. Retail price of electricity to administrative units
3. Retail price of electricity to businesses
4. Retail price of electricity to domestic activities
5. Wholesale price of electricity in rural areas
6. Wholesale price of electricity to collective quarters, residential agglomeration
7. Wholesale price of electricity to commercial – service – domestic complexes
8. Wholesale price of electricity to industrial zones

There are lower prices for consumers with lower consumption rates lower income households usually use less electricity. Consequently, consumers with higher consumption rates cross subsidize the tariffs of poorer consumers. Table 16 in the appendix is an example of different prices for different consumer groups.

Furthermore, there are indirect subsidies on electricity in Vietnam. The government subsidizes domestic coal and has set the price below world market prices (MOIT, 2015). The main reason is to lower electricity prices for the production of goods and therewith to attract investors. From 2007 to 2012, the indirect subsidies on electricity have costed tax payers annually between US$1.2 billion and US$4.49 billion (UNDP, 2012b).
International as well as national experts have repeatedly expressed their concerns about the low electricity prices. Experts say, the prices are 20-30 % too low (UNDP, 2012a). The World Bank even recommended an increase of the electricity price by 40% in the next three years. The director of the Institute of Energy in Vietnam, Mr. Hoang Tien Dung, made a statement, saying the electricity price should be increased by 50 - 60% to assure "reasonable profit" and increase investors' interest (Delegation of German Industry and Commerce in Vietnam, 2015).

However, in the last decade electricity prices were already increased several times (UNDP, 2012a). The last time the prices were increased the deputy minister of MOIT, Do Thang Hai, said that EVN had to raise electricity prices, in order to protect the SOE from bankruptcy (The Economist, 2013). Between 2004 and 2009 the price increase was about 3.8% yearly (Vietnamnet, 2015). From 2010 onwards, prices increased by about 9.5% year after year, which resulted in an increase of more than 50% in the last ten years.

4.3 Renewable Energy Environment

This section has a focus on RE in Vietnam. Crucial actors in regulation and generation are described as well as the permitting process for wind energy projects, wind and solar potential in Vietnam, the current deployment and RE related policies.

Actors

In the (renewable) energy sector in Vietnam, multiple actors are involved. There are several actors on the regulatory/ governmental side and only few on the generating side. Power generation is dominated by state-owned enterprises. This chapter gives an overview about the actors involved and their responsibilities (UNDP, 2012a); (Pham Khanh et al., 2012); (UNDP, 2012a).

Regulation

At the national level, several ministries are involved. The ministries most involved are the Ministry of Industry and Trade (MOIT), the Ministry of Finance (MOF) and the Ministry of Planning & Investment (MPI). The MOIT is the overlooking ministry that takes the lead with only the prime minister above it.

Ministry of Industry and Trade (MOIT)

The Ministry of Industry and Trade (MOIT) is the ministry responsible for energy related topics. They include a) developing energy strategies such as the 'Power Development Plan', b) the formulation of energy policies, RE as well as fossil fuel energy plans and pricing.

General Directorate of Energy (GDE)

The GDE is the energy department of the MOIT. It supports the MOIT in any energy-related topics, in particular when it comes to bureaucratic tasks and regulations in oil and gas exploitation, electricity generation, nuclear and RE. The GDE is also responsible for the elaboration of details in the Power Development Plans, especially for provinces and cities. However, the MOIT always has to sign and approve their plans. Furthermore, the GDE is responsible for the planning of new power plants and for the development of investment incentives for RE plants.

Ministry of Finance (MOF)

The annual investment plans are created under the collaboration of the Ministry of Industry and Trade (MOIT) and the Ministry of Finance (MOF). The MOF is in charge of the overall state budget allocation as well as the budget allocation for RE projects and financial risk management.

The Ministry of Planning and Investment (MPI)

The Ministry of Planning and Investment (MPI) is responsible for the financial aspects of RE strategies and planning. That includes ways to attract foreign investment, both official development assistance (ODA) and private money.

The Electricity Regulatory Authority of Vietnam (ERAV)

The Electricity Regulatory Authority of Vietnam (ERAV) is responsible for regulating the electricity market under the supervision of the MOIT. Its main duties are a) the permitting of electricity operation licenses b) the management of the electricity wholesale price, the transmission and distribution costs c) review of end consumer's electricity prices and d) developing the liberalization-strategy of the energy sector.

Departments of Industry and Trade (DOIT)

At the provincial level there are Departments of Industry and Trade (DOIT) that help the Provincial People's Committees (PPCs) managing topics related to energy. It is also involved in the development of the Power Development Master Plan. However, the MOIT gives technical advice to the DOITs.

People's Committee (PC)

On the provincial level there are committees, carrying out the central government's functions. It is therefore the local executive organization of the government. In total there are 58 provinces and five additional municipalities with one PC each. The PCs are also responsible for wind energy project permits.

New and Renewable Energy Department

The New and Renewable Energy Department is the actor specialized in the development of RE projects.

Vietnam Institute of Energy

The Vietnam Institute of Energy is a public consultancy that does its own research on energy-related questions. It also helps the MOIT and EVN in crucial decisions and the development of the national energy strategy. That includes to estimate future energy demand and to evaluate the feasibility of projects.

Energy Generation

On the side of energy generation, the main actors are three state-owned enterprises: EVN (Electricity of Vietnam), Vietnam Oil and Gas Group (Petro Vietnam) and the Vietnam National Coal and Mineral Industries Group (Vinacomin).

Petro Vietnam

Petro Vietnam is specialized in petroleum and hydrocarbon exportation and production.

Vinacomin

Vinacomin is specialized in coal and mineral exploration, processing. The company constructs and operates coal power plants.

Electricity of Vietnam (EVN)

The main actor in energy generation is Electricity of Vietnam (EVN) with a market share of 53.5% in 2015 (see figure 10). It is a state-owned enterprise (SOE) that is active in power generation, transmission, distribution and sales. It is the owner of the national transmission system and therefore the only buyer of generated electricity. Additionally, it has a monopoly on customer services. Even though it is the biggest actor in the market, it is struggling financially. In 2014, it reported a financial loss of 789.6 million US$ (Anandarajah & Tomei, 2015).

Figure 10 shows the share of generated electricity of the state-owned and other actors such as local developers, Joint Stock Companies (JSC) and Foreign Direct Investment (FDI).

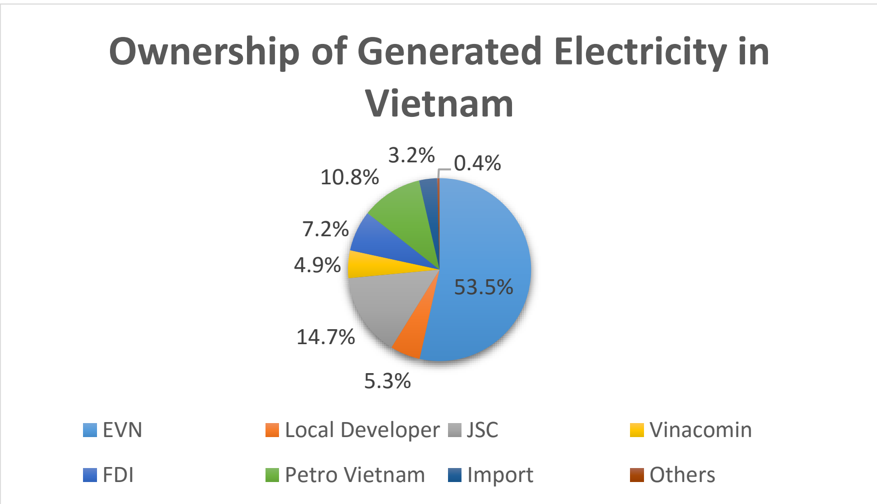

Figure 10: Ownership of Generated Electricity in Vietnam

Source: (Delegation of German Industry and Commerce in Vietnam, 2015)

Permitting Process

This section has a closer look at the permitting process. For large-scale RE developers it is crucial to have transparent and easy permitting processes in place to avoid any delays of the planning and construction of a project. The permitting process for wind energy projects in Vietnam consists of up to ten single steps. There is no national-wide regulation of the permitting process, instead it is in the hands of the administrative provinces (in total there are 58) to regulate. Every one of them is entitled to regulate RE permitting procedures. Following, the steps are explained:

A. Pre-feasibility study, permission for wind measurements

For project developers the first step of a project is to carry out a pre-feasibility study that contains, among other things, the distance to the grid, available basic infrastructure and topography. Furthermore, the developer asks for permission to carry out wind measurements. Involved actors are the Provincial Department of Industry and Trade (DOIT), People's Committee (PC), the Department of Planning and Investment (DPI). The DOIT/ DPI is also responsible to authorize the wind measurement

B. Site Approval, land use rights (optional)

Not every site that is attractive for wind power projects is part of the official power development plan of the province yet. If a site it not part of it yet, it has to be approved.

C. Site registration, wind measurement

Once the investor has fulfilled the previous steps, they can register the site at the People's Committee (PC). After the registration wind measurements can commence which usually takes 12 months.

D. Feasibility study, Investment license

If the wind speed is favorable, the project developer carries out a feasibility study and applies for an investment license. Involved in this process are DOIT, DPI, MOIT, prime minister, energy utility company and PC. The People's Committee receives the investment license application and sends it to the MOIT. Among other things, it contains information on the total investment sum, environmental impact assessment, results of wind measurements, and a PPA agreement with EVN.

E. Land clearance, site preparation

The investor asks the PC to clear the land.

F. Investment Report

The investor has to submit a detailed investment report with project description and technical specifications.

G. Power Purchase Agreement

A PPA is signed.

H. Contract on grid connection

The project has to get connected to the grid. The developer has to bear the costs.

I. Construction license, ownership certificate

Several documents and information that were obtained before have to handed to the PC to get a construction license such as investment license, technical design of project and financial aspects. The Department of Construction (DOC) reviews it to avoid mismatches with military activities and aviation.

J. Electricity operation license

If all involved parties agree, the project developer receives an operation license that is valid for 20 years.

4.4 Renewable Energy Policies

For renewable energy investors it is important to know that a government is committed to RE deployment. By approving supporting laws and regulations, RE investors have a higher investment security. This section presents and explains the most important recent regulatory changes in the power sector.

In the last couple of years, the Vietnamese government approved several policies and strategies. The official goals and strategies aim to increase the share of RE. The focus is on the deployment of wind energy, biomass and biogas. Solar energy is not a part of the strategies yet. The documents are presented in this section are the a) the National Master Plan for Power Development/ the Revised National Power Development Master Plan b) the Decision on Mechanisms for Support and Development of Wind Power Projects c) the Renewable Development Strategy c) the Power Sector Restructuring Strategy.

National Master Plan for Power Development

The "National Master Plan for Power Development for the 2011- 2020 Period with the Vision to 2030", also called "Power Development Plan" (PDP) was approved by the Vietnamese government on June 21, 2011. This governmental document is the key document for the energy sector. It analyses future electricity demand and supply and contains a deployment strategy. It sets targets and encloses plans on how to meet the demand and is re-adjusted every five years. The latest, seventh version, the PDP VII has the official decision number 1208/QD-TTg (Delegation of German Industry and Commerce in Vietnam, 2015).

In 2016 the PDP VII was revised (Socialist Republic of Vietnam, 2011c). A few changes - mainly in the power deployment plan - were incorporated. The revised PDP has the decision number 428/QD-TTg dated March 18, 2016 and the name "Approval of the Revised National Power Development Master Plan for the 2011-2020 Period with the Vision to 2030".

