Capitalising Renewable Energy Projects Through the Incentivisation of Private-Sector Investments via the New Market Mechanism (NMM)

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Capitalising Renewable Energy Projects Through the Incentivisation of Private-Sector Investments via the New Market Mechanism (NMM)

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Executive Summary

The New Market Mechanism (NMM) has been under discussion since the 17th Conference of the Parties (CoP) at Durban in 2011 and cumulatively more so at all subsequent United Nations Framework Convention for Climate Change (UNFCCC) CoP conferences. Currently the NMM is limited to case studies and pilot projects in South America, yet support at the UNFCCC for a sectoral, scaled-up market-based mechanism is growing - mostly fuelled by controversies surrounding the UNFCCC's current flexibility mechanisms such as the Clean Development Mechanism (CDM) as well as the ever-rising concentrations of greenhouse gases in the atmosphere. The interest of the EU in the NMM as an addition to-, or replacement of the CDM is increasing as well, and the EU is funding research on possible design options of the NMM. All issues of the CDM such as the determining of additionality, the complexity of the project-cycle, the fact that large fractions of Certified Emission Reductions (CERs) end up at middlemen such as brokers (as fees or taxes) instead of project developers, the transaction costs which favour larger and more experienced project developers, etcetera, can be resolved with the NMM as a top-down, policy-driven mechanism, purely because of its non-project-based nature. All negotiations, trouble, responsibility and (initially) CERs end up at the host government instead of at project developers - the host government can choose, through negotiations with the UNFCCC, which policy measures and incentives for private-sector investors in renewable energy projects to implement. Options include all existing investment tools: a Feed-in-Tariff (FiT), a national Emissions Trading Scheme (ETS), tax incentives or a carbon tax, project-based incentives or even bottom-up approaches such as subsidies to end-users. The mechanism is sectoral, so policy can be tweaked depending on the sector. Sectors can include the electrical power sector, the heating & cooling sector, high emitting industrial sectors such as the concrete or aluminium sector, the transport sector, etcetera.
To evaluate how the NMM can be used to scale up and incentivise private-sector investment in renewable energy projects, two case-studies will assess all barriers to private-sector (and foreign) investment in renewable energy projects in Serbia & Nicaragua. The author's proposed multilevel framework can bring to light the flexibility of meaning between different stakeholders and actors of the (renewable) energy sector of each country. The author has had the opportunity to travel to Serbia in May 2013 for expert interviews with key stakeholders of the Serbian (renewable) energy sector, as well as having first-hand experience with Nicaragua's (renewable) energy sector after a three month co-authored research in 2012.

The assessment of the Serbian (renewable) energy sector has brought to light several main barriers to private-sector investment in renewable energy. First of all an inefficient, unreliable

and risky legal framework makes the process for private-sector investors to acquire all necessary permits (including the status of Privileged Power Producer (PPP) in order to be eligible for the national FiT) exceptionally lengthy. Even once permits have been received and access to the FiT has been granted, Serbia's centralised energy market and traditionally negative stance towards (non-hydropower) renewable energy technologies and focus on its national lignite resources have meant that the FiT for non-hydropower renewable energy technologies is insufficient and uncompetitive compared to regional FiTs. The FiT can be as much of a disincentive as an incentive for private-sector investors, despite making the government appear open to renewable energy to those who do not critically study FiT developments. The Serbian political landscape is unreliable and lacks capacity; communication between key ministries is low or non-existent and during a change of government work at some crucial offices can be completely paralysed for up to 6 months. The energy market is only now starting to open to external parties, yet the late liberalisation of the market and monopolistic (vertical) power of state utility company EPS which is in control all aspects of the electrical energy sector -from lignite mining up to energy production- will make competition difficult. Low (subsidised) energy (electrical & (district) heating) prices contribute to this phenomena, which has led to a stationary energy sector (with regards to investments and innovation) for the last decade. It was found that infrastructural issues such as insufficient transmission capacity and political preferences for grid extension towards Republica Srpska as opposed to Romania have had a grave impact on renewable energy projects as well as led to problems for (particularly wind energy) developers who wish to get their projects grid-connected. The CDM has not been very successful in Serbia due to a lack of knowledge, complexities of the project-cycle, inherent risks and low CERs prices.
The multilevel analysis has led to interesting conclusions. Whilst actors in the macro landscape have some influence on the meso landscape of Serbia they lack the funding to enforce necessary policy action. International Financial Institutions (IFIs), notably an important part of the meso landscape, provide most of Serbia's funding in the form of concessional loans. IFIs though, are limited to government-guaranteed projects; this means that for the past decade IFIs have been funding fossil-fuel based infrastructure and the historically unchanged policy measures of the Serbian government, leading to further fossil-fuel technology lock-in. This is where the NMM could be of game-changing importance. The NMM, through direct negotiations between the UNFCCC and the Serbian government, has the opportunity to implement tailored policy influences and have a direct impact on the (meso) landscape which private-sector investors in renewable energy sector operate in - whilst simultaneously providing critical funds for the financing of said policy. In this way a more competitive FiT can be simultaneously imposed and financed by the UNFCCC by allocating CERs to the host government for the mitigation realised by the policy changes.

Nicaragua's (electrical) energy situation used to be one of the worst in the western hemisphere, having the lowest percentage of population with access to electricity, the lowest electricity generation and installed (effective) capacity, as well as being largely dependent on oil imports from Venezuela for electrical energy production. The share of renewables in the electrical power sector, however, is expected to reach 94% by 2017. The current explosive expansion of renewable energy in Nicaragua is an indirect (and perhaps unintended) result of the implementation of a petroleum-based electrical energy system with the help of Hugo Chávez through the 2006 ALBA alliance. As 70.24% of Nicaragua's electricity generation in 2010 was powered by oil the country became overly dependent on Venezuelan oil imports, as

well as susceptible to international price fluctuations of oil. After social unrest due to high energy prices grew the Sandinista government opted to subsidise energy leading to massive amounts of public debt. The resulting financially unsustainable situation meant that finding an alternative to diesel plants suddenly became a priority; and the (renewable) energy sector became the top investment sector of the country.
Nicaragua's Foreign Investment Law, Renewable Energy Law and a series of other laws aimed at creating an enabling legal environment mixed with a collection of tax incentives, privatizations and free trade zones as well as the very high price of electricity have led to an explosion of renewable energy in one of the poorest nations in the western hemisphere. Nicaragua regularly places 1st or 2nd in international reports as offering the most enabling environment for Foreign Direct Investment (FDI) in general - or in renewable energy in particular. Remarkably, the implementation of renewable energy in Nicaragua leads to lower energy prices.
As will be shown, barriers to (future) investments in renewable energy still exist in Nicaragua. Nicaragua lacks a relevant FiT and private-sector developers have traditionally been incentivised through a per-case Power Purchase Agreement (PPA) between the distribution company Disnorte/Dissur and the project developer. Additionally, demand increases are required for the continuation of investments in renewable energy. This can be realised either by further grid extension into Nicaragua's off-grid areas or by allowing the distribution company to export power to neighbouring countries via the under-construction Central American megagrid. Transmission & distribution losses also remain a problem. Unsustainable (fuel)wood burning and agricultural "slash and burn" practises also contribute to carbon increases.
The multilevel analysis confirmed that no influence from international organisations was necessary for the enormous increase in renewable energy which can be observed in Nicaragua. Contrary to what seems to be the case in Serbia, IFIs have had the opportunity to invest in renewable energy projects in Nicaragua as renewable energy is supported by the national government - which is consequently willing to back the concessional loans. Due to the current high rate of renewables and inclusive motivation for the expansion of renewables in Nicaragua it is difficult to find a way for the NMM to contribute to any further expansion of renewable energy in Nicaragua. Smaller project developers would have had an opportunity to benefit from carbon crediting had a sectoral mechanism been in place instead of the CDM, as the CDM is inherently too complex, risky and thus expensive for smaller project developers.

The NMM can be used to scale up and incentivise private-sector investments in renewable energy projects by being a means for an outside organisation (the UNFCCC) to exert influence whilst providing funds for to-be implemented policy measures. Through the necessary negotiations between the host government and the UNFCCC, the UNFCCC has the opportunity to simultaneously impose and fund necessary policy changes. The flexibility of the NMM to make use of the entire basket of incentivising methods and choose different sectors and thresholds are all additional advantages. One of the main weaknesses of the NMM is its continued reliance on global carbon prices. Every country, (renewable) energy sector and renewable energy (project) type is unique, therefore the UNFCCC could use its position as the lead-negotiator to run a detailed policy analysis & technology assessment of the respective country where a potential NMM could be implemented to investigate the barriers to private-sector investment in renewable energy projects, much as was the case in this thesis report. As has become apparent, in the case of Serbia such policy influences could have a significant impact on the development of renewable energy. In the case of Nicaragua it was found that a NMM is not a necessity for further developments in renewable energy.

Acronyms

AAUs	Assigned Amount Units
ACUs	Australian Carbon Units
AECID	Spanish Agency for International Development Cooperation
AERS	Energy Agency of the Republic of Serbia
ALBA	Bolivarian Alliance for the Americas
ALBANISA	ALBA Nicaragua S.A.
ARECA	Accelerating Renewable Energy in Central America
ATDER-BL	Association of Rural Development Workers - Benjamin Linder
BAU	business as usual
BCEI	Central American Development Bank of Economic Integration
BIO	Belgian Investment Company for Developing Countries
BOT	Build-Operate-Transfer
CABEI	Central American Bank for Economic Integration
CAF	Andean Investment Corporation
CAFTA-DR	United States free-trade agreement with Central America and the Dominican Republic
CAREC	Central American Renewable Energy and Cleaner Production Facility
CSOs	Civil Society Organisations
CEB	Council of Europe Development Bank
CEI	Central European Initiative
CERs	Certified Emission Reductions
CDM	Clean Development Mechanism
CHP	Combined Heat & Power
CIF	Climate Investment Fund
CoP	Conference of the Parties
CPM	Carbon Pricing Mechanism
DEG	Deutsche Investitions- und Entwicklungsgesellschaft
DNA	Designated National Authority
DNO	Distribution Network Operator
DOE	Designated Operational Entity
EAR	European Agency for Reconstruction

EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECLAC	United Nations Economic Commission for Latin America and the Caribbean
ECT	Energy Community Treaty
EDC	Export Development Canada
EIB	European Investment Bank
EIF	European Investment Fund
EKF	Danish Export Credit Agency
EMS	Serbian Transmission System and Market Operator
EnDev	Energy in Development
ENEL	Nicaraguan Energy Company
ENVE	Commission for Environment, climate change and energy
ERPA	Emission Reduction Purchase Agreement
EPS	Electric Power Industry of Serbia
ERUs	Emission Reduction Units
ESCOs	Energy Service Companies
ETS	Emissions Trading Scheme
EU	European Union
EUA	European Union Allowance
EU ETS	European Union Emissions Trading Scheme
EUCO	European Council
FDI	Foreign Direct Investment
FinnFund	Finnish Development Finance Company
FiT	Feed-in-Tariff
FP7	EU Seventh Framework Program for Research and Technological Development
FSLN	Sandinista National Liberation Front
FMO	Financieringsmaatschappij voor Ontwikkelingslanden
FVA	Framework for Various Approaches
G2G	Government-to-Government
GCF	Green Climate Fund
GDP	Gross Domestic Product
GGF	Green for Growth Fund
GIZ	German Agency for International Cooperation
HFCs	hydrofluorocarbons
HIPC	Heavily Indebted Poor Countries
IADB	Inter-American Development Bank
IET	International Emissions Trading
IFIs	International Financial Institutions
ILC	indirect land use change
IMF	International Monetary Fund
INE	Nicaraguan Energy Institute
IPA	Instrument for Pre-Accession
IRR	Internal Rate of Return
ITRE	Industry, Research and Energy
IUCN	World Conservation Union
JI	Joint Implementation

JICA	Japan International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau
LAIF	Latin America Investment Facility
LCPD	Large Combustions Plants Directive
LDC	Least Developed Country
LDCs	Least Developed Countries
MARENA	Ministerio del Ambiente y los Recursos Naturales Nicaragua
MEM	Ministry of Energy and Mines
MER	Regional Electricity Market
MIFIC	Ministry of Development, Industry, and Trade
MRV	monitoring, reporting and verification
Mtoe	million tonnes of oil equivalent
NAMAs	Nationally Appropriate Mitigation Actions
NAPAs	National Adaptation Programmes of Action
NDF	Nordic Development Fund
NEEAP	National Energy Efficiency Action Plan
NREAP	National Renewable Energy Action Plan
NGOs	Non Governmental Organisations
NIPAC	National Instrument for Pre-Accession Coordinator
NMM	New Market Mechanism
Norfund	Norwegian Investment Fund for Development
NPEE	National Program of Energy Efficiency
ODA	Official Development Assistance
PDD	Project Design Document
PFCs	perfluorocarbons
PLANER	National Rural Electrification Plan
PNESER	Sustainable Electrification and Renewable Energy National Program
PoA	Program of Activities
PPA	Power Purchase Agreement
ppm	parts per million
PPP	Privileged Power Producer
PPPs	Public-Private Partnerships
SCM	Sectoral Crediting Mechanism
SEIO	Serbian European Integration Office
SFO	Serious Fraud Office
SICA	Central American Integration System
SIEPAC	Central American Electrical Interconnection System
UN	United Nations
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention for Climate Change
US	United States
USAID	US Agency for International Development
WB	World Bank
WBIF	Western Balkans Investment Framework

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1

Introduction

1-1 Problem definition

The European Union (EU), United Nations (UN) (as stressed through the United Nations Framework Convention for Climate Change (UNFCCC)), and other nations and international organisations would like to see significantly lower global carbon & greenhouse gas emissions. To reach or surpass Kyoto commitments, considerable (technological) steps must be taken requiring billions of US$ of investments. Due especially to the current economic crisis which diverts attention away from climate change and sustainability, governments would like to see private-sector investment to reach the estimated 15 trillion US$ of needed investment until 2035 for mitigation[1]. As alternatives to market-based mitigating solutions seem (politically) unfeasible and the current flexibility mechanisms of the UNFCCC (such as the Clean Development Mechanism (CDM) & Program of Activities (PoA)) have not managed to notably slow the increase in the level of greenhouse gases in the environment, a scaled up market-based mechanism seems necessary. The idea of such a *new market-based mechanism* as a sectoral instead of project-based approach was introduced during the Conference of the Parties (CoP) at Durban in 2011 and is currently being debated by policymakers on an international level, with pilot & case studies gradually taking off to test this new mechanism.

1-2 Research goals & questions

To find out whether or not the New Market Mechanism (NMM) could be advantageous as a means to increase mitigation by capitalising private-sector investments in renewable energy projects, research questions need to be answered related to (renewable) energy sectors of (non-Annex I) countries where the UNFCCC's flexibility mechanisms are currently active. It is important to discover what has gone wrong with the current mechanisms by hindering

[1] according to (Bolscher et al., 2012), or roughly 570 billion US$ annually up to 2030 according to (Whitley and Ellis, 2012), to stay within a 2 degree Celsius estimated maximum global average temperature increase

private-sector investment in renewable energy projects, to define these factors/bottlenecks, and to see if the NMM could potentially have an influence on these matters. As such, the main research question can be defined as:

How can the NMM, as a sectoral (crediting/trading) mechanism, be used to scale up and incentivise private-sector investment in renewable energy projects?

To answer this question, the following sub-questions shall be addressed:

- What changes could the implementation of the NMM as a scaled up, sectoral flexibility mechanism have on private-sector investments in renewable energy in certain non-Annex I countries if the NMM were to have complimented or been in place instead of the CDM?
- What are the impacts of current flexibility mechanisms on private-sector investments in-, and technological innovation of renewable energy projects in comparison to potential non-market-based mitigating solutions?
- What are the prerequisite factors which must be met to attract private-sector investments in renewable energy projects?

1-3 Research approach

As will be mentioned in section 2-3 on page 16 there is a great deal of interest from the developed world as well as a list of co-benefits related to the implementation of renewable energy in lesser developed countries. By evaluating the current (renewable) energy sectors of two particular non-Annex I[2] countries in depth with a multidisciplinary perspective through select criteria, a broad understanding can be formed of the current barriers to private-sector investments in renewable energy projects and conclusions can be drawn on the impacts and benefits of the implementation of the NMM to complement or replace the current flexibility mechanisms such as the CDM. The research shall therefore focus, in detail, on the (renewable) energy sectors of two non-Annex I countries as case studies. The non-Annex I countries selected to be evaluated are Serbia and Nicaragua, two vastly differing non-Annex I countries to provide a more diverse basis for the comparative analysis of possible incentive mechanisms. Serbia has a complex, centralised but currently transitioning energy market, with talks of joining the EU (and therefore becoming a part of the European Union Emissions Trading Scheme (EU ETS)) getting stronger - Nicaragua has a much smaller and developing energy market much like its economy, with unique regional political dynamics. Section 1-4 discusses the shortcomings of the chosen research approach & case studies.

1-3-1 Report structure

Figure 1-1 graphically depicts the structure of the thesis report. **Step 1**, as will be elaborated in subsection 1-3-2, covers the multilevel framework methodology which will be used

[2] as shall be explained in chapter 3 starting on page 19 a non-Annex I country is a country defined under the UNFCCC as a country which is not committed to achieve certain quantified emission limitations, and, most importantly, can make use of the UNFCCC's flexibility mechanisms

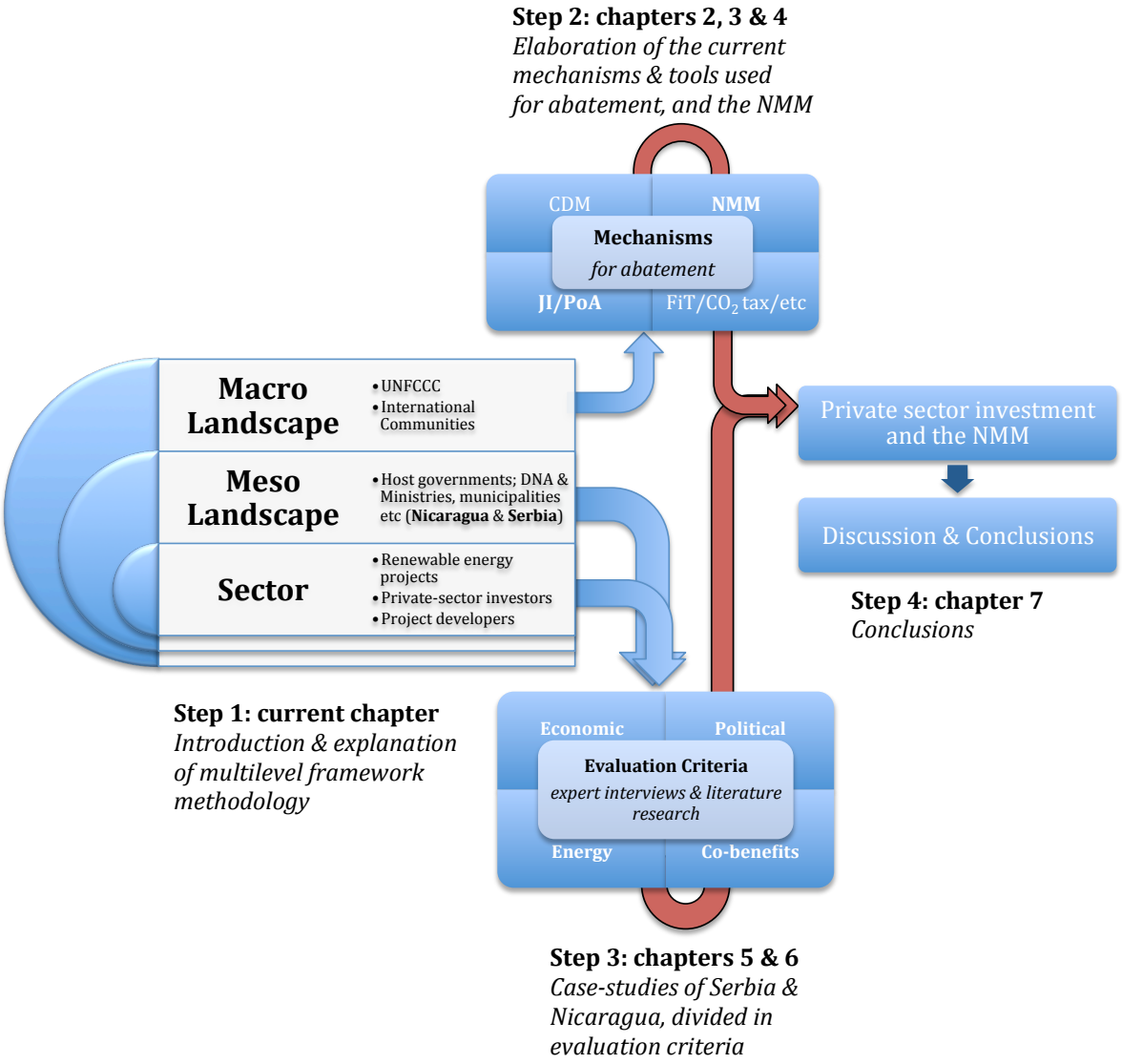


Figure 1-1: Report structure & multilevel framework

throughout the thesis. The macro landscape is defined as the international organisations which impose regulation and offer *tools* for individual countries to reach certain abatement goals. These tools & mechanisms, such as the UNFCCC's CDM, Joint Implementation (JI) & PoA flexibility mechanisms, but also other possibilities such as a Feed-in-Tariff (FiT) or CO_2 tax are discussed in **step 2** (chapters 2, 3 & 4). Chapter 2 starts off with a short historic, political and economic elaboration of the responses to climate change. Chapter 3 covers the current (non-)market-based mitigation tools; section 3-1 on page 19 qualitatively covers the functioning of the UNFCCC's current flexibility mechanisms whilst section 3-2 on page 26 looks at non-market-based mitigating methods. Chapter 4 on page 29 will cover the proposal of the NMM as an addition to the spectrum of mitigation tools; different forms of the NMM influence aspects such as political feasibility, environmental impacts or governance, and a greater understanding of these influences will elucidate the fundamental complexities which make implementation of the NMM as an additional mechanism so politically challenging. As

will become apparent in chapter 4, the NMM is a tool which allows for the use of all existing (non-)market-based mitigation solutions, be it project-based such as the CDM or through the use of a CO_2 tax or FiT - for this reason the thesis contains a brief introduction of all these methods in step 2. The meso landscape & (renewable) energy sectors of two non-Annex I countries shall be analysed in **step 3** through select evaluation criteria to be certain of a thorough and consistent analysis, as shall be elaborated in subsection 1-3-2. The case study Serbia is analysed in chapter 5, and Nicaragua in chapter 6. **Step 4** is to combine the findings to a set of conclusions and answer the research questions - to look at private-sector investments in general and how the NMM could fit in with the current tools of the UNFCCC; the findings of the two cases shall be used to come to more general conclusions on the possibilities, flexibilities and shortcomings of the NMM in achieving this.

1-3-2 Methodology & data collection

Table 1-1: Multilevel framework - main actors per level

Macro landscape	International organisations, International Financial Institutions (IFIs), development banks, the UN/World Bank (WB), regional organisations, etcetera
Meso landscape	Countries & governments, national (centralised) energy companies, ministries, municipalities, etcetera
Sector	Actors in the (renewable energy)[a] sector such as project developers, private-sector investors, construction companies, private power companies, etcetera

[a] this report will focus on the (renewable) energy sectors of the two case studies

As mentioned, the thesis will start off by looking into the current responses to climate concerns such as political and budgetary challenges related to CO_2 and other greenhouse gas emissions abatement, and carbon as a *commodity* which can be traded under one of several emissions trading schemes. The majority of the rest of the thesis comprises a multilevel framework analysis as proposed by the author[3]; dividing the analysis into a *Macro landscape*, *Meso landscape*, and *Sector* levels. Table 1-1 shows the main actors per level, the bulleted list below offers a further elaboration of the different levels.

- ***Macro landscape*** - The idea is that the UNFCCC, through the international community, sets the macro landscape which individual countries must/can comply to or use to attract low carbon investments. For example; the macro landscape obliges certain Annex I countries to comply to agreed upon emission levels, and offers said countries a set of mechanisms to help reach these levels. Non-Annex I countries, which do not have to comply to certain emission limitations, can make use of these mechanisms as a means to attract low carbon investments. The macro landscape therefore *sets the rules of the game*, and offers countries a collection of *cards* (essentially tools) to reach

[3] not to be confused with Geels' multilevel perspective, which is a specific interpretation of transition thinking and looks at socio-technical dynamics by means of landscapes, regimes, and niches (Mil and ten Pierick, 2009)

goals. Host governments are then free to play the cards as they wish by setting up their own *meso landscape*, the landscape under which (renewable) energy developers in that country can get to work.

- ***Meso landscape*** - The meso landscape is the interpretation of individual countries of the macro landscape and how this gets translated into their own (energy) policy. As country governments are obviously free to set up the meso landscape as they wish, many differences in the meso landscapes between countries exist. This report covers two meso landscapes through two case studies; Serbia and Nicaragua. Those two non-Annex I countries with a history of registered CDM projects shall be evaluated with literature studies and expert interviews to determine to which extent a transition to-, or addition of the NMM to the CDM could be beneficial or disadvantageous uniquely per case study. As a framework a list of evaluation criteria has been formed, as listed below, to allow for a consistent analysis, followed by a conceptual multilevel model to portray the flexibility of meaning between key stakeholders and how a NMM could be- or could have been beneficial to private-sector investments in renewable energy projects. The criteria shall be evaluated by literature studies and expert interviews; the author has had the opportunity to travel to Serbia in May 2013 for expert interviews with key stakeholders of the Serbian (renewable) energy sector, as well as having on-site experience with Nicaragua's energy market after a three month co-authored research in 2012 on the potential and viability of renewable energy technologies in the northern Nicaraguan province Estelí (van Duinen and Negenman, 2012). The experience and local network set up in Nicaragua combined with the expert opinions of crucial stakeholders in Serbia can contribute to a broad basis for the research with information not readily available in literature.

- ***Sector*** - As mentioned, policy makers of the individual governments are free to use the set macro landscape as they wish; the differences between how Serbia and Nicaragua decides to set up their policy (their meso landscape) are vast and therefore the impacts on renewable energy and private-sector investments in the energy sector also differ greatly. The policy could favour certain sectors such as the forestry or agricultural sector, the final level of the multilevel framework is therefore defined as the "sector". This report focusses on the individual renewable energy projects and private-sector investors or project developers of the **(renewable) energy sector**.

Data collection - The case-studies will bring to light the flexibility of meaning between different stakeholders and actors, and the multilevel framework can portray those dynamics and interactions between the different levels of influence by the conceptual modelling thereof. The main methods of collecting data are through expert interviews and thorough literature studies, as well as database analyses and by analysing sources such as official websites, reports, policy studies, conference proceedings, press releases, technical reports, statistics, books, scientific articles, etcetera. As mentioned, several interviews were held with key stakeholders. Most of these interviews were in-person (one was via Skype) and have been recorded[4], a few were through the answering of emails - please see the list of all actors in annex A-4 on page 142. All interviews contain identical basic questions based on the views of the interviewee on the CDM, NMM, and state of the (renewable) energy market of the relevant case study country.

[4] in Spanish, English & Dutch

After that the interviews were continued with open-questions depending on the interviewee. In addition to the interviews which were held specifically for this thesis, information (and experiences) from the author's previous study in Nicaragua[5] have been used which are not on this list[6] - similar to a selection of discussions and phone calls with stakeholders[7] which could not be documented or recorded. Actors were selected from literature studies, and through *"snowballing"* via suggestions of key stakeholders which other actors should be included.

Evaluation criteria - Four main evaluation criteria have been defined for a consistent analysis of the meso landscape & sector level of the two case studies.

- Economic
  - Private-sector investment
  - Economic sustainability
  - Local employment
  - ...
- Energy
  - Energy independence/depletion
  - Grid reliability
  - Technology transfer
  - Environmental impact
  - ...
- Political and societal
  - Societal awareness
  - Political feasibility
  - Legislation
  - Operational practicality
  - Social sustainability
  - ...
- Co-benefits
  - Infrastructure
  - *Rural electrification*
  - ...

The economic criteria focus on the country's current economic aspects regarding renewable energy (investments). Quantitative elements such as levels of investments, Foreign Direct Investment (FDI), concessional loans of IFIs, and qualitative consequences such as local (un)employment due to current policy, or effects investments in renewable energy can have on local employment. The effect of the UNFCCC's transaction costs related to CDM projects will also be analysed here. The energy criteria shall evaluate the energy situation of the country; is the grid reliable, does energy have to be imported, etcetera. The environmental impact of energy policy shall also be discussed here. Finally, the political and societal situation of the country, including the legal framework, operational practicality, and social sustainability and awareness of renewables are grouped, as well as the unique co-benefits related to renewable

[5](van Duinen and Negenman, 2012)

[6]such as interviews at the Ministry of Energy and Mines (MEM) and Energy in Development (EnDev) in Managua - Nicaragua

[7]such as with the vice-mayor of Estelí - Nicaragua, and a sustainable energy professor from FAREM University

energy which shall be analysed per case.

1-4 Relevance & shortcomings

Due to the ever increasing concentrations of greenhouse gasses such as CO_2 in the atmosphere, growing global consensus on the necessity of mitigation, fossil-fuel depletion and growing political will for energy independence, renewable energy is expanding at unprecedented rates. Mechanisms to incentivise private-sector investment in renewable energy are being researched and investigated at a large scale by research institutions such as ECN worldwide, often funded by organisations such as the EU, UNFCCC or WB. Research centre ECN has kindly supported the author with the formulation of the research topic to guarantee a relevant thesis topic. The NMM is a relatively new mechanism and in the initial phase of debates and design. This makes researching the NMM both interesting, relatively *new*, and relevant.

Whilst the case studies used in this thesis differ greatly on almost all fields there is one mentionable similarity. Both countries have different climates, economies, politics and are based on different continents yet both Serbia and Nicaragua are non-Least Developed Country (LDC) countries. Nicaragua is the 2nd poorest nation in the western hemisphere nonetheless, but the similarity has to be noted. Additionally, and as will become apparent after reading chapter 2, Certified Emission Reductions (CERs) originating from non-LDCs have not been eligible for compliance under the EU ETS as of January the 1st 2013. Whilst non-LDC CERs could always be traded under the voluntary carbon market or on other emission trading schemes, the EU ETS is the largest creator of demand for CERs and thus the most important player for those wishing to sell CERs to fund renewable energy projects. The scope of this MSc. thesis report does not allow a thorough global analysis, and it was chosen to focus the thesis on two detailed case studies.

2

Responses to Climate Change

This chapter will start off with an introduction of the ways climate change has been, and is being tackled currently. The succeeding chapter will follow up on these developments by describing the current market- and non-market-based mitigating solutions which have been implemented thus far.

Global CO_2 emissions remain in a constant rise as seen in Figure 2-1 and concentrations are expected to have surpassed the symbolic 400 parts per million (ppm) mark in May 2013 (Vidal, 2013). As a response the United Nations Framework Convention for Climate Change (UNFCCC) has continuously been pushing the importance of lowering global CO_2 emissions. Since the Clean Development Mechanism (CDM) is the UNFCCC's main flexibility mechanism and thus the current *weapon of choice*, the UNFCCC recognises the 5,118 CDM project activities registered in over 80 countries generating investments in excess of USD 215 billion, and pushed for the extension of the CDM at the 18^{th} Conference of the Parties (CoP) at Doha in November 2012 as the CDM was originally scheduled to be decommissioned in 2013 (UNFCCC, 2013c). The CDM was extended and allowed to continue as of 2013. Due to the -at that time- expected decommissioning of the CDM at the end of 2012 the number of registered CDM projects increased sharply to 6,663 as of March 2013 (UNFCCC, 2013d) as can be seen in Figure 3-2; despite appearing more alive than ever the mechanism has entered a time of grave uncertainty due to political and economical reasons.

2-1 Political

Despite times of European austerity as a consequence of the 2008 global financial crisis and resulting European debt crisis, the European Heads of State and Governments have agreed to the suggestion of the European Commission (EC) to commit at least 20% of the European Union (EU) budget from 2014-2020 to climate-related spending (Hedegaard, 2013a), up from 5% of the former 2007-2013 budget (van Renssen, 2012). The EU currently commits itself to climate change in three ways known as the 20-20-20 targets for 2020; a 20% reduction in

EU greenhouse gas emissions from 1990 levels; a raise in the share of EU energy consumption produced from renewable resources to 20%, and a 20% improvement in the EU's energy efficiency[1]. The official European Council (EUCO) conclusions of the multiannual financial framework from February 2013 states:

> *Climate action objectives will represent at least 20% of EU spending in the period 2014-2020 and therefore be reflected in the appropriate instruments to ensure that they contribute to strengthen energy security, building a low-carbon, resource efficient and climate resilient economy that will enhance Europe's competitiveness and create more and greener jobs*[2].

Whilst this sounds optimistic with regards to climate policy, the statement mentions nothing of the European Union Emissions Trading Scheme (EU ETS) (EUCO, 2013), the world's driving Emissions Trading Scheme (ETS) when it comes to the creation of demand for Certified Emission Reductions (CERs) from sources such as the CDM. The concerns to the UNFCCC and its' flexibility mechanisms such as the CDM became apparent a month and a half later when the European Parliament blocked a proposal to postpone the auctioning of new carbon emitting allowances (so called *backloading*) which would increase the price of carbon as a commodity (Clark and Chaffin, 2013) (more on this in section 2-2, please see Figure 2-3 for a graph of the immediate reaction of the commodity market due to this vote). The EU ETS is often seen as the EU's flagship climate change policy and the EC pushed for the move to *save* the carbon price of a European Union Allowance (EUA), yet a 334-315 vote put a halt to the proposal. The European Parliament's Commission for Environment, climate change and energy (ENVE) voted in favour of the proposal in February, yet the committee on Industry, Research and Energy (ITRE) voted against the proposal. The reasoning of both the ITRE and the European Parliament's vote against the proposal is simple, the current economic reality in Europe creates opposition to climate policy tightening in times of crisis (Keating, 2013). On top of that, business groups do not believe in political interference with the system; it is assumed that as the economy picks up the carbon price will pick up (Clark and Chaffin, 2013). The European Parliament will have a second chance to vote on the backloading issue in 2013[3], if the plan passes the carbon price could be pushed above 10 euros for the first time in two years (Straw, 2013).

The EU ETS is not the only emissions trading scheme, yet it is the largest and most influential. How did this come to be in a political sense? During the 1990s the EC proposed a European-level carbon taxation plan to stabilise the European Community's greenhouse emissions to 1990 levels by 2000 (Bonnell and Martz, 1995). This was proposed around the time of the UN Conference on the Environment and Development, held in Rio de Janeiro, which resulted in the creation of the UNFCCC among other agreements. The proposal was, however, not ratified by all European Community member states[4] as there was strong opposition from the

[1] It is estimated that meeting the 20% renewable energy target and the 20% energy efficiency improvement by 2020 could lead to a boost in net employment of 817,000 jobs (EC, 2012c)

[2] multiannual financial framework of February 2013 (EUCO, 2013)

[3] On July the 3rd 2013 the European Parliament voted in favour of a second, slightly amended, backloading proposal. Insecurities on long term carbon prices remain as only half of surplus allowances will be taken off the market (EL, 2013), so the UNFCCC's flexibility mechanisms remain in an unsure state.