The Power Development Plan's objectives are to a) increase the electricity generation to meet the demand b) increase the share of renewable energy c) reduce electricity elasticity coefficient d) electrify mountainous and rural areas. The objective with the highest prominence is the development of an energy sector that meets the demand of the county "in conjunction with the national socio-economic development strategies" (Socialist Republic of Vietnam, 2016). The goal is to provide electricity to all Vietnamese households, either on-grid or off-grid by 2020. The Power Development Plans projects the average annual electricity demand growth rate for the period 2011- 2030 between 7.2% and 14.1%. That means the electricity demand in 2030 will be about seven times higher compared to 2010.

Power Deployment

In order to meet the increasing electricity demand the government plans to increase the national electricity generation capacity. The national electricity mix will change until the year 2030 (see figure 11). A big share of the demand is planned to be covered by coal power plants. Their capacity is planned to increase from 35GW in 2020 to 75GW in 2030. The share of natural gas decreases from 24% in 2020 to 15% in 2030. The share of hydropower in the energy mix decreases as well, mainly because suitable locations for new hydropower plants are rare. The share of imported electricity from the neighbouring countries Laos, Cambodia and China is planned to increase to 4% in 2030. Additionally, there are plans to build nuclear power plants (Socialist Republic of Vietnam, 2011c).

The PDP VII sets the target to increase the RE share. In 2010, the share of RE in the total electricity capacity was 3.5%. The target for 2020 is a share of 4.5%, respectively 6% in 2030. The capacity of wind power plants is planned to reach 1000MW in 2020 (0.7% of total electricity capacity) and 6200 MW in 2030 (2.4% of total electricity capacity).

The Revised National Power Development Master Plan has lower wind power capacity targets (Socialist Republic of Vietnam, 2011c). The capacity of wind power plants is planned to reach 800 MW in 2020 (0.8% of total electricity capacity) and 2000 MW in 2025 (1% of total electricity capacity) and 6000 MW in 2030 (2.1% of total electricity capacity). In the revised document there are also goals for solar power deployment for the first time. The target for solar power capacity for 2020 is 850 MW (0.5% of total capacity), 4,000 MW (1.6% of total capacity) in 2025 and 12,000 MW (3.3% of total capacity) in 2030.

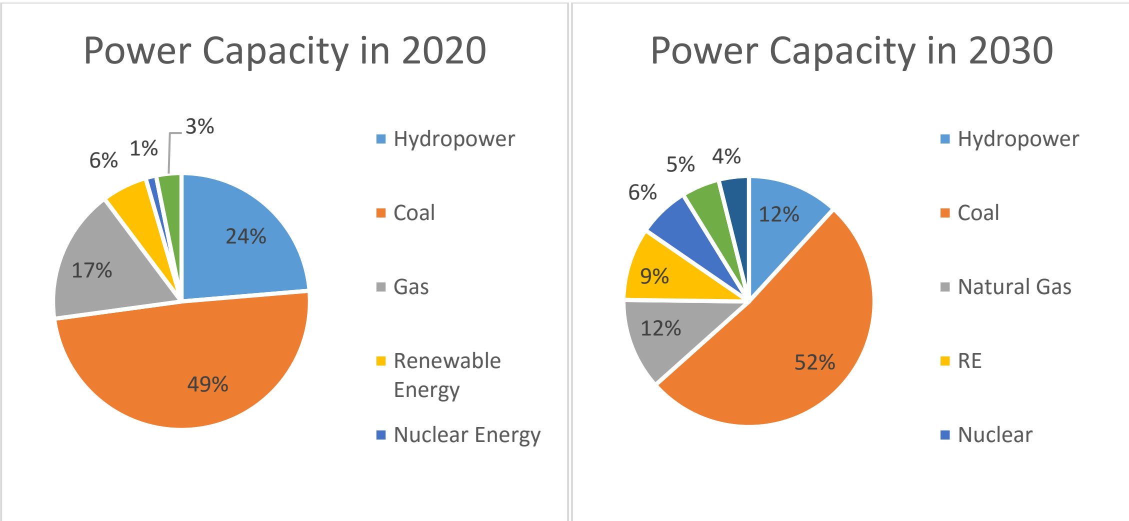

Figure 11: Targeted Power Capacity for 2020 and 2030
Source: (Socialist Republic of Vietnam, 2011c)

Financial Aspects

The plan includes a passage on private investment in the energy sector. It states that private investments and increased competition is needed. However, since the electricity price is currently rather low (see chapter "electricity tariff rates") it will be increased from the current average price of US$7.2 cents /kWh to US$8-9 cents/ kWh by 2020. The higher price will make it easier for investors to develop financially feasible projects. Furthermore, it will help to increase efforts to conserve electricity by using it more efficiently.

Mechanisms for Support and Development of Wind Power Projects

On June 29th, 2011 the "Decision on Mechanisms for Support and Development of Wind Power Projects in Vietnam" with the decision number 37/2011/QD-TTg was approved by the prime minister (Socialist Republic of Vietnam, 2011c). The decision regulates and approves support mechanisms for wind power projects.

Financial Aspects

For the first time in Vietnam a decision regulates a premium for electricity generated in RE projects. Wind power project developers can expect concluding a Power Purchase Agreement (PPA) over 20 years with the state- owned electricity buyer, the Vietnamese power utility EVN. The agreement is coupled with a FiT over VND1,614 (about US$6,8 cents) /kWh. In addition to to the US$6,8 cents, RE power generators receive US$1 cent/kWh from the Vietnam Environment Protection Fund, established by the government. Therefore, wind energy developers receive US$7,8 cents/kWh in total.

Beside the FiT the government agreed on more benefits for developers, such as i) tax exemptions on import duties for technologies related to wind power projects that cannot be purchased locally, and ii) free land or a reduced land lease fee. During the operational phase, special benefits for project operators are available too. There are tax exemptions on corporate income tax for the first 1- 4 years, and a 50% tax reduction for the next 5-13 years. Furthermore, there is an option for wind power project developers to sell Clean Development Mechanism (CDM) certificates, which can further increase the revenue of project developers.

Renewable Energy Strategy

The decision "Vietnam's Renewable Energy Development Strategy up to 2030 with an outlook to 2050" (No.: 2068/QĐ-TTg) was approved by the prime minister on November 25 2015. It is a comprehensive strategy on how to improve the RE investment environment in Vietnam. Its main objectives are to a) increase the share of renewable energy b) improve the energy security and c) electrify "most" household by 2020

Energy Deployment

The RE strategy includes deployment numbers for hydropower, biomass, onshore wind and solar. In figure 12 the projected share of solar and wind power can be seen. Wind energy's share of generated electricity is expected to increase to 1% by 2020, 2.7% by 2030 and 5% by 2050, respectively 2.5 billion kWh in 2020, 16 billion kWh in 2030 and 53 billion kWh in 2050. For the first time, there are targets for solar power too. The targets are to be achieved are 0.5% (1.4 billion kWh) by 2020, 6% (35.4 billion kWh) by 2030 and 20% (210 billion kWh) by 2050.

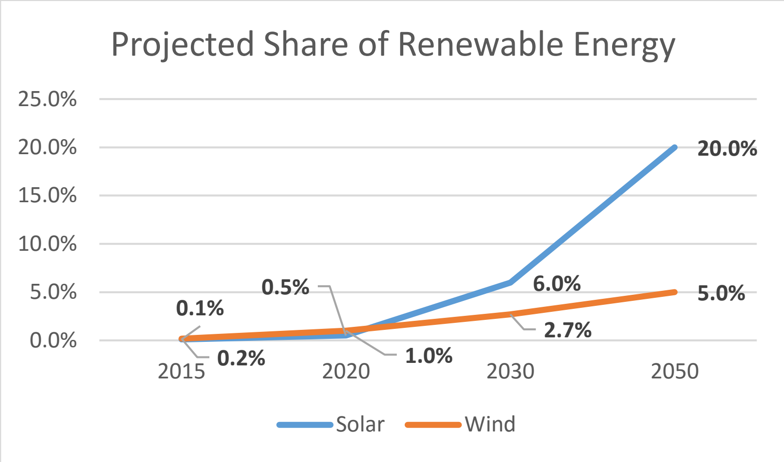

Figure 12: Projected Share of RE in Total Electricity Supply

Source: (Socialist Republic of Vietnam, 2011c)

RE Support Strategies

The RE strategy states that Vietnam aims to build up its own RE equipment industry in order to import less RE technology. The industry is planned to grow quickly with the help of state support. In addition to the benefits of a new industry, the state also hopes to increase energy security with the deployment of more RE and to improve energy supply for rural areas. The government tries to improve the investment climate by protecting "the legitimate rights and interests of those organizations/individuals that develop and utilize RE sources."(Socialist Republic of Vietnam, 2011c)

The strategy also shows that the government is aware of barriers that RE investors face. For that reason, several improvements are planned. The strategy states to **improve the governmental management** "in terms of the management of development activities and RE utilization the renewable energy sector" (Socialist Republic of Vietnam, 2015b, p. 6). It declares that the MOIT will be the responsible actor national wide, together with ministries that cover specific topics (see chapter 4.2 "actors"). Furthermore, RE agencies are planned at the provincial level. Their duties are planned to include RE management, development and utilization. **Data on RE potential** is planned to be improved by measurement efforts throughout the country. Based on the data obtained, a **nation-wide RE development plan** is planned. The MOIT also plans to develop **nation-wide technical standards** and norms. Also, an **improvement of the RE development and utilization** is planned by "encouraging organizations/individuals" (Socialist Republic of Vietnam, 2015b, p. 2). For example, in rural areas the PPC is supposed to promote the use of RE. **Financial support mechanisms** for RE deployment are mentioned in the RE strategy too. The strategy aims to put an environmental fee on the use of fossil fuels. Part of that income is earmarked for a Sustainable Energy Promotion Found that supports, e.g., the deployment and use of and research and development of RE technology. On the agenda of the Renewable Energy Strategy is also the **improvement of human capital** "at all levels" (Socialist Republic of Vietnam, 2015b, p. 9). This also includes the support of universities. The promotion of RE and **rising the awareness on RE** technology by **improved communication and information** is part of the strategy too. An **improved cooperation** between Vietnam and international partners in the area of RE is a goal too. The main expectation is to benefit from technology transfer.

Financial Aspects

Financial support instruments to attract private investors are the same as in the “Decision on Mechanisms for Support and Development of Wind Power Projects in Vietnam” from June 29th, 2011. This includes tax exemptions on import duties, corporate income tax (CIT) reduction and land-use tax/ charges and environmental protection fees exemptions.

Power Sector Restructuring Strategy

The decision “Approving of the Scheme of Vietnam's Power Sector Restructuring for the cause of industrialization and modernization and sustainable development until 2020, vision to 2030" with the decree number No: 14318 / QD-BCT was approved on December 25 2015. It builds upon the “Approval of the conceptual design of the Wholesale Electricity Market of Vietnam” with the decree number Số : 6463/2014/QĐ-BCT which was approved by the prime minister on July 22, 2014 (Socialist Republic of Vietnam, 2015b, p. 10). The main goal of the Power Sector Restructuring Strategy is to liberalize the energy sector. With the liberalization it aims to meet the energy demand in a sustainable manner at a reasonable price (Socialist Republic of Vietnam, 2014).