[4] some member states such as Germany, Belgium, Italy, Luxembourg, Denmark, and the Netherlands initiated differing small scale carbon taxation policies of their own

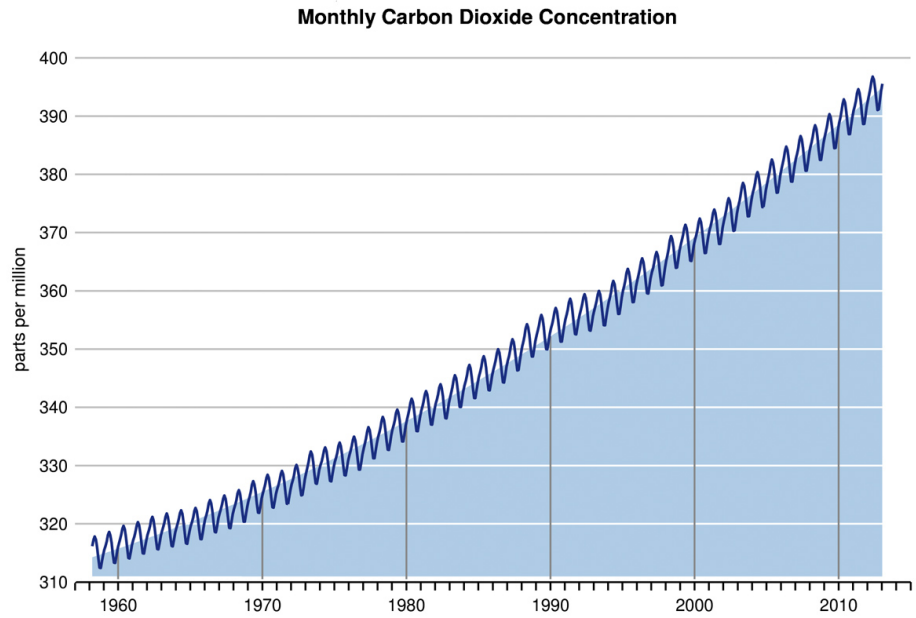


Figure 2-1: CO_2 ppm over time, April 23rd, 2013 (source: Scripps Institution of Oceanography)

industry. Between 1997 and 2001 the Kyoto Protocol developed into a trading system, and after the United States (US) of America withdrew from Kyoto in 2001 the EC adopted the original US idea of favouring market based instruments to trade in carbon (Spash, 2009) to replace Europe's taxation failure; the US has had successful experiences with a cap-and-trade system for sulphur dioxide in the 1990s (Castree, 2009). After Russia and Canada ratified the Kyoto Protocol in 2002, the treaty was officially brought into effect on February 16, 2005 and defined three flexibility mechanisms that can be used to a limit by Annex I countries for mitigation:

- **International Emissions Trading (IET)**; emissions allowance trading between registered polluters
- **CDM**; offset trading in the form of CERs between Annex I countries and developing (non-Annex I) countries
- **Joint Implementation (JI)**; enabling Annex I countries to invest in emission reduction projects in *economies of transitions*; mostly hosted by Russia and Ukraine

Most of the industry, including companies such as Royal Dutch Shell, have historically supported an ETS instrument over carbon taxation as a means to reduce carbon emissions at minimal cost to the economy (Martin, 2012), favouring harder emissions goals over renewable energy targets (Nichols, 2013). Large sums of public money are required to establish such a trading system, which eventually leads to a largely privatised system which is difficult to scrutinise (Whitfield, 2006). Support for an emissions trading scheme is not limited to (fossil) energy industrials as the 2006 Stern Review points out, greenhouse gas control is seen as a pro-growth strategy offering positive financial returns for the financial sector (banks, investors) in funding mitigation (Stern, 2006).

The IET flexibility mechanism led to the creation of the EU ETS which has evolved through three phases between 2005 and 2013 (Hedegaard, 2013b):

1. Phase one was seen as a short three-year pilot period to prepare for the second phase (Ellerman and Joskow, 2008). In phase one the EU ETS covered only CO_2 emissions from certain industrial sectors, most allowances (EUA) were allocated to businesses for free. Phase one succeeded in establishing a price for carbon as the penalty for non-compliance was 40 euros per tonne, free trade in emission allowances across the EU and an infrastructure for monitoring, reporting and verification (MRV) of emissions. Since the EU had no true data of CO_2 emissions, the cap of the cap-and-trade was determined by a mixture of *grandfathering*, guessing, and negotiating.

2. Phase two coincided with the first commitment period of the Kyoto Protocol and included nitrous oxide emissions by a number of member states and the inclusion of Iceland, Liechtenstein and Norway. Several member states now started auctioning allowances as less allowances were given away free of charge (90% of allowances were allocated for free in phase two), on top of that the penalty for non-compliance was increased to 100 euros per tonne. As it was now advantageous for businesses to buy CDM and JI credits to reach emissions goals (allowed to a limit of 13.4% of the overall cap during phase II (Nazifi, 2013)), demand for CERs increased and the EU ETS became the biggest source of demand for such credits. As a system of MRV now existed, member states had the data required to determine a proper cap.

3. Phase three, started in 2013, is far more harmonised than previous phases and includes more fundamental rules (Hedegaard, 2013c). A single harmonised cap on emissions was decided to be used instead of 27 different national caps, and 40% of allowances are auctioned. More sectors are now included as well as perfluorocarbons (PFCs), a greenhouse gas mostly emitted during the production of aluminium.

Phase one and two received (international) criticism[5], yet the consensus is that most problems could be, and have been, designed away. Much debate over the effectiveness of market-based mitigating solutions exists and whether or not expansion of the system (with the New Market Mechanism (NMM) for example) is such a good idea. It is argued that some *flaws* can not be designed away (Spash, 2009); the system of MRV puts governments in a weaker position than the industry since it is the industry who knows how much they emit leading to corporate-led self-monitoring and verifications schemes run by big businesses. Emissions can therefore be exaggerated by the industry, effectively creating a higher baseline or cap (Whitfield, 2006). It is therefore impossible for governments to determine the true level of business as usual (BAU), and it is costly to even come close. When it comes to the accounting of global emissions, climate models can be infinitely complex and still not account for all variables of the carbon cycle. Not enough is known about the absorption of greenhouse gases in the global system as a whole (carbon sinks), and the physical dynamics between carbon emissions and certain climatic feedback-loops have not yet been properly modelled. This means that the assigning of allocations has become a political negotiation between Kyoto ratifiers, with members trying to prove the wealth of their carbon sinks (for example

[5]one of the controversial results of the EU ETS is the fact the not only did electricity prices increase, profits for producers also increased (Hobbs et al., 2010)

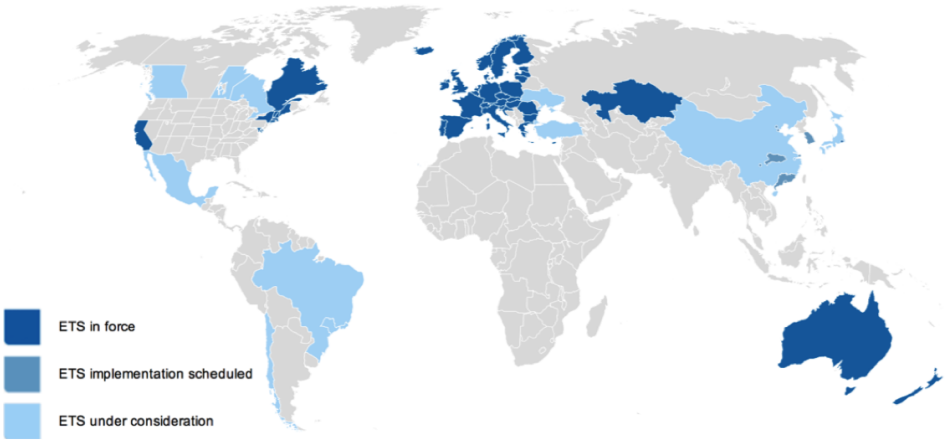


Figure 2-2: Global emissions trading schemes in 2013 (ECOFYS and ICAP, 2013)

large forests) and lower their mitigating commitments (Spash, 2009). Depending on how many sectors are part of an ETS or which countries are included, carbon leakage between the sectors or crossing borders poses an additional problem (EU, 2013b). Despite the many problems and issues, emissions trading schemes are a fact and further global schemes are being set up[6] as can be seen in Figure 2-2, and merger plans exist such as the Australian Carbon Pricing Mechanism (CPM) with the EU ETS which was expected to merge, in part, in 2015. The European Parliament's failed[7] backloading vote, however, deterred these plans and could lead to the Australian-induced delay of the linking until 2018 to avoid a serious impact to Australian Carbon Units (ACUs) (De Wit and Jones, 2013). According to Peer Stiansen, the new chairman of the UNFCCC's CDM Executive Board, the expansion of emissions trading schemes is a positive indication that the demand for CERs will eventually increase (King, 2013).

A global political phenomena, partly due to (fossil fuel) technology lock-in, is the (in)direct subsidising of fossil fuels. The US federal government provided larger subsidies to fossil fuels than to renewables, totalling approximately 72 billion US$ over the period 2002-2008 while subsidies of renewable energy sources totalled 29 billion US$ over the same period (Adeyeye et al., 2009). These subsidies, mostly in the form of tax breaks but also in the form of R&D expenditures in technologies such as hydraulic fracking for the extraction of shale gas[8], create a perverse incentive for the fossil fuel business (ELI, 2009). Globally, fossil fuels are supported by subsidies that amounted to 523 billion US$ in 2011, up almost 30% on 2010 and six times more than subsidies to renewables which amounted to 88 billion US$ globally in 2011 (IEA,

[6]Besides the EU ETS, national or sub-national systems are already operating in Australia, Japan, New Zealand and the United States, and are planned in Canada, China, South Korea and Switzerland (EU, 2013c)

[7]On July the 3rd 2013 the European Parliament voted in favour of a second, slightly amended, backloading proposal. Insecurities on long term carbon prices remain as only half of surplus allowances will be taken off the market (EL, 2013), so the UNFCCC's flexibility mechanisms remain in an unsure state.

[8]The US government, also under the current Obama administration, is a keen supporter of shale gas and believe it to be a contributing reason for the 20 year low in carbon emissions of the US. Both Republican and Democratic party members believe in the extraction of shale gas, as a boost for the US economy as well. Shale gas extraction is attracting billions of US$ of private-sector investments (Crooks, 2012), and could be seen as placing the US in an attractive position compared to Europe when it comes to economic growth, low energy prices, lower emissions and job growth as extraction has led to the creation of 39,000 jobs in the shale gas industry in 2012, with an additional quarter million jobs expected up to 2035 (Upton, 2013).

2012a). It is sometimes argued that ending the subsidy on fossil technologies could be more desirable than raising taxes or the costs to consumers for mitigation.

Political views on how and how much to mitigate vary not only per country but also over time as national political (meso) landscapes change. As will be discussed in chapter 4, the NMM offers opportunities as a flexible mechanism to compliment or replace the CDM which can be tweaked to match local political demands. Together with Nationally Appropriate Mitigation Actions (NAMAs) as a new non-market-based mechanism and a Framework for Various Approaches (FVA) which is currently in the making (Marcu, 2012) to be able to link and calibrate future global carbon projects with different carbon markets, the UNFCCC offers what could be more politically feasible mitigating methods (Figueres, 2013).

2-2 Economic

The impact of anthropogenic climate change - and perhaps climate change in general - is possibly the most controversial, disagreed upon, and debated topic of the past decade. Particularly the economic impact sparks much debate in (international) politics and amongst economists; the difficulties of determining a discount rate to compare economic impacts occurring at different times and to put a number to marginal damages associated with climate change. A recent report written by more than 50 scientists, policy experts and economists and commissioned by 20 governments estimate the current global annual financial impact to be 1.6% of global Gross Domestic Product (GDP), rising up to 3.2% in 2030 with some Least Developed Countries (LDCs) suffering up to 11% (DARA, 2012).

As mentioned in section 2-1, the European Parliament blocked[9] a backloading proposal to postpone the auctioning of new carbon emitting allowances on April the 16$^{\text{th}}$ 2013 which would have certainly increased the price of carbon as a commodity (Clark and Chaffin, 2013). After the vote the price of EUAs per tonne CO_2, however, deflated immediately as seen in Figure 2-3, with the price of CERs (which ultimately end up in the hands of the project developers) remaining on historic lows as seen in Figure 3-1. The EC is aware of not only the effects of such a low carbon price on non-EU ETS (and thus non-Annex I) countries, it also recognises that it does not provide investors with sufficient incentive to invest in -; nor does it succeeded in being a major driver towards - long term low carbon investments (European Commision, 2013).

As the gradual construction of a global ETS is effectively underway to gather the billions of US dollars required to reach the 2 degree Celsius goal (Polycarp et al., 2013) and to possibly limit the (economic) impacts of climate change, the challenges of reaching global consensus in times of austerity become apparent. A problem of a global ETS are that there will be loose policy due to differing international goals; fundamental differences between developing countries who want to see more action from the west, the US's historic position of favouring economic growth over climate change investments, and China's massive industrial (and emissions) boom as industry is shifted from Europe and the US to China. Demand for emission allowances is to increase for market-based mechanisms to succeed at realising significant mitigation, this

[9] On July the 3$^{\text{rd}}$ 2013 the European Parliament voted in favour of a second, slightly amended, backloading proposal. Insecurities on long term carbon prices remain as only half of surplus allowances will be taken off the market (EL, 2013), so the UNFCCC's flexibility mechanisms remain in an unsure state.

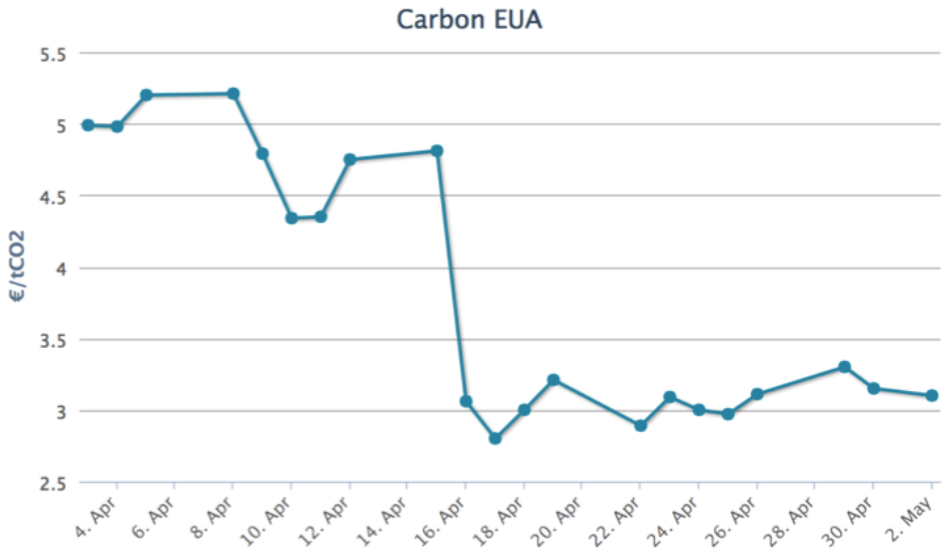


Figure 2-3: EUA CO_2 price per tonne during the backloading vote in april 2013 (source: NASDAQ OMX)

can be done by increasing reduction targets in the EU ETS, by backloading, by including more countries in a global ETS or to increase demand by getting more countries to set up their own ETS.

Whilst auctioning is seen as the most effective way to allocate credits in the EU, and regulation of auctioning the way to steer the carbon price, it must be noted that auctioning could impede EU competitiveness in certain energy-hungry sectors such as the steel, chemical or aluminium sector. As seen in Figure 2-4, the US's low energy prices due to their shale gas revolution and lenient climate policies are straining European industries with gas prices around four times- and electricity prices approximately 50% lower in the US[10] (Chris, 2013). Coupled with relatively high labour costs, Europe's high energy prices have far-reaching impacts for many industries. Whilst a global ETS could be 'softer', it could solve inequalities such as these which have profound negative economic impacts on the more dedicated mitigators.

Carbon markets are unique as they differ from *normal* (commodity) markets in the way that there is no transfer of tangible goods, no consumption as such. This effects the discussion over upstream vs. downstream CO_2 trading. As load-based, and thus downstream, ideas to allocate personal carbon "credit cards" to consumers which track and limit the carbon levels of purchases were proposed in the UK, Sweden and California (Hobbs et al., 2010), societal acceptance proved difficult due to the intangibility of carbon allowances. In a downstream system, consumers would be responsible for limiting emissions instead of the upstream electrical power producers which the EU ETS currently focusses on. It has been argued that such a system, if initial allowances are given away for free, could, amongst other advantages[11], lessen

[10] A recent example is BMW's decision to open an energy-intensive carbon-fibre plant in the US to fabricate parts which shall then be shipped back to Europe for the production of their new BMW i3 model.

[11] A downstream system could lead to more consumer awareness of the carbon numbers and emissions of products which are bought, which could lead to an increase in the motivation of carbon reductions more readily than would price increases due to carbon taxes. It is also argued that such a system can cover more sectors, and lead to a fairer distribution between different consumers with incomes (Hyams, 2009). This leads to more

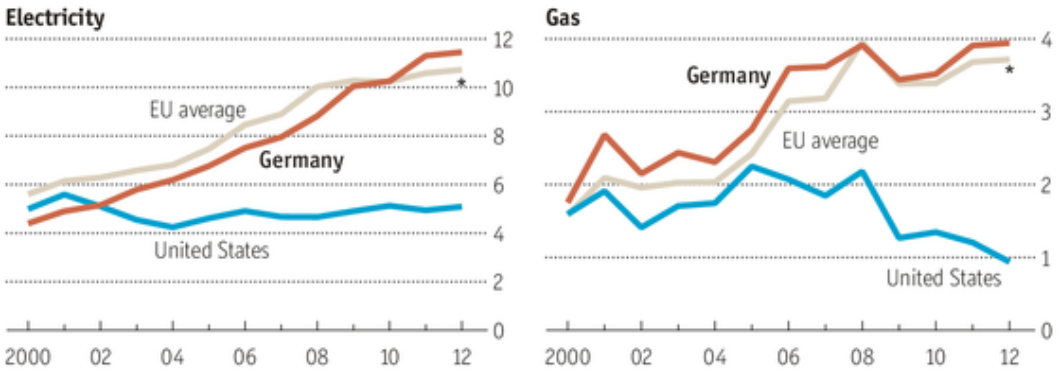


Figure 2-4: Industrial energy prices, euro cents per kWh (source: Enerdata/McKinsey)

consumer costs lead to lower producer profits as has been the case with energy producers in the EU ETS, even though a system as such would be fundamentally more complex than an upstream system with few emitters to be monitored, recorded, and verified.

2-3 Third World

As mentioned earlier, LDCs and developing countries could suffer the most from climate change, not only economically (up to 11% of GDP by the year 2030 (DARA, 2012)), but also in the form of environmental issues (agriculture, food supply, etcetera), health (the broadening of the "malaria line"), water management (flooding, droughts), and the results of extreme weather (storms). Whilst developed countries might view the help allocated to such countries as simple aid, third world countries could view this as a form of compensation for a problem not fundamentally caused by them. This phenomena can be seen, in different forms, on all levels regarding the climate change discussion, at the UNFCCC for example.

It is also the developed countries which typically provide aid to the third world, often delivering finance in the form of (concessional) loans through one of the several International Financial Institutions (IFIs) such as the World Bank (WB), 40% of World Bank lending contributed to climate change adaptation, mitigation or both, double the 2011 amount (World Bank, 2012). An odd phenomena here in general, is that loans are often 7-15 years but the life of renewable energy projects is longer, around 30 years - extending the length of loans might make projects more financially viable (CCAP, 2012). These loans are given to countries which are often already debt overloaded, and carry with it several consequences. Bilateral or multilateral development banks do not open credit lines without the host government having to conform to certain criteria or constraints[12]. In order for a Least Developed Country (LDC) to attract such loans the government might have to open up financial flows or create an enabling environment for foreign investors, such policy could mean lower taxes or other incentives which might not benefit LDCs (Tan, 2010). Whilst developed countries are trying to push for *climate loans* via the WB[13] or other IFIs, protests are being organ-

of a so-called "market-pull" instead of "technology-push" from the supply side.