The single buyer market that is currently in place is expected to be changed with the implementation of the decision. The strategy aims to break the market dominance of EVN and to attract independent power distribution companies and retail companies that buy electricity at a wholesale spot market. However, a certain share (up to 30%) of any company in the sector will remain to be owned by EVN.

The strategy asks for more international investment, cooperation and foreign aid. It is emphasized that the remuneration for RE will be high enough to attract RE investors (Socialist Republic of Vietnam, 2015a). Furthermore, the strategy states that pricing will become more transparent. The power sector-restructuring plan is divided into 4 stages:
In stage 1 (2015-2017) the introduction of a market-based electricity market starts. Before the reform power corporations bought 5% of the total electricity at market price. The rest was bought for a bulk price between EVN and power corporations.
In stage 2 (2017-2019) a fee for the utilization of the power grid and other services will be introduced. The share of electricity power corporations purchase for a market price will be increased.
In stage 3 (2019 – 2021) the wholesale electricity market is planned to be fully liberalized. All electricity will be sold at market price.
In stage 4 (beginning in 2022) the implementation of a competitive retail market is planned to begin.

4.5 Summary of Country Context

In this chapter, the results of a systematic desk research were presented to provide a general understanding about Vietnam and its energy sector. In the next chapter, the results of the desk research will be complimented with the results from the expert interviews. That allows a validity check and the inclusion of information provided by experts/ practitioners. The different sources combined will allow answering research question 1*: How conducive is Vietnam’s contextual setting to renewable energy investment?*

Identification of barriers and risks for renewable energy investment

The description of the energy context of Vietnam shows that there are barriers and risks as well as opportunities. The main opportunities are a steadily **increasing electricity demand** that already leads to **frequent power cuts**. **Investments into new power capacity are necessary** but the main actor in the energy sector, **EVN lacks investment capital**. Therefore, big sums of private capital are needed. Consequently, several **policies to support RE investments** have been approved by the government. A **RE FiT** was put in place and the government plans to **liberalize** the currently highly restricted electricity market. Furthermore, there are **RE deployment and CO_2 reduction targets** in place, also because Vietnam is one of the countries affected most by **climate change** worldwide. RE deployment can help to achieve the GHG reduction targets. It can also help to increase the bad **air quality,** the local population is negatively affected by. Without strong reliance on coal power plants the country would not get into a **coal import dependency**. A RE industry in Vietnam can bring the country **many new jobs**. The **technical potential** for sun and wind power is favourable for large and small-scale projects. Small-scale RE projects are also very promising in regions with **no access to electricity yet**.

The main barriers are an **intransparent permitting process** with many actors involved, **low electricity tariffs** and **subsidies for fossil fuels**, **old transmitting infrastructure** and **corruption**. Table 5 lists opportunities and barriers RE investors in Vietnam face.

Table 4: Opportunities and Barriers for Investors in Vietnam

Opportunities for RE Deployment	Barriers for RE Deployment
Increasing electricity demand and Frequent power cuts	Intransparent permitting process with many actors involved
Investment into power capacity necessary	Low electricity tariffs
Main actor lacks capital	Subsidies for fossil fuels
RE support policies are in place e.g. FiT and an energy sector liberalization strategy RE deployment and GHG reduction targets are set	Old transmitting infrastructure with losses
Climate change and other environmental issues like bad air quality	Highly regulated market
Coal import dependence	Corruption
New jobs through new RE industry	
Technical potential high	
Regions without access to electricity	

5 Analysis

This chapter contains an ex-post effectiveness analysis of current RE policies and an ex-post analysis of investment barriers. It answers research question 1: *How conducive is Vietnam's contextual setting to renewable energy investment?* and identifies RE investment barriers.

The ex-post effectiveness analysis of current policies analyses if implemented policies work successfully or if adjustments are needed. The assessment will be conducted by analyzing and comparing the officially set RE targets with the actual deployment rate.

For the identification of barriers and de-risk instruments the barrier categories developed in this thesis were used. After the categorization of the barriers they are analysed in a structured way. Grading criteria for every single barrier were developed to find out which potential barriers are still real barriers in Vietnam. The approach uses grades from 1-3 to rate the application of de-risk instruments. Ex post effectiveness analysis of current policies

5.1 Ex post effectiveness analysis of current policies

Vietnam has set RE targets and implemented several policies for the promotion of RE. In this section an ex-post evaluation of the effectiveness of the current policies will be conducted. Ex-post evaluations are a way to give feedback and information about the impact of a policy. The evaluation also shows if the expected objectives are reached. Policy makers can learn from previous mistakes and successes through the evaluation. If the result of an ex-post analysis is negative, an adjustment of the evaluated policy is recommended (Socialist Republic of Vietnam, 2015a); (European Parliament & Council, 2002).

An instrument is effective if a set goal is achieved. In the energy sector, goals are usually stated in RE deployment in MW or share of RE in total energy generation (Vaz & European Environment Agency, 2001). Mickwitz (2006) explains the effectiveness analysis by asking: "to what degree do the achieved outcomes correspond to the intended goals of the policy?" (Mickwitz, 2003, p. 426).

In the case of RE deployment it is still difficult to make an effectiveness analysis since the official Power Development Plan VII only contains targets for the years 2020 and 2030. However, it is possible to see a trend. For the analysis the elements output, outcome, impact and effectiveness will be used.

Output

The government's output are several policies that try to increase the share of RE. The introduction of a FiT is an output as well as RE targets. The latest RE targets are part of the PDP VII.

The "National Power Development Plan for the period 2011–2020 and looking forward to 2030" (Decision 1208/2011/QD- TTg dated July 21, 2011) states that the RE share of total electricity generation in 2020 shall reach 4.5% in 2020 and 6% in 2030. The capacity of wind power plants is planned to reach 1000MW in 2020 (0.7% of total electricity capacity) and 6200 MW in 2030 (2.4% of total electricity capacity).

In 2016 the PDP VII was revised and a few changes were incorporated. The revised PDP with the decision number 428/QD-TTg dated March 18, 2016 and the name "Approval of the Revised National Power Development Master Plan for the 2011-2020 Period with the Vision to 2030" states that the capacity of wind power plants is planned to reach 800 MW in 2020 (0.8% of total electricity capacity) and 2000 MW in 2025 (1% of total electricity capacity) and 6000 MW in 2030 (2.1% of total electricity capacity). In the revised document there are also goals for solar power deployment for the first time. The target for solar power capacity for 2020 is 850 MW (0.5% of total capacity), 4,000 MW (1.6% of total capacity) in 2025 and 12,000 MW (3.3% of total capacity) in 2030.

Outcome

As a consequence of the governmental policies, only a few actors started investing in wind and solar energy projects.

Impact

These investments resulted in an impact that can be measured in MW. In 2016, four years after the approval of the PDP VII, 140 MW of wind power capacity were installed. From 2001 until December 2015 52 MW (3 wind energy projects) were installed and connected to the grid (Socialist Republic of Vietnam, 2016).

In 2014, there were 4MW of installed PV in Vietnam. Most of it, about 80%, were used off-grid, mainly in rural areas. The remaining 20% were connected to the national grid (Delegation of German Industry and Commerce in Vietnam, 2015). At the beginning of September 2015, the Vietnamese company "Thien Tan Company Limited" started constructing a 19.2 MW solar power project at a cost of US$40 million. It is expected to be on the grid by June 2016 (Nguyen Ninh Hai et al., 2015).

Effectiveness

The targets have a timeframe until 2020, which only allows to analyse a trend. However, the RE deployment rate since the introduction of the targets is low. The set targets for wind energy are 1000MW/ 800 MW in 2020 while the installed capacity is 140MW. The government has reduced the official targets already, which also shows that the targets were too ambitious, given the prevalence of different barriers. The target for solar power capacity is 850 MW until the year 2020. Currently there are less than 30 MW installed in Vietnam. Also, in the deployment of solar PV the governmental policies have not worked effectively.

The low deployment rates show that the policies are not yet working sufficiently. Therefore, the policies should be readjusted. The barriers responsible for the low deployment rate will be assessed in section 5.2.

5.2 Identification of Barriers and De-Risk Instruments

Section 5.1 showed that the current policies are not effective yet. The RE targets will be difficult to reach without policy adjustments and enforcement. The current investment barriers need to be removed. In this section barriers found in literature and through interviews will be categorized in the barrier categories developed earlier in this thesis. The categories are market barriers, informational barriers, political barriers, administrative barriers, and technical barriers. The categories form the foundation of the analytical framework. Starting from the barrier categories, it is easy to find a specific barrier. From there it is possible to find a de-risk instrument that allows the removal of a barrier or risk. The process is visualized in figure 13.

Figure 13: Use of Framework- From Category to Instrument

In a further step, an assessment was conducted that shows which barriers are not sufficiently covered by de-risk instruments yet. For each barrier category indicators were developed. The grading was done according to the findings from the literature and interviews. The approach uses grades from 1-3 to rate the application of de-risk instruments. 1 stands for barrier of high significance, 2 for barrier of medium significance, and 3 for barrier if low significance. The approach shows which potential barriers can be found in Vietnam. The grading shows where policy adjustments are needed most. Barriers that are rated as significant should be removed with policy instruments.

The analysis of political barriers goes one step further. In this category the concrete instruments are analysed instead of the barriers. This is possible because the instruments (PPA, FiT, long-term RE targets) are explained in detail in the given policies. This is not the case for other instruments. For example, the governmental effort to implement the instrument "streamline and simplify permitting process" is more difficult to assess than the current situation. For that reason, the situation is assessed and barriers disclosed. In a further step the barrier can be removed with a mix of policy instruments.

Political Barriers

In this section political barriers are analyzed and evaluated. The framework (see table 6) shows that there are three main barriers that can be found: a) insufficient cornerstone instruments b) volatile policies and c) insufficient R&D. The barrier "insufficient cornerstone instruments" can be removed by implementing or adjusting cornerstone instruments (power purchase agreements, FiTs/ price premiums). An instrument to improve volatile policies are long term (RE) targets and an instrument to improve insufficient R&D is to increase the R&D efforts. Table 7 shows the evaluation criteria for political barriers and figure 14 shows the results of the evaluation of the de-risk instruments for political barrier.

Table 5: Political Barriers Evaluation Results

Category	Barrier	Instrument	Rating
Political	Insufficient cornerstone instruments	Power Purchase Agreements (PPA)	2
		Feed-in Tariff (FiT)	1
		Price Premium	n.a.
	Volatile policies	Long-term (RE) Targets	3
	Insufficient R&D	Increase R&D efforts	n.a.

Table 6: Political Barriers Evaluation Criteria

Political Barriers		
1 - High significance	2 - Medium significance	3 - Low significance
FiT does not cover investors costs	FiT covers expenses	FiT generates profit
PPA does not reduce risks	PPA partly reduces risks	PPA reduces risks
No long-term targets	Low long-term targets	High long-term targets

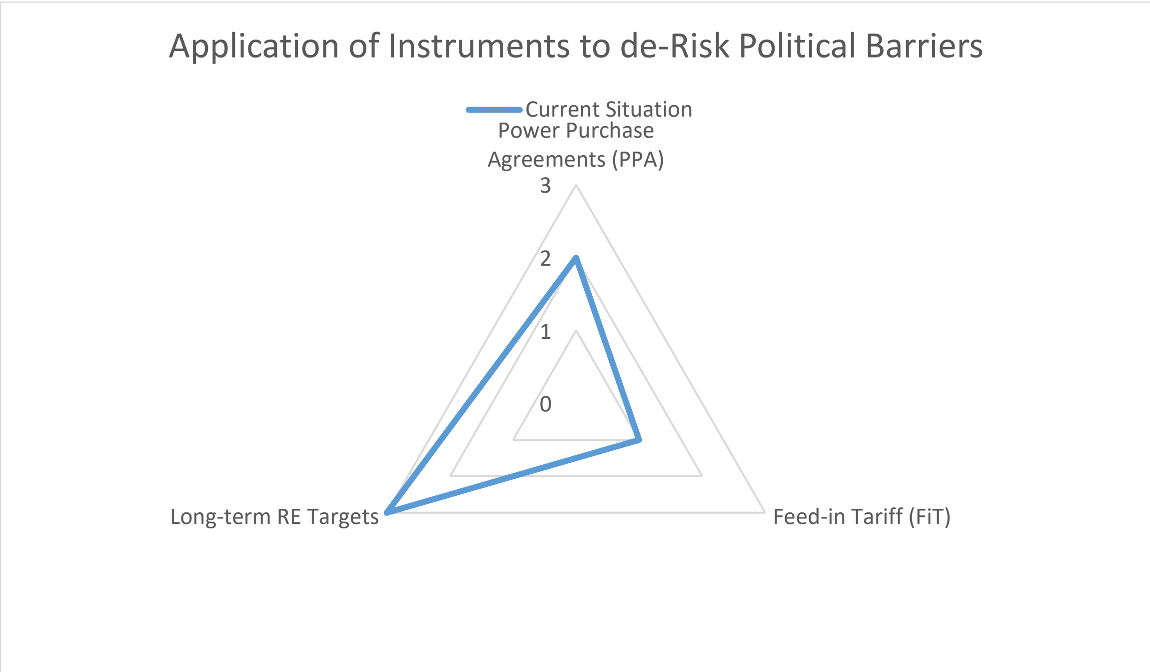

Figure 14: Political Barriers De-Risk Instruments Evaluation Results

Barrier: Insufficient Cornerstone Instruments

Currently, there is a FiT with a remuneration rate of US$7.8 cents/kWh in Vietnam. Additionally, investors can sign a PPA with the local utility company EVN over the time span of 20 years. In order to better understand the situation and to be able to assess it, the following section is about the history of the FiT in Vietnam.

History of FIT in Vietnam

In 2004 there was a first attempt to promote RE by introducing regulations that included tax reductions for power project planners. However, there was no FiT, instead developers had to negotiate prices with the Vietnamese Energy Supplier (EVN) directly (Delegation of German Industry and Commerce in Vietnam, 2015).

In 2009 a PPA coupled with an Avoided Cost Tariff (ACT)[7] was introduced. The tariff was recalculated every year. Even though there was such a tariff, no wind energy project was developed. This was mainly caused by the low financial remuneration of only about US$4 cents/kWh. For small- scale hydropower plants the tariff was more attractive.

A change could be seen on June 29, 2011 when prime minister Dung approved the "decision on the Mechanism Supporting the Development of the Wind Power Project in Vietnam" (No. 37/2011/QD-TTg) (Delegation of German Industry and Commerce in Vietnam, 2015) that aims to support wind energy deployment.

The decision introduced a general FiT of US$7.8 cents/kWh. Already in 2011, international experienced consultants suggested to implement a higher FiT of US$10.5 cents/kWh

[7] Avoided cost describes a utilities expenses to produce one more unit of power

(Interviews). However, the Vietnamese government did not follow this advice. US$6.8 cents of the FIT are coming from the energy supplier EVN while the remaining US$1.0 cent are coming from the Vietnam Fund of Environment Protection (Socialist Republic of Vietnam, 2011b). The regulation states that the electricity buyer, Vietnam Electricity Cooperation (EVN) has to purchase electricity generated by wind power projects, also from privately owned ones. A PPA between project developers and EVN over 20 years is now the standard procedure. The new FiT was partly introduced through the pressure of international donor agencies who lobbied for a better RE policy.

Evaluation: Feed-in Tariff / Power Purchase Agreement

It is positive that Vietnam has a FiT as well as the option of a PPA, however there are some shortcomings. All interviewees agreed that the current FiT is an *insufficient cornerstone instrument* because it is too low. For investors it is not financially viable to develop any large-scale RE projects (beside hydropower) that rely on the FiT at the current time. There are many wind power projects registered in Vietnam but not carried out yet because of the low remuneration. All registered projects have a total capacity of 4252 MW. They are in the “development phase” but they are said to be “on hold” (Socialist Republic of Vietnam, 2011b). Project developers articulated interest and started the development of projects on paper. By officially becoming the project developer of an attractive location with strong winds, other investors cannot claim the land anymore. Project developers who put their projects “on hold” profit from this circumstance and wait for better remuneration schemes. It is expected that once there is a higher remuneration scheme, these projects will be constructed and connected to the grid.

For that reason, the current deployment rate of wind power projects is low (see chapter 5.1). Until today there is only one wind energy project in Vietnam that was carried out with the FiT as the main support instrument. All other wind energy projects were highly subsidized by international donors, such as the German development bank KfW. For example, a project supported by the KfW received a loan over 35 million Euros with an interest rate below market standard. Therefore, the electricity generated is a lot cheaper than it would be without external support.

Several interview partners mentioned that the main reason for the low tariff is the fear of high costs: especially the Ministry of Industry and Trade (MOIT) is concerned about increasing prices. EVN worries that higher tariffs would lead to questions about their efficiency. The state-owned enterprise had already to fight critics in the past. Most Vietnamese consumers are rather price-sensitive. For reasons of public pressure, it is difficult to increase electricity prices in Vietnam in general. The described price increases (see chapter “Electricity Rates”) in the last decade were mainly inflationary adjustments and did not help EVN much in the aim to increase their funds.

The PPA is considered to be positive. However, even though the design of the PPA is of international standard, it does not solve the barrier completely. EVN is a highly indebted SOE. That makes EVN a difficult contract partner for project developers. Especially banks lack trust in EVN’s finances, which drives up interest rates, even though there is a 20 years PPA signed.

The evaluation result for the FiT is: High significance. The FiT does not cover investors’ costs.
The evaluation result for the PPA is: Medium significance. The PPA partly reduces risks.

Barrier: Volatile Policies

In Vietnam there are several official targets that are directly or indirectly related to the RE sector and try to lower the risk of *volatile policies*. There are GHG reduction targets, RE targets and GHG reduction targets specifically for the electricity sector.

At the international level, Vietnam committed to reduce its overall GHG emissions as part of the Intended Nationally Determined Contributions (INDCs). Vietnam's INDCs in terms of GHG reductions are 8% by 2030, respectively up to 25% by 2030 if international actors support the development (Socialist Republic of Vietnam, 2015d).

Furthermore, there are targets to reduce GHG emissions in the electricity sector by 5% until 2020, 25% till 2030 and 45% till 2050 compared to BAU (Socialist Republic of Vietnam, 2015d).

There are several targets for the deployment and share of RE in Vietnam. The government set goals for the years 2020, 2025, 2030 and 2050. The wind power capacity is planned to reach 800 MW in 2020, 2000 MW in 2025 and 6000 MW in 2030 (Socialist Republic of Vietnam, 2016). The targets for solar power deployment 850 MW in 2020, 4,000 MW in 2025 and 12,000 MW in 2030.

Evaluation: Long-term (RE) Targets

According to several interviewees, the INDCs and in particular the GHG reduction goals sound more ambitious than they are. The 8% reduction is a BAU scenario (on total numbers). Experts say that the BAU scenario uses rather ambitious economic growth rates.

Nevertheless, the goals might have an impact already. A media article states that starting from spring 2016 new gas fired power plants will be favoured over coal power plants (Socialist Republic of Vietnam, 2015b). It says that at the beginning of 2016 the prime minister Nguyen Tan Dung appointed the Ministry of Industry and Trade to review the current Power Development Plan. The current plan foresees an increase of the capacity of coal power plans. Premier Dung was concerned about the high GHG emissions, emitted by coal power plants and the consequently difficulties to achieve the submitted INDCs (Viet Nam Energy, 2016). This shows that even though the INDCs are voluntary, they do put some pressure on the government since the government's goal is to receive money from international donors for achieving their GHG targets.

Building new coal power plants would be contradicting and make it difficult to achieve the INDC target as well as the power sector GHG reduction target.

The long-term targets for the deployment of RE are considered as positive. However, concerning the actual numbers of the targets, there are different opinions among the experts. Most of the interviewees thought positive about them. They considered them as modest and achievable, while others said they are not high enough yet and others said they are not achievable.

Furthermore, the Socialist Republic of Vietnam also set the long-term goals to establish its own RE manufacturing industry in Vietnam. The plan is to manufacture wind turbines within the country to create jobs. Experts are sceptical if Vietnam will manage to achieve this goal. Especially the proximity to China where RE technology is already produced makes it difficult for Vietnam.

Overall, most interview partners agreed that Vietnam has stable policies and a safe investment climate. Nevertheless, the current targets need more regulative adjustments and more detailed implementation strategies, otherwise the goals will not be achieved.

The evaluation result for the long-term targets is: Low significance. There are high long-term targets.

Administrative Barriers

In this section administrative barriers will be analyzed and evaluated. The framework (see table 8) shows that there is one main barrier "permitting process" that can be negatively influenced by one or more sub-barriers. The sub-barriers are: a) diffusion of information b) communication among actors c) cooperation among actors d) corruption.

The barriers can be removed or decreased by applying a mix of instruments that have the aim to streamline and simplify the permitting process. The instruments available are a) streamline and simplify permitting process b) restructure responsibilities and processes c) trainings d) communicating responsibilities. Table 9 shows the evaluation criteria of the administrative barriers and figure 15 shows the evaluation results.