[12] An example is the World Bank Partnership for Market Readiness - funds from this partnership will only be released to parties that comply with market readiness

[13] Via the World Bank's *Pilot Program for Climate Resilience* program for example

ised by Non Governmental Organisations (NGOs) and Civil Society Organisations (CSOs) to counter the, according to them, inequitable phenomena of weak countries with fragile economies going in to greater debt and being pushed into policies which could be harmful or unsustainable in the long run (WDM, 2011). The policies could benefit investors more than the host government, and undermine ownership of key assets by host governments. The high (transaction) costs and complex arrangements of these loans, combined with there being a maze of funds from several IFIs, could actually have hindered mitigation. Another reason why developed countries could prefer multilateral and bilateral institutions such as the world bank over UNFCCC administration as a means of finance is that it is sometimes possible to double-allocate funds between UNFCCC financial obligations and Official Development Assistance (ODA) commitments such as through the WB (Doornbosch and Steenblik, 2008), despite this being in violation of article 4 of the UNFCCC which stipulates that all funding should be unique (UNFCCC, 2013f).

There are several (technical) reasons why there should be a focus on the third world for the development of renewable energy and for low carbon investments. It does not matter where on the planet the (carbon) abatement takes place - disregarding the emissions of pollutants which can have a profound effect on regional climates, all carbon emissions diffuse in the atmosphere and affect the atmospheric levels of carbon as a closed system. This physical phenomena, combined with the lower relative abatement costs in the third world, make it lucrative for developed countries to invest in third world low carbon projects to count the mitigation under their own emissions balance. Most importantly, it makes sense to *leapfrog* and skip illogical fossil fuel technologies to avoid technology lock-in in developing countries. Rapidly developing countries with very predictable annual energy demand increases have a chance to set up an infrastructure which favours the application of available renewable energy technologies. Renewable energy requires a grid capable of handling fluctuations due to some novel renewable energy technologies such as wind or solar (PV, CSP) energy; early investments in such an infrastructure ultimately lowers current and future costs for the implementation of renewable energy. A problem of the western world is the fact that fossil fuel technologies are locked-in to its infrastructure and way of life. The opportunity for a third world country to skip this to avoid future fossil fuel price fluctuations, increase energy independence (and slow the export of large sums of money to dubious governments), create jobs locally and ultimately lowers the price of electricity which could give developing countries an advantage.

It can not be expected that the developing world will put investments in renewable energy technologies at the top of their priority list. Whilst renewable energy technologies with high capacity factors such as hydropower or geothermal power have the opportunity of providing a country with relatively cheap energy after a one-time large investment, poverty, hunger, healthcare or education could be the true priorities. Due to these reasons the UNFCCC recognises the "right to develop", mitigation actions should not compromise development which will lead to more emissions as a consequence.

Technology transfer is a key aspect of third world mitigation and for setting up a resilient grid and infrastructure. On top of that, for certain sectors[14] in the developing world large advances in the field of energy efficient are possible with proven technologies. Technology transfer is required for successful mitigation, yet there are disagreements with regard to intellectual

[14] 90% of emission reductions in the steel industry can be achieved by implementing generally known and existing technologies (Bolscher et al., 2012)

property rights of the parties (typically those in developed countries) which generally own the rights/technologies (Tan, 2010). The UNFCCC tries to use its flexibility mechanisms such as the CDM as a way to boost technology transfer to the third world.

3

Current Mitigation Solutions

The most relevant mitigating solutions currently being used will be covered in this chapter, starting with market-based methods and ending with non-market-based methods.

3-1 Current market-based mitigation solutions

One way of treating pollution or emissions of greenhouse gasses is through regulations which impose higher costs on industry; effectively a fine for emitters which trespass a certain threshold. Another way is through (CO_2) taxation; effectively a fee for emitters (see section 3-2-1 on carbon taxes). Both these responses are politically sensitive, yet with the success of sulphur markets in the US in the back of the minds of policy makers, a market solution was chosen as an international means of achieving abatement.

The market solution allocates a number of allowances to emitters, who are then free choose to emit less and trade excess allowances on the carbon market, or emit more and buy allowances from the market. The idea is that instead of choosing how to fine emitters (via regulations) or charge a fee for their emissions (via taxes) the market will sort itself out as abatement is expected to take place in the most efficient way. Businesses are allowed to buy allowances from other emitters, or meet compliance goals by buying carbon offsets: Certified Emission Reductions (CERs). By using CERs, emitters can comply with their Kyoto and/or national targets at costs below those encountered for domestic projects. As it is developed countries who commonly have compliance goals and the costs of abatement programs are often cheaper in developing countries, offsetting often happens in that direction. This creates a phenomena which could be seen as perverse; developed nations paying for pollution by offsetting their emissions by setting up abatement projects in developing countries. The reason why this works is because CO_2 emissions are a cumulative fact, on the long term it does not matter where on earth carbon has been emitted so offsetting internationally is physically possible. The first issue which comes to mind is that the offsetting projects being set up in places where it is cheaper to do so must be *new*, the abatement must have happened only because the funding (at a certain CO_2 price cheaper than abatement in the original country) made that possible.

This is tried by the United Nations Framework Convention for Climate Change (UNFCCC) through certain controversial *additionality* criteria.

3-1-1 CERs

The Clean Development Mechanism (CDM), in its essence, is a method for countries and businesses to reach (compliance) emissions goals (or at least part of it). If emission targets are not stringent then demand falls affecting the CDM and the CERs resulting from CDM projects (King, 2013). The price of CERs, which is what project developers and investors trying to set up renewable energy projects are interested in, is proportional to the price of the European Union Allowance (EUA) but not equal to it as can be seen in Figure 3-1. There have been many attempts at trying to model the differences between CERs and EUA prices but there are too many variables[1] particularly effecting the price of CERs (Nazifi, 2013). Prices differ depending on several factors such as the risk associated to the projects that the CERs originate from, approval risks from the host government (Designated National Authority (DNA)) or registration risks from the CDM Executive Board, etcetera. The EUA price and the CERs price in particular is very volatile, and investors, traders, hedgers or brokers handle it much like any other exchanges meaning that it is possible to buy futures or options to offset risks involved with the long and variable gestation period of CDM projects to eventually yield CERs. Often (but not always as project developers are free to be allocated CERs themselves to trade) complex arrangements are set up between project developers/investors and the broker/buyer who shall eventually buy the CERs. These brokers sometimes pay for Project Design Document (PDD) documentation or bureaucratic procedures and sell the CERs, for a certain percentage of CERs income.

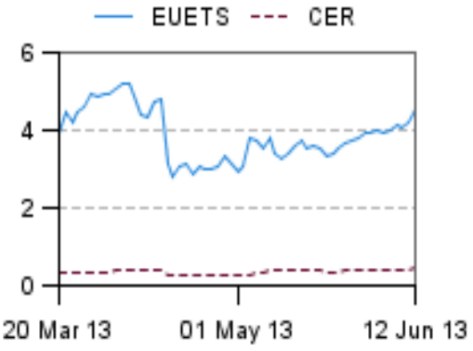


Figure 3-1: EUA/EU ETS vs. CERs price in Euros per tonne CO_2 in 2013 (Source: ArgusMedia)

As business plans for (renewable energy) projects have to be made prior to the investments taking off, a certain level of CERs-income has to be estimated. A frequent occurrence due to the recent price volatility and drops of the CO_2 price is project developers running into trouble paying back their lenders as predicted CERs income fell short of what was expected. This can have profound effects on projects, a typical example of this is the Serbian Alibunar biogas project which is discussed in section 5-3-1 on page 69.

[1] variables include electricity prices, uncertainty of the future of the CDM market, the different market frameworks of the EUA/CERs, a cap on the amount of CERs, etcetera

3-1-2 CDM

The CDM is one of the methods of acquiring CERs. CDM projects include all sorts of renewable energy projects, but also afforestation/reforestation projects, landfill gas projects, energy efficiency projects (controversially also for large fossil fuel burning thermal power plants), and methane avoidance projects. The latter projects often lead to cheap (and thus often already financially viable) abatement yet receive equal amounts of CERs per tonne of CO_2 abatement as smaller project developers in renewable energy whom often face higher relative costs to reach similar abatement (Doornbosch and Steenblik, 2008). Table 3-1 shows the distribution of all project types and the distribution of the amount of CERs allocated to these project types. Figure 4-2 on page 30 graphically depicts the way crediting works. Whilst abatement, in the case of a renewable energy project, is measured in the form of energy produced (i.e. kWh or million tonnes of oil equivalent (Mtoe)), CERs are allocated as tonnes of CO_2. Because of this a baseline and emission factor has to be determined which is dependent on the grid (country) the project shall be connected to. Therefore a 1 MW hydropower plant in once country with an equal capacity factor as a 1 MW hydropower plant in another country might not be allocated an equal amount of CERs. In addition, as the grid becomes more and more renewable the emission factor and consequently the level of CERs for future CDM projects decreases.

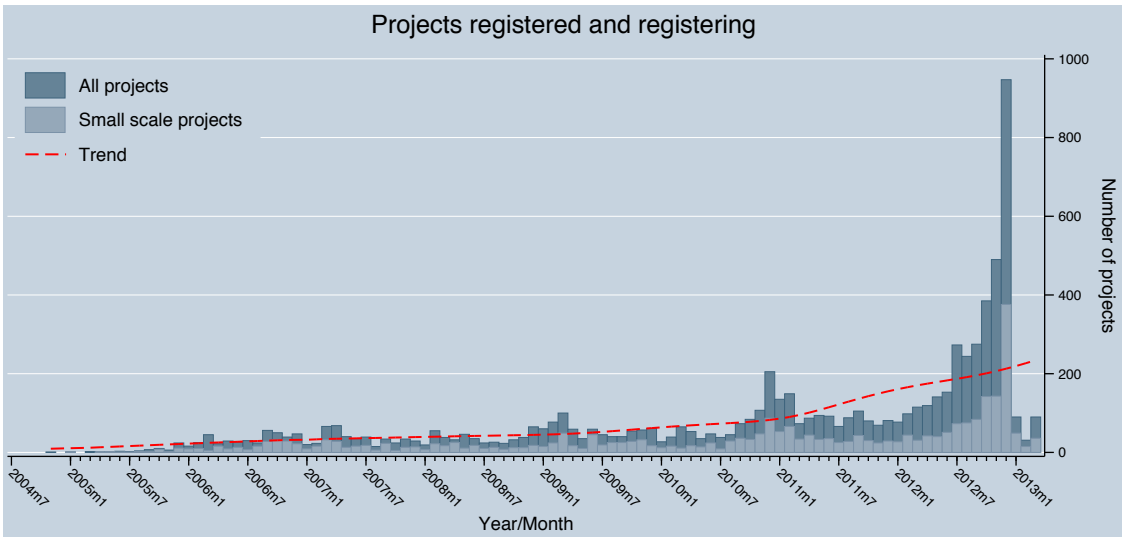


Figure 3-2: Registered and registering CDM projects as of 31 March 2013 (UNFCCC, 2013b)

One thing to note is the most remarkable and controversial CDM fact which has damaged the reputation of the CDM and wasted a great deal of CERs; whilst only 1.7% of CDM projects currently are related to the reduction of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), SF6 & NO2 reduction projects, an excessive 59% of all CERs were once allocated to these types of projects. China profits immensely from these practises as 11 out of the 19 HFC-23 processing plants are based in China, and the cost of destroying HFCs is only 0.17 euros per tonne (effectively burning the gas as it is produced during the production of the refrigerant gas HCGC-22). The credits allocated were sold on carbon markets at the time for 12 euros per tonne. When the EU and other nations tried to ban HFCs from being credited further,

China actually threatened to release these gases into the atmosphere lest crediting continues as China taxes CERs incomes from this source with 65%[2] (EIA, 2011). These types of CDM projects have been banned (which can be seen in table 3-1) and the release of HFCs has been regulated during a recent US-China HFCs Montreal Protocol deal (Kerry, 2013). This case is therefore an example of a type of pollutant which can be better handled through regulations than via a market mechanism, and it is therefore debatable whether or not most *non-renewable energy* projects are good for a market mechanism (or the CDM) in general.

Table 3-1: CDM projects and CERs allocations as of July 1, 2013 (source: CD4CDM)

Type	**% of CDM projects**	**% of 2012 CERs**[a]
HFCs, PFCs, SF6 & N2O[b]	1.7	31
Renewables	70	34
CH4 reduction[c]	15	19
Supply-side EE[d]	7.0	8.0
Demand-side EE[e]	3.5	0.7
Fuel switch[f]	1.6	6.0
Forestry[g]	0.8	0.8
Transport[h]	0.4	0.3
Total	8866 CDM Projects	2.38 billion CERs

[a]The accumulated 2012 CERs is the total GHG reduction in the projects from the start of the crediting period until the end of 2012
[b]Reductions thereof
[c]Including coal and mine methane
[d]Energy Efficiency
[e]Energy Efficiency
[f]Such as projects where there is a fuel switch from coal or oil to natural gas, or the construction of new gas plants
[g]Afforestation & reforestation
[h]Such as a mode shift from road-to-rail

As mentioned in section 2-1 and as can be seen in Figure 3-2 there was a spike in CDM project registrations due to the expected decommissioning of the CDM at the end of 2012. The CDM was extended but, as planned, CERs from non-Least Developed Countries (LDCs) are discontinued for compliance in the EU ETS (as a way to counter the uneven distribution of CDM and CERs distributions, most CDMs and CERs are in China, Brasil, India, Mexico and South Korea), the largest creator of demand for CERs.

The only way carbon offsetting could work is if abatement in non-Annex I countries only happened due to the funding of the CERs and the project is therefore *additional*. This additionality issue is another controversial aspect of the CDM. Not only is the pipeline of CDM projects full of non-additional projects[3], the methodologies and systems set up by the UNFCCC and CDM Executive Board have created a complex (as well as risky and expensive) project cycle system (Fenhann, 2012) as can be seen below and in Figure 3-3. The complexity makes the project application cycle lengthy, and the high transaction costs could make the project less feasible for smaller project developers. Because of this the UNFCCC changed

[2]Note: only half of HFCs emissions in China are reduced (the ones under the CDM). The other HFCs producing industrial projects vent their HFCs into the environment (EIA, 2011).
[3]experts estimate approximately 1/3rd of CDM projects are truly additional

policy and lowered the costs for smaller developers, or made the process as such that parts of the costs need only be paid after the first CERs have been allocated to reduce risk. The transaction costs for projects in LDCs have also been lowered by the UNFCCC (Karcher et al., 2013).

Another way of proving additionality is often abused leading to the net-effect of more emissions[4]. Proving that a project is not financially viable without CERs is an official means to prove that a project is additional, and basically leads to a few paragraphs in the PDD where a business planner states how bad of an investment the project is. The methodologies can be considered insufficient for projects in a certain country if the projects were already considered planned before the CDM was considered. This also works on the national level, an example of this was seen in Costa Rica, which announced early (before 2001) that it will promote renewable energy, even though this policy was completely unenforced. This resulted in an *early-mover penalty*, as future mitigation was regarded as business as usual (BAU) and CDM projects in Costa Rica are difficult to be proven as additional (Bosi and Ellis, 2005). As mentioned it is generally thought that the majority of CDM projects are non-additional, and that, contrary to CDM requirements, particularly hydropower projects are often not sustainable (Haya, 2007).

Steps of getting a CDM project registered (1 to 4 - also see Figure 3-3) and receiving CERs (5 to 7):

1. Project design
2. National approval (of the host-government via the DNA) to prove that the project promotes sustainable development and abides to national law
3. Validation (of the PDD by an independent and external Designated Operational Entity (DOE))
4. Registration by the CDM Executive Board
5. Monitoring
6. Verification (DOE)
7. Issuance of CERs

Since support of the DNA (of the host government) is of vital importance to project developers who wish to get their projects registered, possibilities of fraud or abuse are introduced to the process. Reports of corruption are frequent, such as the DNA in Tanzania who have been known to ask a fee for a letter of approval (ECON, 2009). On top of that some host-governments, such as the Chinese government, impose taxes on the income of certain CERs.

The CDM has not only led to negative reactions. The general consensus is that the CDM has contributed to sustainable development (Purvis et al., 2013). The co-benefits of CDM

[4]i.e. industrialised nations emitting more by buying credits, yet these credits come from projects which are already built once the CERs are given, so the net-effect is more emissions

Figure 3-3: Steps of applying a project for CDM registration (source: UNFCCC)

projects, particularly renewable energy projects, include the creation of local jobs, grid-extensions, infrastructural improvements, and an increase in local economic activities. The United Nations (UN) imposes a tax of 2% on all CERs from CDMs, intended for an internationally managed fund to help LDCs adapt to climate change (collecting 324 million US$ by early 2013 (Purvis et al., 2013)). The CDM is also believed to have contributed greatly towards technology transfer from developed to developing countries. Approximately 30% of CDM projects could have contributed to technology transfer (UNFCCC, 2010a), particularly biomass, wind energy, energy efficiency and landfill gas projects. The level of technology transfer due to the CDM, however, is believed to be stagnating and decreasing as CDM projects have been getting more and more common.

3-1-3 JI & PoA

Joint Implementation (JI) enables Annex I countries to invest in emission reduction projects (similar to CDM projects) in *economies of transitions*; mostly hosted by Russia and Ukraine, to acquire Emission Reduction Units (ERUs). ERUs are similar to CERs yet they originate

uniquely from JI projects. Since JI projects, as opposed to CDM projects, take place in Annex-I countries which have a commitment to reduce emissions under the Kyoto Protocol, the ERUs come from the host-country's pool of assigned emissions credits known as Assigned Amount Units (AAUs), the amount of which was calculated on the basis of its 1990 emission levels. Since the total amount of AAUs therefore do not change when they are transferred as ERUs the UNFCCC makes sure that the emissions of industrialised nations does not alter (UNFCCC, 2013g). The price of ERUs are generally slightly lower than CERs.

One of the problems of the CDM, as mentioned, was the complexity of getting a project registered. Suppose a developer sets up a wind project in a certain non-Annex-I country, and after the costly, length and complex bureaucratic process has managed to get the project registered and CERs are starting to be allocated. If the developer then decides to set up another wind project, identical to the previous project, the developer would have to repeat the process. For this reason, and also as an attempt of the UNFCCC to scale up mitigation due to its flexibility mechanisms, the Program of Activities (PoA) was created in 2007[5]. The PoA is essentially the CDM yet easily reproducible in the case of identical projects, so without the bureaucracy (after the successful registration of one of the projects) and with lower transaction costs (UNFCCC, 2013h).