Table 7: Administrative Barriers Evaluation Results

Category	Barrier	Instrument	Rating
Administrative	**Permitting process**	**Streamline and simplify permitting process** Restructure responsibilities and processes Trainings for staff Communicate responsibilities	**1**
	Diffusion of information		1
	Communication among actors		1
	Cooperation among actors		1
	Corruption		1

Table 8: Administrative Barriers Evaluation Criteria

Administrative Barriers		
3 - low significance	2 - medium significance	1 - high significance
Easy and fast permitting process	Mostly easy and fast permitting process	Difficult and slow permitting process
Good diffusion of information	Mediocre diffusion of information	Insufficient diffusion of information
Good and efficient communication among actors	Mediocre communication among actors	Insufficient and inefficient communication among actors
Good cooperation among actors	Mediocre cooperation among actors	Insufficient cooperation among actors
No corruption	Little corruption	Corruption is common

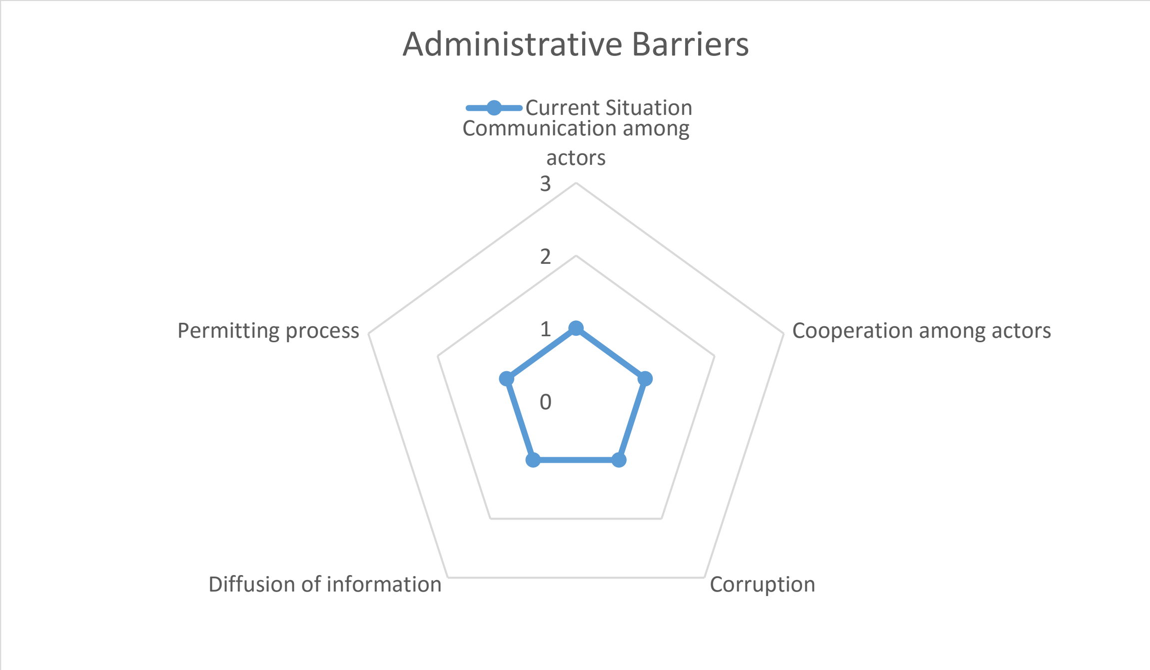

Figure 15: Administrative Barriers Evaluation Results

Evaluation: Permitting process

The current *permitting process* is complex and time-consuming, it is not transparent and involves many actors as described in chapter 4.2 "Permitting Process". It is one of the main obstacles for a more rapid RE deployment in Vietnam and was one of the most mentioned barriers by the interviewed experts.

The interviews showed that developers often do not know who is responsible. There is *missing diffusion of information* about clear responsibilities and the permitting process involves many steps and actors such as the PC, DOIT, DPI, MOIT, local communities and others. That makes the processes inefficient and non-transparent. It lacks clear policies, responsibilities and the communication of such. The fact that the permitting process for wind power projects varies from province to province makes it even more difficult for investors and project developers.

The major problems are missing *cooperation among actors* and *insufficient communication*. At the provincial and local level there is a lack of recognition of national laws and regulations. The national authorities set targets for RE deployment and develop the support framework without sufficient inclusion of local and regional stakeholders. At the local level, actors are partly responsible for the permitting of projects. At this level people are affected by new RE projects and therefore ask for participation in the planning process. A nation-wide FiT often lacks the needed cooperation between different governmental levels. Interviews showed that a law signed by the prime minister and therewith by the highest governmental representative is not per se accepted by local governments. Instead a national law is rather understood as an "idea" than as a fact. After the approval of a national law, it has to be implemented in the regional/ local context by signing a decree. Before this has happened, the national law is not recognized. That leads to many misunderstandings and misinterpretations of national law at the local level. If a project developer approaches an authority at the local level, the process depends on the authority's interpretation of the national law.

In particular, in the matter of centrally planned land use there are constantly overlapping plans among different actors. Interview partners complained about them; for example, big parts of Vietnam's land are taken for resource exploitation like mining and the growing of crops and are therefore not available for RE projects anymore. Wind power project developers experience difficulties changing these plans, especially if a site is not in the National Power Development Plan yet. Developers have to apply to get it into the PDP, which is an unclear, time-consuming process that needs the support of national consultants. Vertical integrated planning and consistent planning with actors of all levels is missing.

Interviews revealed that in Vietnam nepotism and *corruption* are widespread. In most cases it is most important to know someone influential who holds a forceful position, for example in regional or local politics. Additionally, bribes are common. Interviewees mentioned that money is often paid to obtain necessary permits. Corruption is amplified by the high number of actors involved and the obscure structure.

The evaluation result for the permitting process is: High significance. The permitting process is difficult and slow.
The evaluation result for the diffusion of information is: High significance. The diffusion of information is insufficient.
The evaluation result for the communication among actors is: High significance. The communication is insufficient and inefficient.
The evaluation result for the cooperation among actors is: High significance. The cooperation is insufficient.
The evaluation result for corruption is: High significance. Corruption is common.

Market Barriers

In this section market barriers will be analyzed and evaluated. The framework shows (see table 10) that there are several barriers such as a) controlled market, with the sub-barrier "subsidies on fossil fuels". Furthermore, there are the barriers b) access to capital c) public support.

The barriers can be removed or decreased by applying a mix of instruments that have the aim to improve the market and financial conditions. There are various instruments available such as a) liberalization of the market b) remove fossil fuel subsidies c) financial instruments (gap funding, public equity co-investments, loan guarantees, public loans/ soft loans, carbon offset, tax credits) d) trainings. Table 11 show the evaluation criteria for market barriers and figure 16 the evaluation results.

Table 9: Market Barrier Instruments and Evaluation Results

Category	Barrier	Instrument	Rating
Market Related	**Controlled Market**	**Liberalize market**	**2**
	Fossil fuel subsidies	Remove fossil fuel subsidies	2
	Access to capital	Gap funding Public equity co-investments Trainings	1
	Public support	Public loans/ soft loans Loan guarantees Carbon Offset Tax Credits	2

Table 10: Market Barriers Evaluation Criteria

Market Barriers		
3 - low significance	2 - medium significance	1 - high significance
Liberal market	Closed market with liberal elements	Closed Market
No fossil fuel subsidies	Low fossil fuel subsidies	High fossil fuel subsidies
Easy access to capital	Mediocre access to capital	Difficult access to capital
High public support	Some public support	Low public support

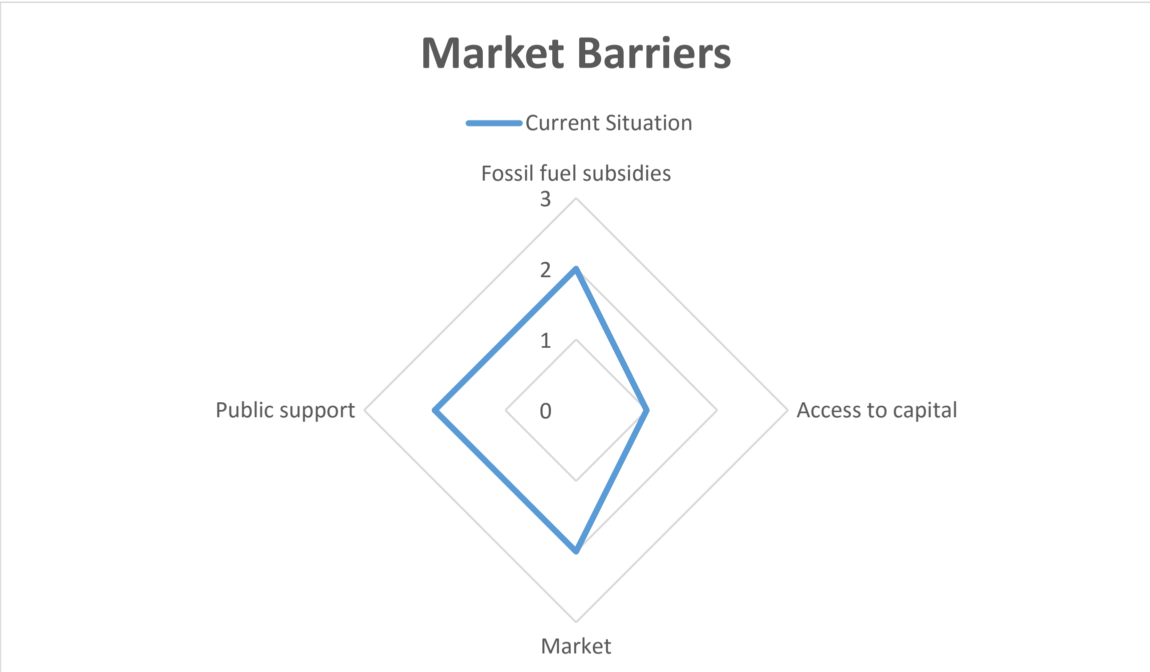

Figure 16: Market Barriers Evaluation Results

Evaluation: Controlled Market

The electricity market in Vietnam is highly regulated. It is a closed market with only few liberal elements (e.g. private companies are allowed to produce electricity). The main actor in the energy sector is the State Owned Enterprise EVN. The company has a monopoly on the electricity grid and owns most of the generation capacity. The electricity prices do not reflect the actual costs for the generation and distribution but are set by governmental organizations.

Furthermore, there are *fossil fuel subsidies* in place that promote the use of coal for energy generation. The fossil fuel subsidies make RE in comparison more expensive.

The Vietnamese government approved a decision that aims to restructure the energy sector. The plan is to liberalize the electricity market and to establish a competitive market. Furthermore, the latest official governmental strategy states, that the RE deployment will be "based on market instruments". However, experts are not convinced by the news yet.

The evaluation result for the Market is: Medium significance. The market is closed with liberal elements.

Evaluation: Access to capital / Public support

The access to capital for RE projects in Vietnam is difficult. The Vietnamese government gives out *public loans/ soft loans* with low interest rates that investors can apply for. Soft loans are known to be a good instrument to simplify access to capital and decrease the financial costs at the same time. However, at the moment these loans are not effective. Interview partners stated, that the loans are granted to those investors who pay the most to the administration issuing them. Even though the interest rates are low, the loans have to be "bought", which drives up the costs.

In Vietnam it is still difficult to get loans for RE projects (except hydropower) from commercial banks. Most of them are rather small and have difficulties to offer loans large enough to finance large-scale RE projects. Furthermore, the staff at banks is lacking know-how on RE investments, which drives up the interest rates.

In addition to the soft loans, the Vietnamese government installed several other public support instruments. The indirect financial support mechanisms are a) tax exemptions on import duties for any technology needed that is not produced within the country b) free land or a reduced land lease fee c) tax exemptions on corporate income tax for the first 1- 4 years, and a 50% tax reduction for the next 5-13 years d) the option to sell Clean Development Mechanism (CDM) certificates. These instruments are considered to be helpful and good for investors.

However, iinterview partners mentioned that the lack of governmental *loan guarantees* is a problem. This is in particular a problem because of the EVN's negative financial balance. Having the highly indebted company EVN as a contract partner drives up the perceived risks. Until today the company has always paid, however, the perceived risk increases due to its debt.

At the global level there are several financial policy instruments and multilateral initiatives that aim to shift risks from investors to public actors (Viet Nam Energy, 2016; Micale et al., 2013). For example, there is the World Bank agency Multilateral Investment Guarantee Agency (MIGA) that offers policy risk insurance for investors in developing countries. The insurance covers losses that happen due to government's breach of a contract with investors(e.g. if a PPA is changed) (Micale et al., 2013; UNEP, 2004). Furthermore there is the Overseas Private Investment Corporation (OPIC) for US investors. Another financial de-risking instrument by the World Bank is a partial risk guarantee that was introduced in 1994 (Multilateral Investment Guarantee Agency, 2016). A relatively new tool is the OPIC FiT insurance, which covers retroactive policy risks. However, this tool is for US investors only.

Interview partners were aware of the global de-risk instruments but expressed concerns about the bureaucracy of them, which is said to be cumbersome. A main shortcoming is the time-consuming endorsement process in the case of broken contracts. That process can take up to several years, a timespan small investment companies cannot wait for. For this reason, only large, financially strong investors can rely on them.

The evaluation result for access to capital is: High significance. It is difficult to access capital.

The evaluation result for public support is: Medium significance. There is some public support.

Informational Barriers

In this section informational barriers will be analyzed and evaluated. The framework shows (see table 12) that there are several barriers such as a) availability of know-how b) access to reliable information c) skilled labour d) social acceptance.

The barriers can be removed or decreased by applying a mix of instruments that have the aim to improve the level of information within the country. There are various instruments available such as a) increase R&D b) improve access to reliable information c) communicate responsibilities d) improve O&M skills e) improve RE social acceptance/ support f) trainings for staff g) restructure responsibilities h) improve cooperation among actors. Table 13 shows the evaluation criteria for informational barriers and figure 17 the evaluation results.

Table 11: Informational Barrier Instruments and Evaluation Results

<table>
<tr><th>Barrier Category</th><th>Barrier</th><th>Instrument</th><th>Rating</th></tr>
<tr><td rowspan="4">Informational</td><td>Availability of know-how</td><td rowspan="4">Increase R&D
Improve access to reliable information
Communicate responsibilities
Improve O&M skills
Improve RE social acceptance/ support
Trainings for staff
Restructure responsibilities
Improve cooperation among actors</td><td>1</td></tr>
<tr><td>Access to reliable information</td><td>2</td></tr>
<tr><td>Skilled labour</td><td>1</td></tr>
<tr><td>Social acceptance</td><td>2</td></tr>
</table>

Table 12: Informational Barriers Evaluation Criteria

Informational Barriers		
3 - low significance	2 - medium significance	1 - high significance
Know-how available	Mediocre know-how	Little know-how
Easy access to information	Mediocre access to information	Difficult access to information
Skilled labour available	Few skilled labour	Lack of skilled labour
High social acceptance	Somewhat social acceptance	No social acceptance

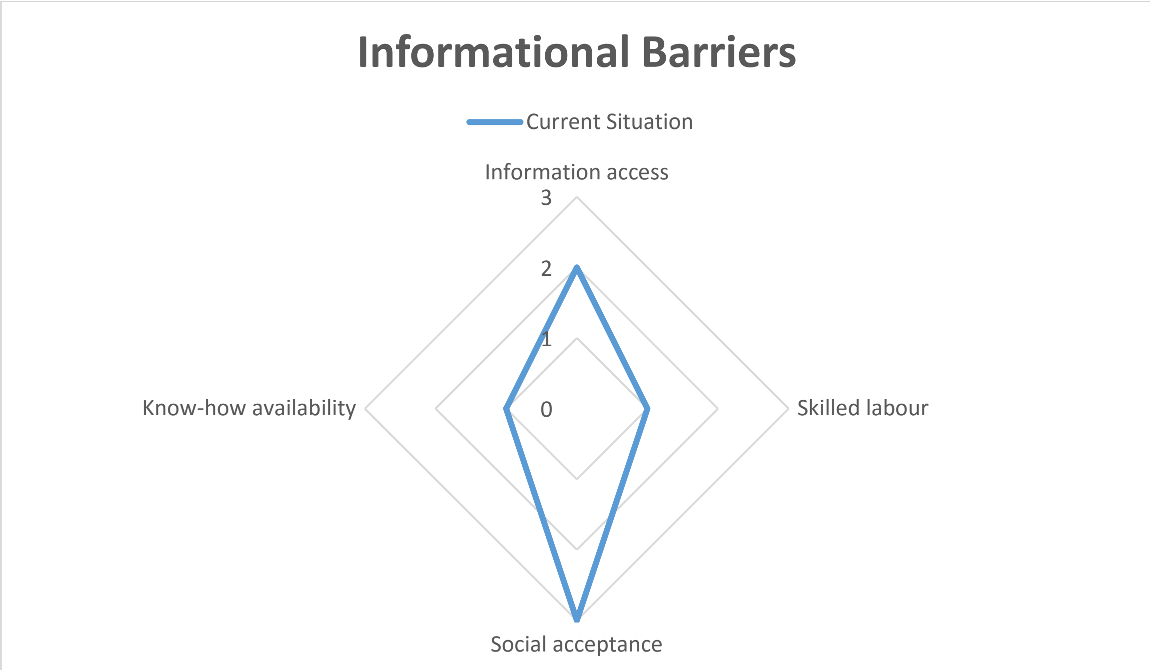

Figure 17: Informational Barriers Evaluation Results

Evaluation: Availability of know-how/ Access to reliable information

In Vietnam there is *little know-how* about RE in the country. Most interview partners complained about missing information for investors, in particular, they miss a) unambiguous official governmental information b) wind speed data c) reports by practitioners.

For developers it is difficult to obtain reliable information from governmental actors. Even though there might be information available, it is not always clear and leaves room for interpretation. For example, there are no national policies but different regulations in the different provinces because on the provincial level there are different interpretations of national policies. The permitting process is not straightforward, official governmental information and responsibilities are often not obvious.

In terms of *wind speed data* there are not enough reliable studies and the wind speed data available is not of high quality, nor quantity. Measurements have been taken at fewer than 30 sites across the country, which is not enough to get a comprehensive picture of the wind power potential in Vietnam. Also, the way the measurements were taken in the past is problematic. For example, the World Bank obtained its data by measuring the wind speeds only 4 times per day. Additional issues are insufficiently trained wind measurement staff and possibly external influences by curious citizens who disturb the measurements. Today, several institutions such as the KfW, World Bank and GIZ collaborate in order to build up a database with reliable wind speed measurements.

There are several international organizations involved in improving the investment situation for RE in Vietnam. For example, there is the Asian Development Bank (ADB), World Bank (WB), Japan International Cooperation Agency (JICA), KfW, GIZ, Swedish International Development Cooperation Agency (Sida) and UNDP. Some actors are just starting to work in the field of energy while others are already experienced. For example, the delegation of the EU now focuses on the energy sector and plans to spend significant amounts of money (more than 400 Million Euros until 2020) on energy-related projects in Vietnam, however they are a new player and still learning. On the other hand, there are actors like the GIZ that has already been involved in energy related topic in Vietnam for many years.

Important for successful and efficient work is the information exchange among actors (internationals as well as locals). A new project by the EU delegation aims to support this idea. They are in the process of establishing an energy group with international and national actors. The Vietnamese governmental will be represented by the MOIT.
The research for this thesis revealed that the project would be highly beneficial. Talking to different actors in the field showed that often employees of one organization were not aware of the work of other organizations.

The evaluation result for Availability of Know-how is: High significance. Little know-how is available.

The evaluation result for Access to Reliable Information is: Medium significance. There is a mediocre access to information.

Barrier: Missing skilled labor

There is a *lack of skilled labour* in all renewable energy-related areas from the government to the private sector. There should be more knowledge among governmental officials, interviewees said. Currently there are only few officials who already have expertise on the topic and they mostly work in Ha Noi for the central government. At the provincial level there is an even stronger lack of knowledge among governmental officials.

Also in the private sector there is a lack of skilled labour. For example, there is a need for experts who can consult developers in the permit process. Also local banks should have more knowledge in order to be able to design suitable financial products for wind and solar developers. In addition, there is a lack of knowledge and human capital in the field of operations and maintenance.

Currently there are no university programs in Vietnam that focus on the topic of RE. Due to the few projects that have been carried out so far, there is also a lack of experienced practitioners who could share their knowledge.

The evaluation result for skilled labour is: High significance. Skilled labour is missing.

Barrier: Missing social acceptance

The *social acceptance* of large-scale RE projects is considered to be high. The interviews revealed that there are no problems like NIMBY movements in Vietnam. Wind power plants are considered as an indicator for industrial/ economic development, which is seen as something positive by the population. For this reason, most Vietnamese are in favour of wind and solar power plants.

However, the social acceptance could even be improved if all citizens would know about the technology. Many people are still not aware of RE. Publicity campaigns could help to increase the demand of the technology.

The evaluation result for social acceptance is: Low significance. Overall social acceptance is high.

Technical Barriers

This thesis does not cover the analysis of technical barriers because most interview partners were not aware of them. However, some have brought up concerns about pressure on the grid through higher shares of volatile RE. The fluctuating energy is more difficult to manage than coal power plants. Therefore, fast RE deployment can distort the grid stability. The national grid is old which makes investments in the grid essential.

5.3 Barriers Summary

The analysis in this chapter allows answering research question 1: *How conducive is Vietnam's contextual setting to renewable energy investment?* This chapter showed that there are still several investment barriers for large-scale wind and solar developers. The use of the framework and the evaluation criteria allowed uncovering the biggest investment barriers.

Table 14 shows the main barriers found in literature and found through interviews. Table 15 shows the barrier categories, barriers, possible instruments to reduce barriers and the evaluation results for the barriers. In the political barriers category, the FiT has major deficiencies. The administrative barriers are immense. The permitting process is complex and time consuming, diffusion of information as well as the communication and cooperation among actors is insufficient. On top of this grave barriers, corruption is omnipresent. The biggest market barrier is the difficulties of access to capital and the gravest information barriers are a lack of RE know-how and a lack of skilled labor.

However, the previous chapter showed that the climatic conditions in Vietnam are favorable for RE projects. There is enough wind and sun for large-scale RE projects. However, at the moment, the contextual setting is not conducive. In the next chapter policy scenarios will be presented to answer research question 2: *What are possible ways to de-risk renewable energy investments in Vietnam?*

Table 13: Mayor Barriers in Vietnam Overview

Barriers found in literature	Barriers most mentioned in interviews
Permitting process	FiT
Highly regulated market	Permitting process
Subsidies for fossil fuels	Diffusion of information
Low electricity tariffs	Communication and cooperation among actors
Old transmitting infrastructure with losses	Corruption
Corruption	Access to capital
	Lack of knowledge
	Lack of skilled labour

Table 14: Barrier Categories, Barriers and Corresponding De-Risk Instruments

Barrier Category	**Barrier**	**Instrument**	**Rating**
Political	Insufficient cornerstone instruments	Power Purchase Agreements (PPA) Feed-in Tariff (FiT) Price Premium	2 1 n.a.
	Volatile policies	Long-term (RE) Targets	3
	Insufficient R&D	Increase R&D efforts	n.a.
Administrative	**Permitting process**	**Streamline and simplify permitting process** Restructure responsibilities and processes Trainings for staff Communicate responsibilities	**1**
	Diffusion of information		1
	Communication among actors		1
	Cooperation among actors		1
	Corruption		1
Market Related	**Controlled Market**	**Liberalize market**	**2**
	Fossil fuel subsidies	Remove fossil fuel subsidies	2
	Access to capital	Gap funding Public equity co-investments Trainings Public loans/ soft loans Loan guarantees Carbon offset Tax credits	1
Informational	Availability of know-how	Increase R&D Improve access to reliable information Communicate responsibilities Improve O&M skills Improve RE social acceptance/ support Trainings for staff Restructure responsibilities	1
	Access to reliable information		2
	Skilled labour		1
	Social acceptance		2
	Missing diffusion of information		1
Technical	No national wide standard	Implement national wide standard	n.a.
	Old infrastructure	Improve infrastructure	n.a.