[5]and altered in 2009

3-2 Current non-market-based mitigation solutions

Market-based mitigating solutions with the intention of incentivising abatement have been put forth as the main means of international mitigation. Particularly the US was opposed to stricter Kyoto obligations if the chosen methods were not market-based (Purvis et al., 2013). As will be discussed, other means of incentivising or controlling abatement exist. These methods include tax breaks, demand-side subsidies such as a Feed-in-Tariff (FiT), and disincentives for fossil fuel technologies in the form of taxes or the removal of subsidies (Polycarp et al., 2013).

3-2-1 Carbon Tax

The most popular tool of economists for reducing carbon emissions is often the carbon tax. A tax on activities which generate (negative) externalities is called a Pigovian tax, and should be equal to the marginal damage costs. Carbon taxes are indirect taxes, meaning they do not tax an income, and are therefore prone to being regressive. Carbon tax revenues can be used to reduce distortionary taxes and improve efficiency, or, as in the case of Australia, used to reduce income tax or increase pensions and welfare payments to compensate for expected price increases. Australia is also an example of a carbon tax being implemented concurrently with a cap-and-trade system (Emissions Trading Scheme (ETS)).

The costs are set by assessing the cost or damage associated with the level of emissions. The problem is the economic calculating of that price; calculating impacts over time requires a discount rate which is hard to determine. Either way, the results of the tax level have an effect on society; too low and society will continue to pollute and accept the new payments, too high and impacts on the economy might be too large. An advantage of a carbon tax is certainty of price. As is seen now with the EU ETS, carbon prices and allowances are continuously variable, with the European Parliament, at one point, voting against a backloading proposal, and a few months later voting for only a slightly amended version of it. The only variable aspect of a carbon tax is the amount of emissions, which under a carbon tax is not set (which for a cap-and-trade system theoretically is). A stable tax (with 100% dividend) on carbon could drive innovation and economic growth with a snowballing effect as, due to the bottom-up approach of carbon taxes, purchasing low-carbon products becomes profitable and producers will have to innovate to improve their products (Hansen, 2009). A hybrid system where both a tax and a cap-and-trade system is used could introduce a *carbon floor price*, where, should carbon prices in the ETS fall below a certain level, a tax 'takes over' so emitters will always pay for emissions. Obviously such a system increases the bureaucracy of things. Another advantage of using a carbon tax is that inefficient firms are affected more by a tax. Contrary to the case of an ETS where initial permits are allocated by means of grandfathering, in that case inefficient firms have an advantage over efficient firms. A carbon tax could also be subjected to consumers instead of (or less so for) industry, leading to less industrial impacts with regards to international competition or carbon leakage.

One advantage on not having a tax is that money doesn't go to the government. Occasionally, particularly during times of austerity, governments are not reliable at returning tax revenues to consumers. This hinders public opinion of the approach, and possibly, in the case of more fraudulent or corrupt states (typically lesser developed countries), an ineffective system.

3-2-2 Nationally Appropriate Mitigation Actions (NAMAs)

Despite lacking an internationally agreed upon definition[6] (and in essence similar to National Adaptation Programmes of Action (NAPAs)), Nationally Appropriate Mitigation Actions (NAMAs) basically boil down to being voluntary domestic policies and measures of a country to undertake as a commitment to mitigate (Stadelmann et al., 2011). Measures can be in the form of a strategy (such as a certain target of renewable energy, or a master plan to improve transit management), policy (such as setting up a feed-in-tariff or ETS), or project (such as building a hydropower plant) (Cameron et al., 2012). As the name states, the NAMAs shall be tailor-made for the country at which the plan is to be implemented, considering the differences between different countries with regards to mitigation possibilities. The country comes up with NAMAs, perhaps with technical assistance through bilateral co-operation (Fujimoto, 2013), and proposes the plans to the UNFCCC who adds them to a database.

Developed countries can potentially find a NAMA of interest in the database, and support the plan with funding or technology transfer (technical assistance) or capacity building. Funding for NAMAs is initially expected to come from bilateral support. Over time, multilateral support in the form of funding from a new Green Climate Fund (GCF) could potentially mobilise billions of US$ (Cameron et al., 2012), possibly (and mostly) in the form of concessional loans. No concise source of funding for NAMAs exists as of yet, and very few NAMAs have been implemented so far (Gov. UK, 2013). This lack of concrete funding and implemented projects means there is much insecurity in general surrounding NAMAs as a means to promote mitigation, though more and more NAMA proposals are being submitted to the UNFCCC.

3-2-3 Feed-in-Tariff

The FiT has been shown in practice to be most successful in increasing the implementation of renewable energy technologies by stimulating private-sector investment compared to any other available systems[7], and reach mitigation through the instalment of renewable energy. The FiT is essentially a guarantee to renewable energy producers that electricity generated by renewable energy sources are bought at a fixed rate, for a certain length of time (such as with a Power Purchase Agreement (PPA)). The FiT is simple, stimulates renewable energy producers to innovate as a reduction in production costs increases profits, offers certainty to investors, and stabilises volatility in the energy market for renewable energy producers.

The core elements of a FiT are:

- The definition of which technologies are eligible
- The definition of the tariffs (differentiated per technology)
- Legal criteria
- Guaranteed grid-connection (a statement thereof)

[6](UNFCCC, 2013a)
[7](KEMA, 2011), (Ragwitz et al., 2007), (Fultun et al., 2009), (Streck, 2010)

- Definition of the timeframe of the tariffs

As with a carbon tax, proper tariffs (prices) have to be introduced. Too high and the transfer costs will be too high for society. Too low, and private-sector investors won't pick up on the incentives. Often a FiT has certain variables, such as large hydro power plants receiving a lower FiT than smaller hydro power plants. Advanced FiTs could have other characteristics (Fultun et al., 2009), such as price adjustments over time, a degression rate or additional incentives such as the government funding a percentage of the investment costs of the project (Ragwitz et al., 2007). A FiT often proposes tariffs for a bucket of renewable energy technologies. It is suggested that the implementation of a several renewable energy technologies benefits the consumer/society in the long run by lowering transfer costs and promoting innovation (Ragwitz et al., 2007). The incentivisation of more expensive, novel renewable energy technologies such as photovoltaics could eventually be capped to a certain level to avoid high costs.

4

New Market Mechanism (NMM)

The New Market Mechanism (NMM) (also known as the Sectoral Crediting Mechanism (SCM)) has been discussed internationally since the 17th Conference of the Parties (CoP) at Durban in 2011. Particularly at the CoP of Bonn the NMM was discussed in more detail (UNFCCC, 2012c). Though currently the NMM is limited to case studies and some pilot projects in South America (KfW, 2013) (Karcher et al., 2013), support at the United Nations Framework Convention for Climate Change (UNFCCC) for a larger, scaled-up market-based mechanism is growing[1] mostly fuelled by controversies surrounding the UNFCCC's current flexibility mechanisms, particularly the Clean Development Mechanism (CDM) (Figueres, 2013). The interest of the European Union (EU) in the NMM as an addition to-, or replacement of the CDM is increasing and currently research (& pilot projects) is being done on which design proposals of the NMM are most beneficial (Bolscher et al., 2012).

The main issues of the CDM such as the determining of additionality, the complexity of the project-cycle (and the large number of stakeholders involved to for example help with the Project Design Document (PDD)), the fact that large fractions of Certified Emission Reductions (CERs) end up at brokers as fees (or, in the case of China; taxes) instead of project developers, the transaction costs which favour larger and more experienced project developers etcetera, can be resolved with the NMM purely because of its non-project-based nature. The CDM is essentially a bottom-up, project-driven market mechanism, whereas the NMM is a top-down, policy-driven market mechanism (Baron, 2012). All negotiations (for a tailored policy plan) and *trouble* (& responsibility) ends up on the plate of the host government, instead of at the project developers. Project developers would therefore end up communicating with the host government in the case of the NMM, perhaps even in the same ways as currently already in a country with a Feed-in-Tariff (FiT) or Power Purchase Agreement (PPA) system, but more on this later.

Contrary to the way International Financial Institutions (IFIs) currently fund (renewable energy) projects with concessional loans, the host government can expect credits in the form of CERs instead of (soft) loans, making the NMM inherently more attractive to debt-ridden

[1] (IGES, 2011), (IGES, 2013)

developing countries. The CERs can be used to leverage private-sector investment which, as was mentioned in chapter 2, is the favoured way for governments to tackle climate change. On top of that, and as German development bank Kreditanstalt für Wiederaufbau (KfW) stressed during a CoP (UNFCCC, 2012b), the importance of involving the private sector with regards to climate change are immense as the costs (and scale) of necessary action are high. In addition, targeted (financial) support for renewable energy projects to tackle climate change can induce technological innovation (Doornbosch and Steenblik, 2008).

4-1 Methodology & flexibility

The strength of the NMM is its flexibility. The NMM, as seen in Figure 4-3, is created through negotiations between the host-government and the UNFCCC, with independent review teams auditing the host-government's system of monitoring, reporting and verification (MRV). The negotiations could involve detailed policy analysis and assessment of the current energy situation of the host-government (potentially involving bi-/multilateral institutions or IFIs who can offer an independent view) to bring to light the most influential barriers to private-sector investments in renewable energy projects under the current policy regime (must like the case studies in this thesis of Serbia & Nicaragua) to then come with tailored, made-to-fit policy solutions which the UNFCCC could demand to be implemented for the release of CERs (which will end up financing said policy).

As the NMM is sectoral, the analysis can indicate which sector requires most attention and incentivising. Sectors can include the electrical power sector, the (district) heating & cooling sector, high emitting industrial sectors such as the concrete or aluminium sector, the transport sector, etcetera. Unlike a nationwide Emissions Trading Scheme (ETS) which often contains a large amount of sectors and is limited to emissions reductions only, a sectoral approach could be more politically feasible due to this flexibility in design.

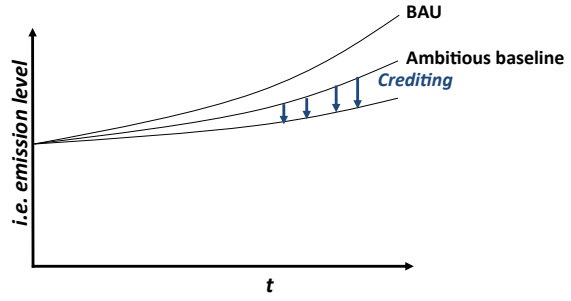


Figure 4-1: Visualisation of the NMM crediting threshold (source: author)

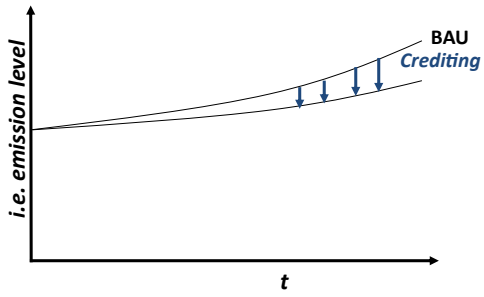


Figure 4-2: Visualisation of the CDM crediting threshold (source: author)

Once a sector has been chosen negotiations will continue to agree to a certain threshold. Once again the flexibility of the NMM becomes apparent, as several types of thresholds can be implemented. In most suggestions of the possible NMM the system involves determining a business as usual (BAU) level, followed by the negotiation of a more *ambitious* baseline which the host-government should try to reach on its own (see Figure 4-1 for a graphical representation of this). Once this ambitious baseline has been reached the host-government can receive

credits for anything beyond this baseline. The most straightforward threshold would be an emissions threshold, much like Kyoto's current focus. Other possibilities include a technology penetration threshold (UNFCCC, 2012b); for example the UNFCCC could administer CERs if the installed capacity of renewable energy technologies (either the percentage thereof, or the generated energy yield) of a particular renewable energy technology reaches a certain threshold. Another option could be an energy efficiency threshold in the power sector (for example decreasing the transmission losses from 20% down to 15%) or increasing the energy efficiency of buildings in the heating & cooling sector. Another option could be a threshold in the transport sector, such as a certain percentage of national vehicles having a certain mileage. Note that for most of these examples an emission factor must be determined to transpose the results of the particular threshold into a certain reduction of emissions.

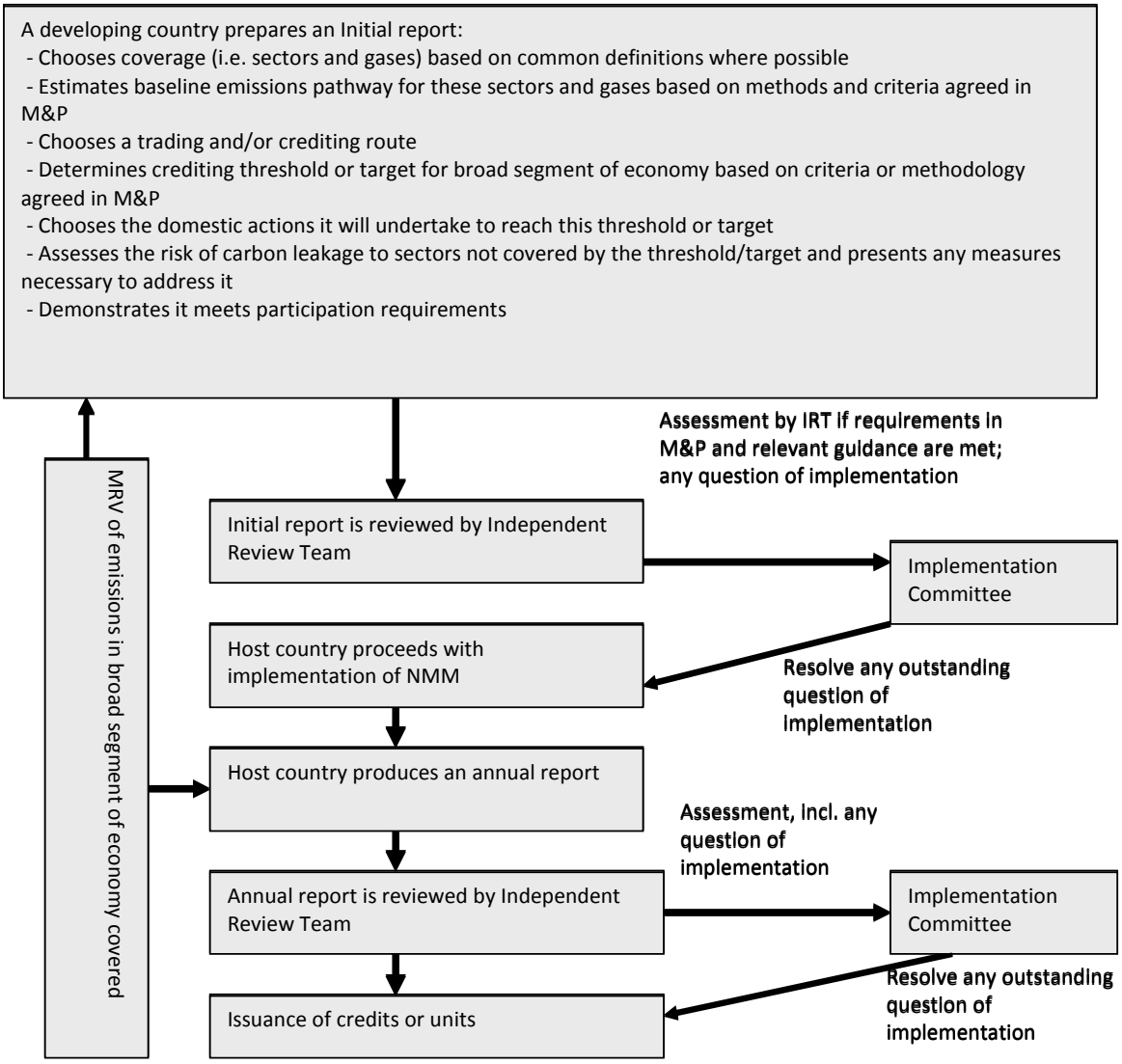


Figure 4-3: Illustrative example of NMM operational cycle (source: (UNFCCC, 2012c)). For a more detailed description see Annex A-1 on page 139.

Once a sector and threshold have been chosen, the NMM allows for two types of market based

approaches covering broad segments of the economy[2]:

- **Crediting**: Emissions of a broad segment of an economy will be checked against an ex-ante[3] agreed crediting threshold for this segment. If emissions are below this threshold, emission credits will be issued ex-post[4], which can be sold to recover, at least partly, the cost of the chosen mitigation activities. If emissions are not below the threshold, no penalty will be applied (no-lose target). See Figure 4-1 for a visualisation of the crediting threshold.

- **Trading**: In accordance with an ex-ante defined absolute target for a broad segment of an economy, emissions allowances will be issued ex-ante. If emissions are lower than the number of issued allowances, excess allowances can be sold to recover, at least partly, the cost of the chosen mitigation activities. If emissions are higher than the number of allowances issued, additional allowances need to be purchased on the global carbon market to comply with the target agreed for the broad segment. This approach is essentially similar to a national cap-and-trade system, though focussed on a particular sector and with more flexible thresholds and thus more politically feasible. See Figure 4-4 for a visualisation of the trading threshold.

Crediting would be preferential to most host-governments, but due to the lack of a penalty could have the risk of the ambitious baseline not being reached - and therefore climate goals not being reached. As credits are allocated after a certain timeframe, the host-government could run into trouble financing the tools which shall be implemented into the meso regime to reach the ambitious goals. The alternative, a trading system, can be less attractive to host-governments as the system is inherently similar to an ETS and the system includes a penalty if the ambitious baseline is not met, see Figure 4-4 for a visualisation of this.

The key advantage of the NMM is the flexibility of the host-government to choose which policy to implement to reach the threshold negotiated with the UNFCCC. Options include all existing investment tools: use of a FiT[5], a national ETS, tax incentives to certain industrial producers/consumers, or even bottom-up approaches (Fenhann, 2012) such as subsidies to end-users (to fund end-user abatement such as heat pumps, efficient air conditioning, solar hot water use, etc). A host-government can even choose to revert to a project-based mechanism once again, and offer funds to certain projects which the host-government deems most crucial to reaching goals, or have the most co-benefits to the nation. In the power sector, for example, substantial abatement potential exists within the sector by improving energy efficiency and the deployment of renewable energy. However, significant abatement potential also rests with the end-users. The NMM could be designed to create incentives to develop this potential. The use of policy to push a certain technology could also be performance-dependent (Vieira, 2006).

[2](UNFCCC, 2012c)

[3]Ex-ante, i.e. to establish the form and scope of a mechanism

[4]Ex-post - after (independently) monitored and evaluated progress

[5]The FiT has been shown in practice to be most successful in increasing the implementation of renewable energy technologies compared to any other available systems (KEMA, 2011), (Ragwitz et al., 2007), (Fultun et al., 2009)

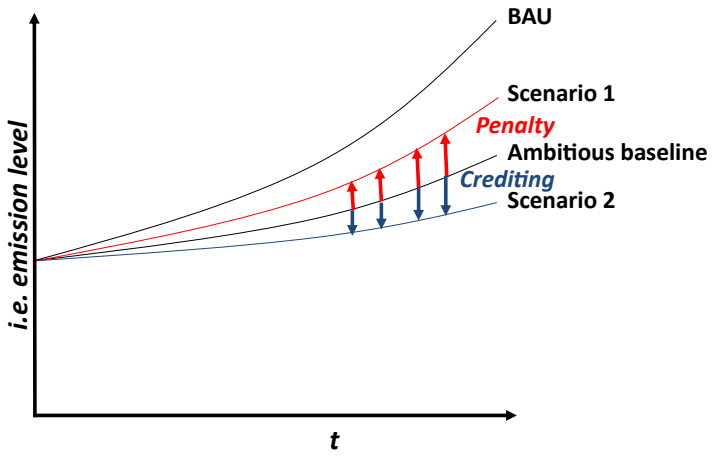


Figure 4-4: Visualisation of the NMM trading threshold with penalty (source: author). In the 1st emission scenario the host-government has not reached the ambitious baseline and shall be *punished* as the host-government needs to purchase allowances on an ETS to comply with the ambitious baseline. In the 2nd scenario the host-government's policy has led to an excess of allowances, which can be sold on an ETS.

4-2 Conclusions

From a regulatory side, policy makers want to achieve confidence that incentives can achieve policy goals. From the market side, the market has to remain stable through periods of weak demand or uncertainty. Because the NMM is reliant on the price of carbon a level of uncertainty will remain for investors; even though for private-sector investors the certainty of acquiring credits for a project are larger (as well as the process being simpler, reducing risk and consequently costs). To avoid further losses in investor's confidence as continuity of existing mechanisms is essential to create and maintain investor confidence, the CDM should remain active (if applicable, regarding the EU's Least Developed Country (LDC) policy), perhaps running parallel to the NMM. The Framework for Various Approaches (FVA) could be used to link the NMM to the CDM (Mace et al., 2008) as it is crucial to avoid double counting as this could undermine economic efficiency (Marcu, 2012). Double claiming, the phenomena where both the host government and the buyer country count emissions reductions towards their emissions pledges, are a shared worry with the CDM and should be avoided in the NMM (Carbon Market Watch, 2013).

Whilst some experts believe the NMM might start working in 2016 with the first effects visible after 2020, others believe the NMM cannot be implemented in the near future and thus believe official implementation talks should start around 2020 when developing (non-Annex I) countries are scheduled to present their emission reduction plans to the UNFCCC. A sectoral trading mechanism could be less effective than a country-wide crediting mechanism, but might still be more appropriate by being more feasible politically and economically. The NMM, particularly one with a penalty system, is a potential stepping stone towards a national ETS (EC, 2012b), something developed countries would like to see implemented in developing countries. Systems of MRV might also be more manageable at a sectoral level, especially for developing countries with little emissions data (Bosi and Ellis, 2005). The NMM could potentially use existing infrastructure (Designated National Authority (DNA), independent

external validators, etcetera) as is currently being used for the CDM, which can simplify the activation of a NMM in a country. There are also options of having regional sectors, as a means to avoid carbon leakage and maximising efficiency.

5

Serbia

Figure 5-1: Serbia in green (source: author, map data from wikimedia)

5-1 Brief overview

After a brief introduction of the recent history of the Republic of Serbian (from now on called *Serbia* for convenience, not to be confused with *Republika Srpska*) this chapter will proceed to evaluate Serbia's renewable energy (meso) landscape by means of the set criteria. It will become apparent while reading the chapter that many aspects, particularly related to the low

levels of renewable energy developments, are interrelated - these relations shall be grouped and clearly listed at the end of the chapter.

Serbia, located in the Balkans and having a population of 7.2 million[1], is a landlocked country with quite a tumultuous recent history. Whilst Europe and eastern European countries generally developed during the 1990s, the Yugoslav wars which include the *War in Slovenia* (1991), *Croatian War of Independence* (1991 - 1995), *Bosnian War* (1992 - 1995) and *Kosovo War and NATO bombings of Yugoslavia* (1998 - 1999) have led to serious economic collapse which the country has been recovering from since 2000. The Federal Republic of Yugoslavia was renamed Serbia and Montenegro in 2003. Montenegro declared independence in June 2006 and the ongoing Kosovo dispute since February 2008, left the Republic of Serbia in the state it is today. Serbia remains in a special tie with Republika Srpska (effectively meaning "Serb Republic"), one of two political entities within Bosnia and Herzegovina, and has a population of approximately 1.4 million. Republika Srpska is a legal entity of Bosnia and Herzegovina independently performing its constitutional, legislative, executive and judicial functions from the moment the Constitution of Republika Srpska was signed in 1992. Currently Serbia suffers from a relatively high unemployment rate of 27%[2] and trade deficit, with a Gross Domestic Product (GDP) per capita of 35% of the EU average in 2011 and current account deficit of 11.5% of the country's GDP in 2012[3]. The current president of Serbia, Tomislav Nikolić, has been president since May 2012 after his party, the Serbian Progressive Party, won from the Democratic Party (both considered generally "pro-EU"[4]).

Serbia has been a member of the United Nations Framework Convention for Climate Change (UNFCCC) since 10 June 2010 and Kyoto Protocol relatively late since 17 January 2008[5] as a non-Annex I country, making it eligible for the UNFCCC's flexibility mechanisms such as the Clean Development Mechanism (CDM). Serbia does not have any emission reduction commitments in the first commitment period of Kyoto. The current emission/energy commitments of Serbia mostly come from the Energy Community Treaty between the EU and nine southeast European countries, which was signed in Athens on October the 25th 2005, and ratified by Serbia on 14 July 2006 (Bogunovic and Bogdanov, 2009). The Energy Community Treaty imposes regulations such as the Large Combustions Plants Directive (LCPD) 2001/80/EC which handles emissions such as SO_2, NO_x and dust from thermal power plants larger than 50 MW (EC, 2013). This is an important policy driver for Serbia (Energy Community, 2012), as the commitments have been incorporated in Serbian law.

In 2002 Serbia introduced the National Program of Energy Efficiency (NPEE) which included pilot projects and research studies for the application of renewable energy. In the process of synchronising national legislation with the EU requirements (also regarding the Energy Community Treaty), the Ministry of Energy and Mines (MEM) of Serbia declared to create a more efficient energy market based on the Energy Law (2004) together with the *Energy Sector Development Strategy by 2015* adopted by the Government of Serbia at the end of 2004[6] (Zivkovic et al., 2013). This NPEE together with several other laws and action plans

[1] 2012, excluding Kosovo, statistical office of Serbia

[2] (Balkan Insights, 2013)

[3] (Trading Economics, 2012)

[4] Boris Tadić, as the former president from 2004 - 2012 and Honorary President of the Serbian Democratic Party believed that Serbia should join the EU whilst keeping sovereignty over Kosovo

[5] after having ratified Kyoto on September 24, 2007

[6] approved by the Serbian Parliament in May, 2005

(which lead to almost insignificant renewable energy capacity increases for several years) was the start of post-Yugoslav War redevelopment of the energy sector, and together with other aspects which will become apparent throughout this chapter, is basically an affirmation of Serbia's apparent dedication to lignite (and at most (small)hydropower) by focussing policy on energy efficiency[7] and strategic use of Serbia's nation resource which is open-pit mined lignite of exceptionally poor quality due to low calorific values[8] and high sulphur contents[9].

5-2 Evaluation Criteria

5-2-1 Energy

The first evaluation criteria shall analyse Serbia's (renewable) energy sector.

5-2-1-1 Reliability of the grid

Following the Yugoslav Wars which saw an increase in electricity consumption of 44% from 1990 to 2000 without an increase in capacity (MEM, 2000), the lack of a reliable energy supply was one of the key problems that Serbia faced and is the reason why first foreign support-, which started to flow after the Union of Serbia and Montenegro stepped forward to meet its international obligations[10], came for the energy sector facilitating the sufficient supply of energy and further development of economic activities[11]. Until 2006 the republic included Montenegro, so capacities had to be split between Montenegro and Serbia when the Union of Serbia and Montenegro came to an end. Most projects were financed with a small share of investments from the host government or state companies. The European Agency for Reconstruction (EAR) was one of the agencies which helped with the so called "Energy for Democracy" programme of the EU, together with the funding of 75% of Serbia's electrical energy imports (EAR, 2007). Most thermal power plants were and are still ageing[12] and highly inefficient with reported efficiencies between 25 and 30% whilst not having desulphurisation facilities which consequently leads to lower efficiencies by itself. Because of the priorities of securing the supply of electrical energy, money flowed towards urgently needed spare parts and emergency repairs of power stations, lignite mines and transmission networks, in close collaboration with the state companies Electric Power Industry of Serbia (EPS), which is in charge of both production and mining, and the Serbian Transmission System and Market Operator (EMS).

The investments in thermal power plants between 2001 and 2008 led to a decrease of forced shutdowns from 32.3% in 2000 to 15.6% in 2005, and an increase in thermal power plant generated electricity (EPS, 2009). Power cuts were reduced from 52 days in 2000-2001 to zero by 2002, 110 km of power lines were replaced (EAR, 2007), and transfer and distribution losses

[7] of the grid, buildings, but also and mostly thermal power plants

[8] Serbian lignite calorific values are between 7.5-8.2 MJ/kg, compared to United States (US) lignite values of around 15 MJ/kg (EUROCOAL, 2013)

[9] sulphur contents between 0.4-0.9 % a.r. (EUROCOAL, 2013)

[10] support from the European Union (EU) & US

[11] EU assistance on energy in Serbia totalled 450 million euros from 1999 to 2006 (EAR, 2007)

[12] currently up to 50 years old for smaller plants, with larger plants with outputs of 400 MW or more having an average age of 25 years (EPS, 2009)

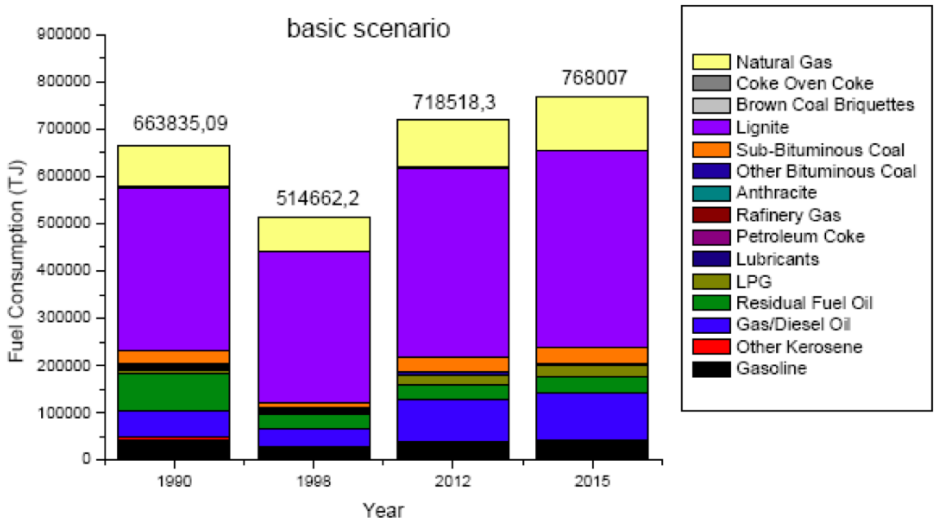


Figure 5-2: Projected fossil fuel consumption for energy production in Serbia (Spasojevic, 2011)

dropped from 19% (MEM, 2000) down to 16%[13]. It is obvious that during this time renewable energy was of very little priority to the MEM in Serbia, as was Kyoto. On top of that, resources at the MEM were low, and the implementation of most projects and reforms was already happening with technical assistance of several bi- and multilateral support agencies.

5-2-1-2 State of the energy sector

Several EU Directives in the field of energy[14] have led to minimal improvements in the total share of renewable energy in Serbia. Disregarding large hydropower, since the transition period up to October 2012 only 10 MW of capacity has been added to the Serbian renewable power portfolio; 19 small hydro plants with a total of 7.4 MW, 9 small PV solar plants totalling 0.1 MW[15], one small wind plant of 0.5 MW, and two biogas plants totalling 2 MW. Table 5-1 shows the portfolio of installed electrical power capacity in Serbia. It has to be noted that, though several news articles and other mentions of renewable energy projects in Serbia can be found which could give the impression that those projects are already finished, several of those projects still do not have financing ready yet as it is not uncommon for International Financial Institutions (IFIs) to receive phone calls from such project developers asking for funding[16].

It has to be said that the energy sector of Serbia is everything but transparent and statistical data is often conflicting. Currently at the university of Belgrade professors are piecing together

[13] see Figure 5-7

[14] examples include Directive 2001/77/EC on Promotion of electric energy from renewable resources on international electro energy market, Directive 2003/30/EC on promotion of utilisation of bio fuels or other renewable fuels for transport, Directive 2001/80/EC on limited emission in the air from big facilities with combustion, and Directive 2006/32/EC on energy end-use efficiency and energy services (Bogunovic and Bogdanov, 2009), (EC, 2012a), (Zivkovic et al., 2013).

[15] 6 PV solar plants under construction totalling 4.2 MW

[16] According to an energy expert at German development bank Kreditanstalt für Wiederaufbau (KfW)

Table 5-1: Installed electric generation capacity by source in Serbia in 2011 (Energy Community, 2012)

Source	**Capacity** (MW)	**Percentage**
Coal-fired	3,936	55%
Gas-fired	353	5%
Hydro	2,879	40%
out of which pumped storage	*614*	*(9%)*
Other renewables	3	negligible
Total	7,171	

historic energy data[17] and trying to complete a representative energy model for the MEM, and in part for the EU Seventh Framework Program for Research and Technological Development (FP7). Much research is done to make this detailed energy model, and parts of it will actually remain confidential for ministry use. Information on (electrical) energy imports/exports and trading are impossible to find as they have never been published, raising concerns for energy trading practices which might not benefit Serbia, more on this in section 5-2-2-4 on page 60.

In the electrical power sector virtually all renewable energy is in the form of large hydro plants, most of them old Yugoslav plants at the border of Romania where the capacity of the "iron curtain" hydro plants are shared between the two nations. In the energy sector in general, most renewable energy is consumed in the form of logged wood for cooking and the heating of rural housing (1.1 million tonnes of oil equivalent (Mtoe) annually vs. 0.86 Mtoe per annum of hydro energy consumption). Wood is logged and burned yet the volume of wood (trees) is increasing steadily every year (Bogunovic and Bogdanov, 2009); the consumption is therefore renewable. See table 5-2 for the energy consumption, and note that currently approximately 21% of total energy consumption is renewable. In general, poor infrastructure management and high losses due to inefficient power generation, transmission and distribution systems have increased the energy intensity in Serbia (Stankovic et al., 2007). For a map of all power plants and (lignite) coal plants of Serbia which are under state control of EPS, please see Annex A-2 on page 140.

5-2-1-3 Renewable energy potential

The potential for primary energy production from renewable energy sources as seen in table 5-3 is estimated at around 4.3 Mtoe per annum (KEMA, 2011) - roughly half gross final energy consumption of Serbia which currently already has a renewable share of 21% meaning in theory 60% of current non-renewable energy consumption can be replaced by renewable sources. The majority of this is biomass, with an estimated annual potential between 2.7 and 3.3 Mtoe/annum[18]. Biomass also includes future biofuels which could be used to reach the required 10% of renewables in transport energy consumption.

As seen in table 5-4 hydropower has some significant potential totalling approximately 0.6 Mtoe per annum. Serbia has about 60 small hydro projects currently functioning or needing

[17] from 1990 until 2005 there was extremely limited data on energy consumption, and only in 1990 and 1998 did EPS finance a greenhouse gas inventory report which is the only data currently available on the period

[18] estimates differ (Zivkovic et al., 2013), (Macura, 2011), (KEMA, 2011)

Table 5-2: Energy consumption by source in Serbia

Type	**Mtoe[a]/annum**
Total electrical energy consumption	3.01 (of which 0.86 renewable)
Electricity (lignite/coal)	2.12[b]
Electricity CHP[c] (oil/natural gas[d])	0.03[e]
Electricity large hydropower	0.86[f]
Total energy consumption for heating & cooling	4.1 (of which 1.1 renewable)[g]
Total energy consumption for transport	1.9 (of which 0.0 renewable)[h]
Total energy consumption	9.0 (of which 21% renewable)

[a] million tonnes of oil equivalent
[b] 2008, (EPS, 2009)
[c] Combined Heat & Power
[d] (IEA, 2013)
[e] 2008, (EPS, 2009)
[f] 2008, (EPS, 2009)
[g] (MEDEP, 2013)
[h] (MEDEP, 2013)

overhaul (Bogunovic and Bogdanov, 2009), some as much as 90 years old, and steps are being taken to revitalise, reconstruct, or replace 31 of these plants with a cumulative capacity of 80 MW (EPS, 2011). As will be discussed in section 5-2-2 on page 51, the feed-in-tariffs of Serbia are very beneficial for hydropower developers, and in June 2013 several hundred permits for small and medium sized hydro sites will be allocated to interested investors/developers. The most interesting development is the 680 MW pumped storage Bistrica hydro project, which offers an impressive energy storage of 60 GWh through several reservoirs and should be completed in 2020 after five years of construction (EPS, 2013). Unfortunately for Serbia, a large hydro potential totalling between 553 and 771 MW[19] on the Ibar and Driba rivers in Serbia have been "sold" to Italy's *Seci Energia* (TANJUG, 2012) in 2011 with limited benefits for Serbia's EPS (Hydroworld, 2012). The electrical power shall be transferred to Italy via an under-construction underwater energy interconnection between Italy and Montenegro which Italy will use to help reach its own 17% renewable energy share of energy consumption EU objective upon completion in 2015. The capacity and production of this high-quality hydroelectric energy resource will therefore go to Italy, not Serbia. In the long term it is not beneficial to Serbia as hydropower is a vital, clean and renewable natural resource which debatably outweighs Serbia's other national resources such as lignite, and local academics and energy stakeholders were frustrated by the move. Due to talks of possible conflicts of interests in the awarding of these contracts by the previous energy minister Milutin Mrkonjić, the current government has committed itself to not sell energy resources in the future.

Throughout Serbia[20] there are possible wind sites with average wind speeds higher than 6 m/s. On top of that there are mountainous regions[21] which could be suitable for smaller scale wind turbines, but this has yet to be determined (Bogunovic and Bogdanov, 2009).