6 Policy Scenarios

This chapter in an ex-ante analysis that answers research question #2: *What are possible ways to de-risk renewable energy investments in Vietnam?* Five policy scenarios were developed are presented. The scenarios work as alternatives to current policies. This section builds upon the findings of Chapter 5.

The identification of barriers showed that there are still many barriers even though the government declares it is committed to RE deployment. Nevertheless, a **political** barrier is the **current FiT** that is not designed appropriately and therefore does not decrease investment risks. Additional to the political barriers there are **administrative** and **informational** barriers that hinder the deployment of large scale RE projects in Vietnam. The **permitting process** is cumbersome, there is little **diffusion of information**, a **lack of communication and cooperation among actors.** Furthermore, there is **corruption** that is amplified by the high number of actors involved in the permitting process and the intransparent structures. Additionally, there is a lack of RE **know-how** and **skilled labor**.

The scenarios show different de-risk options and their advantages as well as disadvantages. Applying de-risk strategies goes hand in hand with the official governmental position. The Renewable Energy Strategy states: "Barriers shall be gradually removed and mechanisms/incentives shall be promulgated to encourage the appropriate RE development for rapid generation of RE sources" (Socialist Republic of Vietnam, 2015b, p. 2).

Five different policy scenarios will be assessed:

1. Increased FiT
2. Auctioning System
3. Improved Access to Capital
4. Trainings
5. Increase Cooperation among Actors

Scenario 1: Increase FiT

Currently the FiT for wind energy in Vietnam is US$7.8 cents/kWh. Most, if not all international actors in Vietnam involved in RE, propagate for a higher FiT. Already in 2011, experienced international consultants suggested to implement a higher FiT of US$10.5 cents/kWh. EVN and the government fear high costs and increasing electricity tariffs with an increased FiT. However, unofficial studies by one of the international actors showed that increasing the FiT would hardly have any negative impact on the general electricity price in Vietnam. If the government and EVN want to make sure that the electricity price does not increase, a capacity cap or a budget cap should be installed. In this way the government could ensure that not too many large-scale RE projects are developed at the same time. However, in this case, manufacturers would also hesitate producing in Vietnam, depending on the cap.

The main advantage of higher a FiT is that it is very easy to implement. The current system would not change; however, more money would be paid. This would *attract more RE investors* from all over the world due to income security. It is likely that the RE deployment rate increases since investors have higher incentives to invest in the country. Once investments are made, it is possible that RE *manufacturers start manufacturing* in Vietnam and that an industry develops within the country.

The main negative aspect about this approach is, that the higher FiT would *not change the deep-rooted problems* explained in chapter 5. Especially the *cumbersome permitting process* with many actors and *corruption* involved would not be changed. That means that the public/ electricity consumers would have to pay more for electricity. A higher FiT would lead to distributional effects and possibly increase income and wealth disparities. A better solution for the Vietnamese population are structural changes that end corruption.

Scenario 2: Auctioning System

Another successful instrument is auctioning systems. They are led to remarkable RE deployment in many other countries. Even though only two interview partners mentioned auctioning systems at all and none of them was prone to support it, it might be suitable for decreasing RE investment risks in Vietnam.

Auctioning systems have several advantages. For example, the described problem (see chapter XX) of finding the right price cannot occur in an auctioning system since potential investors bid. If the government is concerned about too high prices per kWh/MW the design can include a maximum price. The advantage of auctions is that EVN already knows before the construction starts how much money they will have to spend for a defined installed capacity of RE. By decreasing entrance barriers and making the bidding and the deployment easy, competition among investors will increase, which may bring down the price of projects. The main problem in the current system is the cumbersome permitting process with many actors and corruption involved. Auctions can change this as described in the two option below.

However, the auctioning system approach has a few possible disadvantages too. With a good policy design these can be avoided. One question is whether there would be enough competition among investors in Vietnam after the introduction of the auctioning system. In order to assure competition, the auctions should be promoted globally. Once investors notice the system works well, more investors will show interest, bid and lower the prices per MW.

In order to prevent under-bidders, penalties should be included in the auctioning system (see chapter 2.2). The aim of penalties is to prevent long construction delays. However, import difficulties of technology might lead to delays anyways. If the developer is not responsible for the delay, no penalties should be applied. Another possible disadvantage stated in the literature is that for countries with auctioning systems, it is more difficult to attract manufacturers and to build up a national manufacturing industry for RE technologies.

There are different design options for auctioning systems. The following two are presented: Option A is a Conventional Auctioning System and option B is a new design, developed in this thesis, the One Stop Auctioning System.

Option A/ Conventional Auctioning System

One of the main barriers for RE investments in Vietnam is the lack of communication between the national and the provincial government. The National Energy Strategy is developed by the central government in Hanoi without including local or regional governments. Currently, there are many cases of misunderstandings and misinterpretations of national law at the local level. If a project developer approaches an authority at the local level, the further process depends on the authority's interpretation of the national law. This insecurity for investors can be avoided by integrating the provincial and local governments from the beginning, instead of having a pure top-down approach. Once authorities at the local level have selected a site, it can be approved by the national government and EVN. EVN (the grid operator) can then check, prior to an investment, if a project is feasible or if grid improvements have to be implemented. After all actors have agreed on a site, an auction can be carried out for the pre-identified sites. That eases the permitting process since local actors are involved from the very beginning and are well informed.

Developers can be sure the permitting process will be fast and easy. By introducing an auctioning system, developers have to deal with fewer actors, which decreases the opportunities for corruption. Even though developers have an additional bidding process, which is time consuming, the overall development will be less risky since it is simpler, faster and cheaper.

Option B/ One Stop Auctioning System

Another, even easier and therefore less risky option for developers is the One Stop Auctioning System. This approach cannot be found in the literature yet, because it is one of the results of this thesis.

A One Stop Auctioning System is a conventional auctioning system with a special feature. The auctioning itself is as described in the literature review. However, investors bid for a "ready to go" site, which means that the land come already with a permit for a RE project. In this way investors can directly start construction without any long-lasting permitting processes. Official governmental actors do the permitting process before investors/ developers get involved.

One option to achieve this is for the government to buy a suitable piece of land and give it to the developer either for free or for a fee. That way the developer can focus on the technology, operation & maintenance and financing of the RE project. Uncertainties in land ownership and difficulties in the permitting process could be avoided. The sunk costs for pre-construction activities are reduced to the bidding process. This new approach streamlines the processes and reduces uncertainties for investors in terms of administration (e.g. delays in the permitting process) and speeds up RE deployment.

Scenario 3: Increase Access to Capital

A reason for high interest rates and therefore investment costs are the perceived risks of signing a PPA with EVN. EVN is a SOE which is highly indebted. Banks, international as well as national, do not acknowledge the fact that EVN has always paid the agreed amount in a timely manner and would rather prefer them to have a positive balance sheet. However, that is not a short-term goal and even difficult to achieve as a long-term goal.

Option B: Foundation of new Electricity Purchase Entity

An option to increase the security and therewith decrease the interest rates, is to set up a new organization that buys electricity from RE developers. The organization's responsibility would buy electricity from RE projects and to sell it to the grid utility.

International actors as well as the EVN would have to help fund this organization in the beginning. Since there are currently only a few large-scale RE projects in Vietnam, no exceptional high amount would be required. Once the organization has enough money to pay electricity from RE generators for a few years in advance and indicate a stable income through the sales of electricity, banks will react by lowering the interest rates.

Option A: Loan Guarantees

Another way to decrease the risk is to provide loan guarantees. A loan guarantee shifts risks from private investors to public actors, such as governments and ministries, bilateral aid agencies, export credit agencies and Development Financial Institutions (DFI). No structural changes are made but a shift of risks, which leads to an almost immediate decrease of risks and therefore lower interest rates. Limited and unlimited *loan guarantees* are one way of financial de-risking. A public actor can assure that in case an investor cannot repay an official loan, the public party does (partially or the whole amount). Loan guarantees increase the security for banking institutes and therewith decrease interest rates.

However, currently neither the Vietnamese government, nor other actors provide such a guarantee. Therefore, a public actor should offer such a loan guarantee for investors. In order to make this instrument also helpful for investors with limited financial resources, the process of the guarantee, which included the approval of it, should be fast and rather non-bureaucratic.

Scenario 4: Increase Skilled Workforce

There is a lack of skilled labour in all renewable energy-related areas from the government to the private sector. More knowledge among governmental officials would strike possible prejudices against RE and help them to better understand the advantages and possibilities. At the moment there are some knowledgeable officials working for the central government in Hanoi. However, at the provincial level there is a strong lack of knowledge among governmental officials. Also in the private sector there is a lack of skilled labour. For example, there is a need for experts who can consult developers in the permit process.

Also local banks should have more knowledge in order to be able to design suitable financial products for wind and solar developers. It is still difficult to get loans for RE projects (except hydropower) from commercial banks. Most of them are rather small and have difficulties to offer loans big enough to finance large-scale RE projects. Furthermore, the staff is lacking know-how on RE investments, which drives up the interest rates.

In the field of operations and maintenance there is a lack of knowledge and human capital too. In Vietnam there are currently no university programs that focus on the topic of RE.

Excessive training, mainly provided by international actors, on topics related to RE should be carried out for all sectors and levels. For example, more knowledge about RE in the banking sector could directly influence the investment environment. There should be workshops about financial products for RE investors. Politicians from different regions and levels should learn from other countries and should learn about the advantages of RE.

Scenario 5: Increase Cooperation/ Communication Among Actors

Cooperation and communication among actor is key for any undertaking. The analysis has shown, that there is a lack of *cooperation among actors* and *insufficient communication*.

Currently a top-down approach is used for the development of RE projects. That leads to a lack of recognition of national laws and regulations on the local levels. The national authorities set targets for RE deployment and develop the support framework without sufficient inclusion of local and regional stakeholders. There are many cases of misunderstandings and misinterpretations of national law on the local level. If a project developer approaches an authority on the local level, the further process depends on the authority's interpretation of the national law and eventually on bribes.

In order to strengthen the cooperation and communication among the official actors, a bottom-up approach should be introduced. By incentivizing the local level to have RE projects in their communities, they will be more open towards investors. Regional governments should apply with possible sites at the national level. In case they win and their site gets selected they should benefit financially.

6.1 Discussion of Scenarios and Policy Recommendation

The last section answered the question *What are possible ways to de-risk renewable energy investments in Vietnam?* Five different options where presented, 1) increased FiT 2) auctioning system 3) improved access to capital 4) more skilled labour 5) increase cooperation among actors. In this section the different policy scenarios will be discussed and a policy recommendation will be given.

The **access to capital** can be improved by minimizing risks. This can be achieved by loan guarantees, or the foundation of a new electricity purchase entity. Loan guarantees are easier to implement than establishing a new organisation. For that reason, it might be more recommendable to implement these guarantees. Because of the simplicity of the instrument they should be a priority in the future de-risking mix.

The **increase of skilled labour** can be achieved with more trainings. In order to achieve a strong RE sector in Vietnam, the diffusion of knowledge is needed on all levels. The amount of trainings should increase. International actors train locals already but the high lack of skilled people shows that the efforts are still not enough. Trainings at all sectors, from governmental actors to private sector actors will help to create a better investment climate. Trainings will achieve that policy makers have a better understanding about RE technologies and their advantages, banks can create products that suit RE projects and project developers can hire locals for O&M.