[19] conflicting data, (Lazarevic, 2011) & (EPS, 2013), approximately 600 MW according to an expert at the University of Belgrade
[20] for example Stara Planina, Vlasina, Ozren, Rtanj, Deli Jovan, and Crni Vrh
[21] Zlatibor, Zabljak, Bjelasica, Kopaonik, Divcibare

Table 5-3: Estimated renewable energy potential of Serbia

Technology type	**Mtoe/annum potential**
Biomass	2.7[a]-3.2[b]-3.3[c]
Unused hydro potential[d]	0.6[e]
Wind	0.2[f]
Solar	0.6[g]
Geothermal	0.2-0.4[h]
Potential of various energy savings[i]	0.3[j]
Total	Approx. 4.3[k]

[a](Zivkovic et al., 2013)
[b](Macura, 2011)
[c](KEMA, 2011)
[d]amounting to 40% of the total hydro potential (EPS, 2009), (Zivkovic et al., 2013)
[e](Zivkovic et al., 2013), (EPS, 2009)
[f](KEMA, 2011), (Zivkovic et al., 2013)
[g](KEMA, 2011), (Zivkovic et al., 2013)
[h](Zivkovic et al., 2013)
[i]Annually as of 2018, energy saving methods such as maintenance and rehabilitation of heat distribution systems, improvement or replacement of residential building outside doors and windows and thermal insulation, replacement of conventional incandescent light bulbs with energy efficient ones, promotion of the use of energy efficient electrical household appliances, new rules of building design and construction, minimum energy performance standards (energy efficiency) and certificates of building performance, billing on the basis of actual (measured) consumption of energy by consumers connected to district heating system, etcetera (please see (EC, 2010) for more details)
[j]Of which 0.08 MToe through households & residential buildings, and 0.22 through public & commercial activities (EC, 2010)
[k]Minimum, excluding potential energy savings

Wind power capacity estimates range from 1.3 GW of potential (Bogunovic and Bogdanov, 2009) to around 900 MW[22], right up to 3 GW according to a wind energy developer trying to find investment (Contintental Wind, 2013). As will be discussed in section 5-2-2 on page 51, the current Feed-in-Tariff (FiT) of Serbia is capped at 500 MW and also the National Renewable Energy Action Plan (NREAP) plans no more than 500 MW by the moment for wind, much to the disbelief of stakeholders such as German development bank KfW and experts at the University of Belgrade. In 2008 several plans for cooperation on the realisation of three[23] wind projects was signed (Bogunovic and Bogdanov, 2009), and four[24] wind farms are currently registered CDM projects under the UNFCCC[25]. No large scale wind farms are currently running though, and as will be elaborated in sections 5-2-1-6 & 5-2-2-3, wind farm developers are encountering (indirect) government resistance with regards to grid connections and an unreliable FiT which was unexpectedly lowered for wind energy. In general Serbia has a mediocre wind energy potential, with neighbouring countries such as Croatia offering a more suitable (technical & financial) environment.

[22]Vatterfall independently researched the technically feasible potential of wind (also with regards to grid stability) and determined it to be 900 MW (KEMA, 2011)
[23]Windpark Bavaniste, Windpark Bela Crkva, Windpark Dolovo
[24]Cibuk, Plandiste 1, Kosava I+II, and Kladovo
[25]four out of six total registered CDM projects

Table 5-4: Hydropower in Serbia, current & potential (Bogunovic and Bogdanov, 2009)

Hydro type	Cur. capacity/generation	Pot. capacity/generation
Large hydro (>10 MW)	2.8 GW/10.5 0.9 Mtoe	1.5 GW/0.45 Mtoe
Small hydro (<10 MW)	6 MW/negl.	490 MW/0.15 Mtoe
Hydropower total	2.8 GW/0.9 Mtoe	2.0 GW/0.6 Mtoe

Figure 5-3 and Figure 5-4 show the geographical distribution of the renewable power potentials of wind & hydropower. As will be discussed further in section 5-2-1-5 on infrastructure (page 45), the geographical position of renewable energy potential plays a larger role one would imagine at first. Since the wind potential is largely to the north east of Belgrade towards Romania and the hydro potential is to the south west of Belgrade more towards Republika Srpska, and since Serbia has close ties with the latter, Serbia will put priority in setting up more transmission lines towards Republika Srpska rather than towards Romania - even though both Romania and the Energy Community have repeatedly been pushing for Serbia to increase the capacity of its transmission lines towards Romania to allow it to export more of its power as seen in table 6-4 (for example towards Italy and mainland Europe in the future marine transmission line between Montenegro and Italy). This means any wind potential currently available between Belgrade and Romania could have trouble getting a grid connection, whereas the hydro potential (including the 680 MW pumped storage Bistrica hydro project) towards Republika Srpska can benefit from the political will of grid expansion towards that region. This could be another possible (and certainly unofficial) reason why Serbia's feed-in-tariffs, which is Serbia's main way of promoting (and consequently also demoting) renewable energy projects, are more geared towards (small) hydropower, and are actually insufficiently beneficial for wind power developers - this shall be discussed further in section 5-2-2 on the economic evaluation.

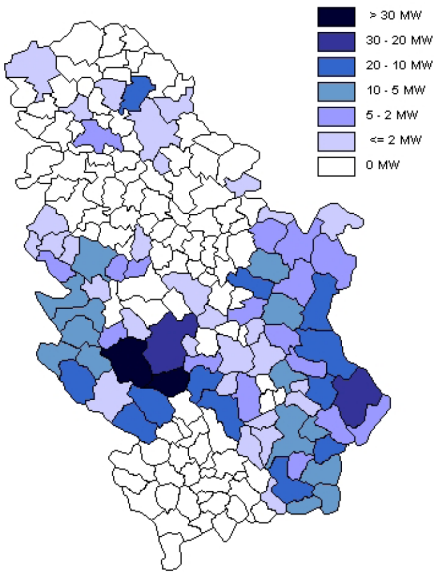


Figure 5-3: Small hydro power potential (Bogunovic and Bogdanov, 2009)

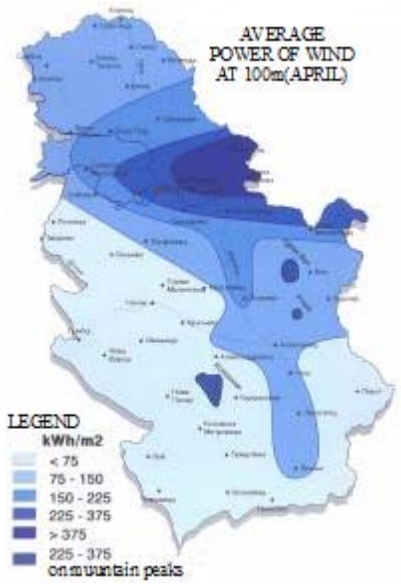


Figure 5-4: Average wind power at 100m in April (source: World Bank)

5-2-1-4 District heating

The price of heat (for consumers) is very low in Serbia due to it being subsidised by the government, consumers only pay approximately 30% of true production price. 1 kWh of heat, for example, costs approximately 2 to 3 cents in Belgrade depending on the location of the residential premises. As a comparison, if one would want to heat his own house the price of gas would be around 5 or 6 cents per kWh of heat since specific fuel prices are higher (Macura, 2011). This mixing of social policy with energy policy has led to the debt of district heating systems in Serbia to suppliers of fossil fuel to be around 350 million euros, with district heating customers owing a further 200 million euros to public utility companies (CESID, 2013). Currently around 90% of thermal energy is produced by the direct use of fossil fuels (compared to the EU average of 15%), of which 10.7% being lignite, 24.6% liquid fuels and 64.7% by gas (Macura, 2011). Geothermal power is being implemented on a smaller scale in Serbia, there is currently 86 MW installed geothermal power[26] of which 18.5 MW for the heating of residential and commercial areas (KEMA, 2011).

It is important to put the costs consumers face in a Serbian context; an apartment in Belgrade of 60 m^2 requires more than 10% of average monthly household income to pay for district heating services. Often people must pay a fixed rate whether they would like to participate in the district heating system or not, and the costs depend on the size of the apartment. This obviously leads to a situation where people can fire up their system to any level they wish and sit in a t-shirt during winter since the costs remains the same. There are plans to introduce a system of paying per consumption yet currently there are few measurement devices at delivery points, only modern buildings have this yet 90% of buildings do not. It is not guaranteed that such a new system would lower prices for consumers, just that it would lower overall consumption. Even though it is sometimes cheaper to heat using electricity, this in theory[27] should not happen because consumers who are connected to the district heating system are obliged to pay for the district heating (according to apartment size).

District heating in Serbia is riddled with several problems. Since for most users the price of heat is fixed, people use the heating as much as they can which can lead to an overload of energy demand as it did during the cold winter of February 2012 when regional supply collapsed. More than half of district heating systems are 20 years old or older, and could not be functioning sufficiently. It often happens that consumers must add electrical heaters to further heat their apartment or house which leads to the perverse phenomena of people effectively heating their houses through inefficiently generated lignite power which has had to travel through an inefficient transmission and distribution system to then turn back into heat. Serbia has a high domestic energy consumption, which could be explained by the use of electric heating to complement ageing district heating systems.

The availability of biomass and geothermal resources to help transition district heating to more renewable resources has been proven[28]. Similarly, the technologies have already been proven worldwide as it is a mature technology, and the costs of the biomass resources are lower than the fossil fuel alternative (CESID, 2013). There is an inspiring example of a municipality where ground water district heating was installed and the price for an 80 m^2

[26] producing approximately 58 Ktoe of energy per annum|

[27] in older buildings where district heating is insufficient to keep a house warm consumers often add electrical heaters

[28] (KEMA, 2011), (Macura, 2011)

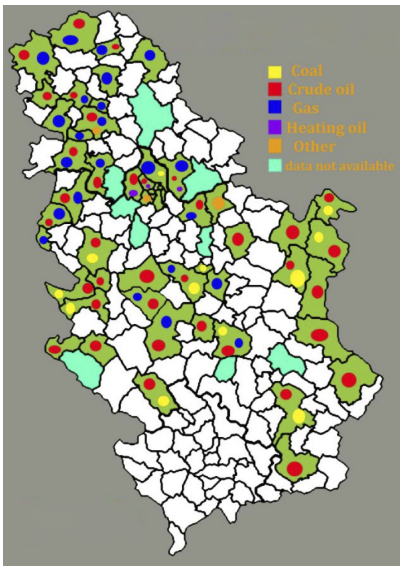


Figure 5-5: District heating plants according to fuel type (CESID, 2013)

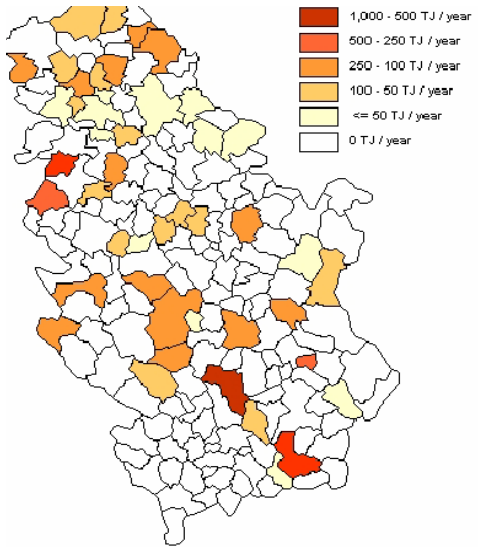


Figure 5-6: Geothermal resources of Serbia (source: World Bank)

apartment remained the same after the implementation (as the subsidised price) according to SKGO[29], the national association of towns and municipalities of Serbia. The political will seems to be positive for biomass/geothermal replacements for district heating, and KfW together with the German Agency for International Cooperation (GIZ) invested in biomass for district heating. GIZ will also open up an office to offer technical assistance for this topic. The issues regarding biomass are the creation of a supply chain as biomass is obviously scattered all over Serbia, the security of supply during hard winters, and creating an enabling legal framework for investments into the projects. This legal assistance is something the Dutch embassy is working on currently, after Dutch investments in biomass via a so called Government-to-Government (G2G) project which started in 2009 was cancelled in 2011 due to the economic crisis and resulting austerity measures of the Netherlands (G2G, 2009). Another challenge is that most district heating systems are controlled by municipalities, and eventually by the association of owners of apartment buildings. If initial investments are required for a conversion or modernisation of systems, resistance often arrises quickly.

Funds need be allocated to efficiency and infrastructure investments[30], issues such as the lack of measurement devices at the point of delivery to enable consumption based billing is an issue for any source of heat be it renewable or not. On top of that the continuity of biomass supply could be an issue as the fears for this could hinder government participation. As an expert at the Western Balkans Investment Framework (WBIF) put it, *"biomass has to overcome the resistance of anything that is "new", Serbia is not ready to accept new ideas in public investments"*. Knowledge at municipalities and at the government has to be increased

[29] according to a key stakeholder at SKGO

[30] Amongst several other loans, KfW credited a 100 million euro loan consisting of three agreements for development, of which 45 million euros for was to be allocated to district heating. The funds were allocated to local municipalities (KFW, 2011) and which was considered very successful according to SKGO. The 45 million euro funds went to efforts such as efficiency increases, which is important also for biomass powered district heating.

as, contrary to initial beliefs, biomass could be decisive for energy independence of foreign gas imports. The added benefit of this is that the natural gas supply is known to be unreliable particularly in eastern Europe and the Balkans. Either way, and as will be discussed later in section 5-2-2-2 on page 55, similar to the electrical power sector there is an enormous potential for social policy to be separated from energy policy which has backfired completely and turned into a doom-loop of expensive fossil fuel lock-in and excessive consumption leading to a (financially) unsustainable system. There is a potential for (for example) wine grape biomass for district heating in Serbia as there are nearly 70,000 hectares of vineyards in Serbia, producing about 425,000 tonnes of grapes annually, but not with these artificially low costs at enormous indirect costs to consumers as a consequence.

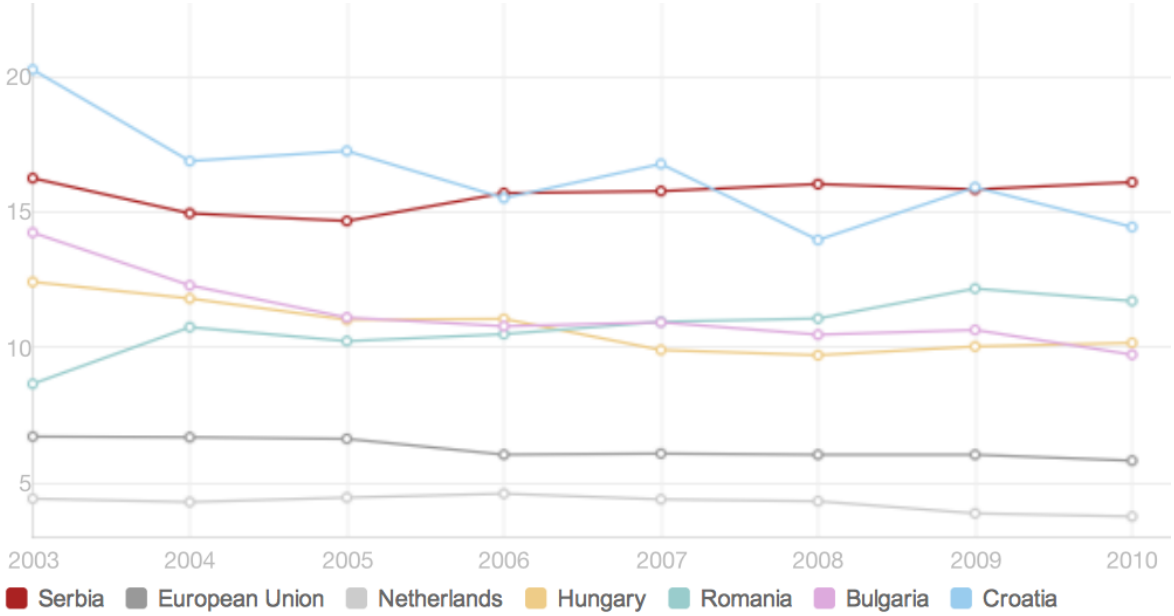


Figure 5-7: Electric power transmission and distribution losses, % of output (source: World Bank)

5-2-1-5 Infrastructure

Serbia has the lowest price for transmission and distribution of all European countries[31] (AERS, 2013), even though it has relatively high transmission losses[32] as can be seen in Figure 5-7. EMS is responsible for the electrical transmission system (losses), yet there is currently no policy in place to improve these losses. There is insufficient transmission capacity to import extra electricity if needed, pressing the need for keeping the ageing and inefficient lignite powered thermal power plants up and running. As previously mentioned Romania is politically pushing (together with the Energy Community) for the expansion of transmission lines towards Romania in order for Romania to export their surpluses to other countries (not necessarily including Serbia). Figure 5-4 and Figure 5-5 show the geographical

[31] Like the energy price, the transmission prices are regulated by the government

[32] despite improvements to the transmission system funded by the EU and the World Bank (WB) - of the 56 total World Bank projects, 9 were related to either the general energy sector, power sector, energy efficiency/heat and power, or transmission and distribution (The World Bank, 2013b)

distribution of the renewable power potentials of wind & hydropower, which directly shows the implications of Serbia's preference to expand transmission towards Republika Srpska due to positive relations between Serbia and Republika Srpska. Even though technical reports indicate the possibility of 900 - 2000 MW of wind power to be integrated into the Serbian power system without sizeable network upgrading (KEMA, 2011), transmission towards Romania is at 100% maximum capacity currently already (AERS, 2013) and any addition of wind power would have enormous impacts on the availability of transmission lines for Romania (due to the low predictability of wind capacity at any given time and the priority which has to be given -by law- to power which is produced renewably) and will therefore seriously impede cross-border energy trading and Romanian energy exports.

5-2-1-6 EPS & Serbian (renewable) energy strategies

Currently approximately 21% of gross final energy consumption comes from a renewable source, yet Serbia committed itself to a target of 27% by 2020 during negotiations with the Energy Community, with a share of renewable resources in the transport sector of 10% (MEDEP, 2013). In order to reach this goal it is estimated that at least 2 GW of added electrical power capacity from renewable resources is required (together with an expansion of renewable resources in the transport and heating & cooling sector), yet the Serbian government has traditionally focussed its attention on the strategic use of lignite resources and therefore chosen for the improvement of (thermal power plant) energy efficiency as a means to reach renewable energy goals as well as offering to expand lignite use in district heating facilities. Serbia's priority, at least since 2002, has been to keep the current lignite infrastructure strong. In 2002 the Serbian energy strategy was the aforementioned National Programme of Energy Efficiency NPEE, and in 2010 the state utility company EPS presented their newest strategies where the top priority was once again energy efficiency (Spasojevic, 2011) with barely any mentioning of renewable energy as can also be seen in the EPS green book documents (EPS, 2009) which stressed once again that lignite is the key strategic national resource for energy production. From the same document, different strategies per sector are discussed and the key points are to increase efficiency of lignite-powered district heating, to build more district heating systems, and to renew thermal power plants running on lignite. As seen in Figure 5-2, fossil fuel use of particularly lignite is projected to go up which is to be expected as EPS is building several new Lignite thermal power stations (some Combined Heat & Power (CHP)) to cope with growing demand (EPS, 2013)[33]. More recent official strategies are CHP and overhauling generators in thermal power plants so as to comply with the Energy Community's LCPD regulations.