An **increased cooperation** among official actors would help to ease permitting processes for investors. By introducing a more bottom-up approach with benefits for the local level, investors will be more welcomed to develop projects.

Beside the policy scenarios three, four and five there are also the options of **increasing the FiT** (scenario 1) and **introducing an auctioning system** (scenario 2). International actors have been lobbying for higher FiT for many years already. Among the experts in Vietnam this is the most favored solution. It is likely that higher FiT would have a positive impact on RE deployment rates as experts say. This is because the higher remuneration per kWh decreases the risk of financial losses for investors. However, one of the mayor RE investment barriers in Vietnam is administrative (e.g. corruption). A higher FiT would not solve this problem. This raises the concern: would a higher FiT lead to more corruption and higher bribes? This is uncertain and to investigate the topic of corruption would go beyond the scope of this thesis. However, if the bribes increase the energy transition would come at a high cost for the mostly poor population. In that case electricity consumers would pay indirectly for corrupt officials. Therefore, it could be a better option to change the cornerstone instrument instead of holding on to a FiT.

An instrument mix, designed around an auctioning system could change the current situation and also the deep-rooted problem of corruption. There can also be corruption and bribes in auctioning systems, however, as described in chapter 6n, in such a system developers have to deal with fewer actors, especially in the policy scenario Option B/ One Stop Auctioning System.

Nevertheless, in order to avoid corruption during the auctions, it has to be assured that the bidding process is as transparent as possible.

In literature there are also other disadvantages of auctioning systems mentioned. One example is, that it is usually more difficult to attract manufacturers to start manufacturing locally. However, in the case of Vietnam the current FiT does not lead to high deployment rates. The deployment rates could be a lot higher with a well working auctioning system and this is the most important factor for manufacturers. This means that a well working auctioning system could actually be more attractive for manufacturers then a poorly working FiT.

One possible reason why international actors do not speak up for auctions is because in a well-designed system individual governmental actors would not profit from it. Governmental officials are in a dilemma of personal interest vs. common interest. The moment bribes decrease the officials get less money but the deployment increases due to lower investment costs.

However, even though not all risks will be removed by introducing an auctioning system, it might still be the better system for Vietnam and similar countries. It would give more security to the government since expenses would be project-based, and for developers because they will get the price they need to carry out a project.

7 Conclusion

This chapter gives policy recommendation, shows the significance and impact of the research and indicates further research fields. This thesis is an analysis of RE investment barriers in Vietnam. The research design of this thesis consists out of four steps 1) identifying and describing the country context 2) analyzing the effectiveness of current policies 3) identifying barriers and risks 4) developing policy scenarios with de-risk instrument.

The first step, the identification and description of the country context, allowed to answer research question # 1: *How conducive is Vietnam's contextual setting to renewable energy investment?*

This thesis found, that even though Vietnam's climatic conditions are favorable for RE projects, it's contextual setting is not conducive. An ex-post effectiveness analysis of current policies in chapter 5.1 demonstrated that the current policies are not effective. The renewable energy deployment rates are low, which is an indicator that more/ different de-risking instrument should be applied. This makes it legitimate to ask research question #2.: "*What are possible ways to de-risk renewable energy investments in Vietnam?*"

The development of a new de-risking framework, based on an existing UNDP framework, helped to successfully identify barriers and matching de-risking instrument. The identification of barriers showed that deep-rooted structural barriers are the main problem for slow RE deployment in Vietnam. The permitting process is complex & time consuming, the diffusion of information as well as the communication and cooperation among (public) actors is insufficient. An omnipresent barrier is corruption. The analysis further showed, that the access to capital for large-scale RE project is difficult. On the informational side, there is a lack of know-how and a lack of skilled labor. The current RE support policy mix, which includes a FiT does not remove the barriers.

An ex-ante policy analysis was conducted in chapter 6 with several policy scenarios, that simulate possible ways to de-risk renewable energy investments in Vietnam. Three scenarios analysed secondary de-risk instruments, while two analyse different cornerstone instruments. The analysed secondary de-risk scenarios are an improved access to capital, a better skilled workforce and an increased cooperation/ communication among public actors. The different cornerstone instrument scenarios are a higher FiT and an auctioning system.

Recommendations

There are many ways to design a policy mix to remove investment barriers. However, the results of this thesis suggest to change the cornerstone instrument to an auctioning system. Unlike (high) FiTs, the "One Stop Auctioning System" (OSAS) developed in this thesis has the chance to remove deep-rooted investment barriers. An increased FiT, which is promoted by most international actor in Vietnam, could lead to higher deployment rates eventually. However, most likely it would come at the cost of the local population in Vietnam who had to pay with their electricity bill for bribes in the RE permitting process. The OSAS minimizes the contact between investors and local authorities and with it the options for corruption and delays.

This instrument, combined with secondary de-risk instruments, like capacity building on all relevant levels and sectors (public and private), the introduction of a university program on RE, improved access to capital by introducing public loan guarantees, has high chances to make Vietnam a more attractive country for RE investors. Furthermore, local governments should be (financially) incentivized to offer land to project developers.

7.1 Significance and Implication of the Research

This thesis gives an impulse to policymakers as well as international experts who fight (unsuccessfully) for higher FITs in emerging economies. The result of this thesis is in particular valuable for countries, that are ranked high in the Transparency International corruption index, because the OSAS has the chance to remove deep-rooted barriers like corruption.

The research result is valuable for several actors working on topics related to RE deployment in emerging economies and Vietnam in particular. These are, among other, international decision makers/ consultants, members of the Vietnamese government, Vietnamese public officials and researchers. Governmental officials in Vietnam should re-examine their preference concerning their RE de-risking policy mix. At the moment the government gives out RE targets that will most likely not be achieved. A main reason for the failure is corruption, in which governmental officials are largely involved. If the government wants to keep the FiT and also wants to reach the RE targets, there are two options: 1) they reduce corruption 2) they increase the FiT. Continuing with bribes makes RE investment expensive. The higher expense would have to be carried by the electricity consumers. A better option is the OSAS.

Within this thesis a new analytical framework was developed to analyse investment barriers. The de-risk approach by the UNDP was used as an inspiration, however this study revealed that the official approach has shortcomings, especially in the usability. The new framework is problem oriented, and easier to use. This new framework can help researchers as well as policy makers to identify barriers and to consequently develop de-risking policy mixes.

7.2 Further Studies

During the research for this thesis several recommendations for further studies arose. The analytical framework of this thesis is new. It should be applied to other countries to gain experiences with it and to adjust/ improve it. This is also the case for the new auctioning system "OSAS". Fellow researcher should evaluate it, improve it and further develop it. The question on how to incentivise local public actors to offer land to RE project developers in centrally governed countries should also be further investigated.

The de-risk RE investment literature has very little information about corruption and how to remove it. Corruption should be moved into the focus of de-risking, since it is a big RE investment barrier.

While conducting the research it might have been helpful, that the research on barrier in Vietnam and possible de-risking approaches was conducted by an "outsider" who is not involved in lobbying activities, nor has specific conceptions about the Vietnamese energy market and it actors. It might also have helped that none of the interviews was conducted with a public servant. However, the perspective of the "other side"- the side of EVN and the Vietnamese Government is missing in this research. Interviewing them and asking for their ideas on how to de-risk RE investments would be interesting.

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Appendix

Table 15: Electricity Prices for Domestic Activities

Tariff	Urban areas		Rural areas	
	Price per unit (VND/kWh)	Price per unit (USD/kWh)	Price per unit (VND/kWh)	Price per unit (USD/kWh)
Level 1: 0 - 50 kWh	1,484	6.7	1,230	5.6
Level 2: 51 - 100 kWh	1,533	7.0	1,279	5.8
Level 3: 101 - 200 kWh	1,786	8.1	1,394	6.3
Level 4: 201 - 300 kWh	2,242	10.2	1,720	7.8
Level 5: 301 - 400 kWh	2,503	11.4	1,945	8.8
Level 6: above 401 kWh	2,587	11.8	2,028	9.2

Source: (MOIT, 2015)

7.3 Interview Partner

Table 16: Interview Partners

Date	Name	Position	Organisation
January 25, 2016	Daniel Plankermann	Energy Sector Coordinator at KfW	Kreditanstalt für Wiederaufbau
February 15, 2016	Axel Neubert	Country Represeantative	Hanns Seidel Foundation
February 15, 2016	Moritz Michel	Deputy Director	Hanns Seidel Foundation
February 22, 2016	Rainer Brohm	Independent Energy Consultant	Independent Energy Consultant
February 22, 2016	Peter Cattelaens	Project Manager	German Agency for International Co-operation
March 10, 2016	Franziska Lang	Attachée Commercial and Economic Affairs Development Cooperation	Embassy of the Federal Republic of Germany
March 11, 2016	Dinh Diep Anh Tuan	Chief of Cabinet	Dragon Institute
March 13, 2016	Prof. Dr. Le Anh Tuan	Assoc. Prof. Dr. in Earth Sciences	Dragon Institute
March 14, 2016	Dr. Cung Vu	Global Associate Director for Power and Energy	Hawaii Natural Energy Institute (HNEI)/ Office of Narval Research
March 14, 2016	Dr. Ing. Nguyen Vo Chau Ngan	Deputy Director, Department of International Relations	Can Tho University
March 14, 2016	Kjeld Ingvorsen	Associate Professor	Aarhus University, Denmark, Faculty of Science and Technology
March 17, 2016	Ms Vu Chi Mai	Project Officer	German Agency for International Co-operation
March 17, 2016	Ms Nguyen Tuong Khanh	Project Officer	German Agency for International Co-operation
March 24, 2016	Yen Hai Mai	Project Manager	Hanns Seidel Foundation
April 8, 2016	Tran Thuy Duong	Programme Officer Development Cooperation Section	Delegation of the European Union to Vietnam
April 5, 2016	Tom Corrie	Counsellor – Deputy Head of Cooperation	Delegation of the European Union to Vietnam

7.4 Sample Interview Questions

I. Policy De-Risk Instruments

1a. Long-term Wind Power target

- What is your opinion about the long term wind power targets?
- On a scale from 1-5 how reliable are the set targets in your opinion?
- On a scale from 1-5 how well designed are they in your opinion?

2a. Stream lined permits process

- What is your opinion about the permit process for wind power projects?
    - Where do you see room for improvement?
- On a scale from 1-5 how easy is it for wind power project developer to obtain a permit?

3a. Operation and Maintenance Skills

- Do you now of any workshops and trainings for wind power O&M provided in Viet Nam?
- On a scale from 1-5 how much wind power O&M knowledge can be found in Vietnam?

II. Financial De-Risk Instruments

1a. Public loans

- Do you now of any public loans for Wind Power Projects?
- On a scale from 1-5 how well are they designed in order to increase wind power deployment?

2a. Partial loan guarantee

- Do you now of any partial loan guarantees for wind power projects?
- On a scale from 1-5 how well are they designed in order to increase wind power deployment?

3a. Political risk insurance

- Do you now of any political risk insurances for wind power projects?
- On a scale from 1-5 how well are they designed in order to increase wind power deployment?

III. Direct Financial Incentives

1a. Feed in Tariff for Wind Power Projects

- On a scale from 1-5 how well is the FiT designed in order to increase wind power deployment?
- What is lacking?

2a. Tax credits

- On a scale from 1- 5 how much are the tax credits helping to increase wind power deployment?