Another example of Serbia's apparent dedication towards lignite and fossil fuels in general became apparent during recent interactions with the UNFCCC. Serbia has currently submitted the most Nationally Appropriate Mitigation Actions (NAMAs) proposals to the UNFCCC in comparison to all other nations (UNFCCC, 2013e). One of the initial barriers was the lack of capacity and experience to develop and formulate NAMAs and to achieve GHG emission reductions, so the government of Serbia requested technical assistance for the formulation of climate change mitigation measures and NAMAs in August 2009. As a result, Serbia has received a great deal of help from Japan International Cooperation Agency (JICA) with the

[33]Quote: *More extensive and efficient use of "green" energy is targeted by the Serbian Energy Development Strategy, with careful and efficient use of the strategic resource - coal* (EPS, 2013)

formulation of NAMAs (JICA, 2013). Eventually 69 NAMA candidates were formulated together with JICA, of which 16 were shortlisted as prospective NAMAs together with JICA (Fujimoto, 2013). The government of Serbia then ended up submitting 12 NAMA proposals to the UNFCCC on April 17 2013 (UNFCCC, 2013e). Only 3 out of these 12 NAMA proposals which were submitted by Serbia involve renewable energy projects; biomass, hydropower and solar thermal technologies. 5 out of 12 NAMA proposals involve direct fossil fuel projects such as building new CHP plants, or increasing the capacity (and efficiency) of lignite power plants. The remaining 4 projects involve energy efficiency matters or installing energy measuring devises in buildings and buildings with the aim of reducing the energy intensity of Serbia.

EPS is a vertically integrated power company with a monopoly in lignite mining, electricity generation and distribution throughout the country, and works together with state transmission company EMS. Being vertical the company is responsible from electrical energy production from beginning to end, and as shall be mentioned in section 5-2-2, combined with the fact that calculations of energy prices are not made public by the Energy Agency of the Republic of Serbia (AERS) this creates a dubious atmosphere. The company becomes even more powerful through close personal connections between ruling political parties and EPS management, allowing EPS to influence political decision on the Serbian energy sector to its own advantage. This phenomena has become apparent during the previous change in government which coincidentally led to EPS management being completely replaced from top to bottom. It can be said that the government has a direct influence on both renewable energy legislation[34], financing[35] and EPS strategy, additionally EPS together with EMS have an influence on renewable energy developments such as grid connections which in turn allow them to create a passively resistant environment for renewable energy.

According to the authorities and EPS, however; Serbia has always been open to renewable energy. Despite years of having such an *open* stance towards renewable energy however, little renewable energy was added to the grid. This could be because of a lack of competence or capacity, or could be due to some form of passive resistance. As a private-sector renewable energy developer has mentioned; EPS is trying to resist renewable energy in Serbia. Particularly wind energy developers are running into a lot of resistance, as was confirmed by a private-sector developer and stakeholders at SKGO who mentioned that wind energy producers have an extremely negative view of the authorities and the MEM. Officially, however, and as EPS claims, connection to the grid for renewable energy projects is straight forward. In reality, the word is that the Distribution Network Operator (DNO), also part of EPS, are finding excuses to not connect renewable energy facilities (especially wind) to the grid, leaving investors in trouble. But what could be some possible motives for passive resistance towards renewable energy. Looking for possible motives, an explanation could be the fact that the level of EPS's investment required for grid connections was underestimated, and the process now competes with other investments required of EPS - therefore a lack of funds. Another reason could be the problems which arise due to the difficulty of creating a stable power production with most non-hydro renewable energy technologies. However, the grid of Serbia is actually exceptionally well prepared for unstable renewable energy technologies due to the large capacities of pumped hydro storage as seen in table 5-1 and which is to increase

[34] for example for developers to acquire the notion of being a privileged power producer, as shall be discusses later in the chapter

[35] through the FiT for example

in the future[36], something which is confirmed by several stakeholders in the sector including wind energy experts. Another motive could be the electricity price following the FiT, any renewable energy producer which is introduced to the grid as a "privileged producer[37]" has priority when energy is produced. EPS is thus losing income whenever a privileged producer produces unstable energy as this has to be bought with an expensive FiT to then be used to halt EPS's own hydro potential to pump up water (in the case of an unstable energy production). Apart from the fact that this creates grid stability issues which EMS and EPS must deal with, it also lowers the production of all other "lesser prioritised" energy production which are the non-renewable energy sources which are all owned by EPS. It was suggested that the costs of having a FiT for electricity production up to 450 MW of wind power would have to be covered by about a 6% increase in electricity prices, something which ends op on EPS's plate as the electrical energy price is regulated centrally. Despite being public, EPS is a company nonetheless, and they act with their own interests.

The Strategy for the development of the energy sector in Serbia until 2015 for instance clearly favours the interests of EPS and its coal business. Reasons for a focus on lignite and why EPS or effectively the Serbian government has not managed to realise significant renewable energy increases in the past decade, could also be due to a loss of jobs in several sectors due to a decline in lignite power. Lignite train transport for example is 3 times higher than regular train transport. Diverging from the locked-in lignite/power situation could lead to similarly painful measures Margaret Thatcher once had to deal with. In the meantime the Serbian government/EPS are running into difficulties due to international agreements, a lack of action and a reliance on foreign investments to develop (renewable) energy projects. German-based RWE Innogy and EPS formed a joint venture for the development of hydropower plants in Belgrade. The joint venture company, Moravske Hidroelektrane d.o.o., is to develop five run-of-the-river small hydro plants with an installed capacity of 30 MW each on the Morava river (Hydroworld, 2011). The plan is still in a very early phase, the initial phase, without clear future prospects which, according to EPS, can be blamed on the German economic crisis leading to a general halt in investment. This delay and others like it put Serbia into a troubled position because it must comply with the LCPD which was put into place in 2006 as a consequence of the Energy Community Treaty (ECT) to reach the goals which have been incorporated into Serbian law. However, it is also believed and can be seen that Serbia has done little to reach LCPD goals, the RWE example could be a way to divert accountability.

Even though in 2008 EPS planned investments of around 9.2 billion euros until 2015 for new thermal power plant capacity and the overhaul of existing thermal power plants as well as the expansion of existing and the opening of new open-pit lignite mines (EPS, 2008) (Jovančić et al., 2011), not all plans to replace smaller (<300 MW) thermal power plants are being implemented. Most thermal power plants above 300 MW (Stankovic et al., 2007) have been desulphurised but smaller plants have received little attention as the original plan was to replace them - not overhaul/desulphurise them. If the smaller plants were to be shut down in 2017 to reach the stringent goals there will be about 1 GW of power unaccounted for, which might have to be imported. Larger plants have been worked on, also due to multi-/bilateral help such as a large Japanese investment in the form of a 260 million euro bilateral loan[38] for the desulphurisation of the Nikola Tesla thermal power plant to handle the strict

[36] citepEnergyCommunity2012

[37] more on this later in the chapter

[38] very affordable loan of 0.6% with a five year grace period (Djelić, 2011)

sulphur emission goals of the LCPD. Adding desulphurising facilities to the smaller and ageing thermal power plants perversely lowers the capacity of already low capacity (and efficiency[39]) power plants, yet power has to come from somewhere. Serbia struggles with the pollution caused by Sulphur emissions, but is currently waiting for details on the relaxation of the LCPD requirements as goals will most likely not be reached.

5-2-1-7 Energy independence/depletion

Serbia imports significant amounts of oil and natural gas to keep up with energy consumption, approximately 0.82 Mtoe of gas and 2.3 Mtoe of oil as well as 0.6 Mtoe of coal[40]. 99% of Serbia's energy reserves are in the form of lignite or coal, constituting a large amount of 2.7 Gtoe of exploitation reserves (3.8 Gtoe geological reserves), and around 20 Mtoe of oil and natural gas reserves (Stankovic et al., 2007). Just because Serbia has its own lignite/coal reserves does not mean the energy is in any way free to use. The controversial Kolubara mine requires 120 to 150 million euro annual investments to keep going (Serbia-Times, 2013)[41].

Depending on the year, Serbia's electrical energy balance with regards to physical energy imports/exports are around zero as seen in table 6-4. It has to be noted that much energy is traded of which records are not published and therefore cannot be retrieved, the impacts of this energy trading on renewable energy and the Serbian energy sector shall be discussed in section 5-2-2 starting on page 51.

Table 5-5: Physical electrical energy imports/exports in 2012 ((AERS, 2013) - in Serbian)

Country	Imports [GWh]	Exports [GWh]
Romania	2,191	67
Bulgaria	1,548	247
Macedonia	260	2,454
Montenegro	425	2,868
Albania	154	1,557
Bosnia & Herzegovina	634	848
Croatia	1,082	594
Hungary	4,485	2,133
Total	10,779 (0.93 Mtoe)	10,768 (0.93 Mtoe)

During the aforementioned hard winter in February 2012, the regional supply of gas collapsed. As mentioned, biomass could be decisive for more energy independence of Serbia. In addition the costs of importing foreign energy are high, money that in this case is being funnelled out of Serbia could instead be used to set up a biomass supply chain and infrastructure within the country. Setting up a supply chain and securing Serbia's supply of energy from local sources can increase the energy independence and financial situation of Serbia. As of yet, EPS response to Serbia's dependence on energy imports has been to apply measures which would lead to more rational and efficient use of imported fuels, particularly natural gas (EPS, 2009), as well as increasing the use of locally mined lignite for district heating.

[39] Most of these plants have an efficiency between 25 and 30 % and are around 50 years old

[40] 2009 net imports (IEA, 2013)

[41] investments amount to 1.72 billion euros till 2015, and an additional 1.05 billion euros till 2020 (Jovančić et al., 2011)

5-2-1-8 Technology transfer

Serbia has received a vast amount of multi-/bilateral technical assistance[42] with regards to renewable energy. For example in 2007 the MEM signed a contract for a feasibility research for wind energy with the support of the government of Spain. This project selected 3 locations and upon completion a detailed feasibility study was elaborated for the construction of possible wind turbines (Bogunovic and Bogdanov, 2009). The FP7 inherited FP6 which funded several projects related to renewable energy and the Energy Community. The FP programmes are the EU's main instrument for funding research in Europe, and the FP7 will run from 2007 until 2013. Partially due to government requests, most researched project opportunities include in particular energy efficiency projects (in the energy production, industry and building sectors), a fuel shift towards low carbon fuels (introduction of natural gas and more renewables), and the modernisation of current technologies (Stankovic et al., 2007). In general, and as will be discussed in section 5-3 on page 68, the CDM has not contributed much to technology transfer in Serbia; the Serbian Designated National Authority (DNA) and most stakeholders in the sector believe that technology transfer in Serbia was mostly driven via bilateral technical assistance[43] or foreign developers.

5-2-1-9 Environmental impact

As has been mentioned, Serbia suffers from the high emissions of sulphur and to a smaller degree the emissions of nitrous oxides. After the war, sulphur and nitrous oxide emissions, which already exceeded emission limit values, increased further due to the decommissioning of thermal power plants. This affected the health of Serbians, particularly those living close to thermal power plants or open-pit mines (EAR, 2007). The Energy Community's LCPD directive and Europe's so-called "20-20-20" targets[44] function as a policy driver towards a cleaner energy sector as 1990 greenhouse gas emissions benchmarks have been reached due to the global phenomena of lower industry (EPS, 2011). Some CDM projects such as the Alibunar biogas project and the JP Serbiagas reduction in methane gas project have led to environmental improvements by reducing the emissions of harmful substances into the atmosphere, including greenhouse gases (CDM Executive board, 2006). Historically, national agricultural policy was never linked to direct support of the utilisation of renewable energy resources, and environmental protection, although identified as one of the strategic aims and an important topic, was never supported with significant budget resources[45].

[42] For example the Dutch investments in biomass in 2009 (G2G, 2009) which were cancelled in 2011 and replaced with technical assistance which Serbia is receiving up to this date

[43] such as the Dutch/Serbian G2G biogas project in 2009 (G2G, 2009)

[44] (EC, 2012c)

[45] Most interviewed stakeholders believe that environmental issues are not of high priority to the current government

5-2-2 Economic

The next section will cover the economic evaluation of the (renewable) energy sector of Serbia.

5-2-2-1 Sources of investments & bi-/multilateral cooperation

As mentioned in chapter 2, bilateral/multilateral funds make up for a great deal of investments in the (renewable) energy sector of most non-Annex-I countries. Section 2-3 on page 16 mentioned the dangers of IFIs gaining influence over host governments via set criteria required for the release of funds, this section will analyse these effects in the case of Serbia, and starts off with a brief selection of IFIs active in Serbia.

As Serbia is an Annex-II beneficiary country (engaged in the accession process to the European Union) (EU, 2013a), theoretically the director of the Serbian European Integration Office (SEIO) is the National Instrument for Pre-Accession Coordinator (NIPAC) which carries the main responsibility of cooperating with the Ministry of Finance regarding ongoing projects funded through European IFIs loans, to cooperate with competent ministries and other interested parties and IFIs in identifying and establishing priorities as well as in formulating, prioritising and finalising project proposals. Basically coordinating EU Instrument for Pre-Accession (IPA) assistance such in a synchronised and coherent way, particularly for the WBIF. Some IFIs partially disagree with this formulation; while this should be the role of NIPAC, in practise their work is take notice of projects that IFIs want to finance, and their main focus in general is on IPA funds. In general IFIs communicate with a network of other IFIs, and there is no competition between which projects to finance. Donor cooperation within the energy sector is considered good in Serbia, information is exchanged and projects are split amongst IFIs themselves. An example is the cooperation between colleagues at KfW and European Bank for Reconstruction and Development (EBRD), communicating frequently about developments and joining projects - particularly the bigger projects where costs (loan risks) are split by working together.

KfW is the German development bank which allocates untied-loans[46] to public companies or state projects since a state guarantee is a requirement for KfW and a private company cannot issue a state guarantee. All KfW loans are formed under an agreement between the Serbian and German government, with frequent negotiations regarding priorities and numbers. The Green for Growth Fund (GGF) as seen below is KfW's way of bypassing the state guarantee requirement which allows them to invest in private-sector projects (although the KfW office does not run any of GGF's work from their office in Belgrade). In general GGF is KfW's way of providing loans for private companies; limited to 5 million euros these loans are riskier because no state guarantee is given for the loan. German **GIZ** works together with KfW, yet focusses on technical assistance[47] and capacity building, all KfW loans and most other loans from IFIs come with technical assistance, usually granted. KfW focuses primarily on the development of the financial sector, improvement of the energy supply, municipal water supply and wastewater treatment, but have also invested in renewable energy (biomass and in small amounts to hydropower as well). KfW invests largely in energy efficiency and lignite

[46] Meaning they do not differentiate between which projects/companies might benefit from loans, be it German or not

[47] Due to 'international-tendering' technical consulting is once again not limited to German consultants

as part of the National Energy Efficiency Action Plan (NEEAP) which was adopted by the Serbian government in 2010. KfW's loans are to the state (which means the state runs the risk) and therefore contributes to Serbia's debt/GDP ratio which is reaching its set limit. KfW therefore might be running to the limit of its capacity and it is getting more and more difficult to get state guarantees and therefore for KfW to work in Serbia - this will certainly be a problem in the future. As will be discussed later in much more detail, the reason why KfW has focussed so much on energy efficiency, lignite mining and thermal power plants, is that the government and EPS have not been developing renewable projects and KfW is restricted to state-guaranteed projects. If the state does not want to develop renewable energy for whichever reason, then KfW cannot provide any loans for any such projects (only via GGF). KfW is proud that although little is happening in the field of renewable energy, at least something is happening in the field of energy efficiency which results in CO_2 reductions (KfW, 2013).

An example of a KfW loan was a 100 million euro loan in 2011, of which 45 million euros was destined for district heating which were channeled through three Serbian banks with clients benefiting from seven-year loans, including a two-year grace period[48] (Filipovic, 2012). Part of the loan was destined for a special fund which opened in 2008 and is under control of local municipalities (KFW, 2011) with SKGO being the executive agency, considered to be a successful cooperation. Even though loans are agreed under an umbrella of Serbia/German government negotiations, implementation of the credit line could be through local banks. This is done to reach smaller projects (under certain conditions so control is not lost) and to encourage competition as several banks receive the loans. Larger projects (20 million euros or up) are usually direct loans. A future loan coming in the autumn of 2013 which shall be backed by the EU to soften up the loan even more is taking a while to negotiate. As usual technical assistance grants shall be connected to this loan, this time in the form of three grants to stakeholders related to the loan (municipalities, local banks, and one related to the EU verification of the loan since the EU will contribute to the loan).

GGF is the first specialised fund to advance energy efficiency and renewable energy in South-east Europe, including Turkey. Initiated by the European Investment Bank (EIB) and KfW, closely followed by the EBRD, supported by the European Commission (EC) together with various other bilateral financiers and administered by the European Investment Fund (EIF), the GGF is a closed-end investment company based in Luxembourg established on 17 December 2009 to reduce energy consumption and CO_2 emissions. GGF provides refinancing to local Financial Institutions to enhance their participation in the energy efficiency and renewable energy sectors and also makes direct investments in non-financial institutions with projects in these areas. The activities of GGF are supported by a technical assistance facilities (GGF, 2013). They work by:

1. Refinancing Financial Institutions (local commercial banks, non-bank financial institutions such as micro-finance institutions and leasing companies and other selected financial institutions), providing loans to households, businesses, municipalities and the public-sector for energy efficiency measures or renewable energy projects. Investments through Financial Institutions will constitute the majority of GGF's investments, and is basically similar to what KfW is doing.

[48] According to Serbian central bank governor Jorgovanka Tabakovic (Filipovic, 2012)

2. Providing direct financing to Non-Financial Institutions (energy service companies, renewable energy companies or projects, small scale renewable energy and energy efficiency service and supply companies) that meet GGF energy saving and/or emissions targets, and comply with the technical criteria and GGF exclusion list. These loans are generally riskier, and limited to 5 million euros per project.

Due to not being restricted to government-backed loans, GGF is popular amongst private-sector developers as a means to get project financing.

EAR has, on behalf of the EU, supported the Serbian energy sector with projects in total of 450 million euros (EAR, 2007) from 1999 till 2007 until the agency came to an end. 87% of total funds (1.3 billion euros) which were allocated to Serbia was contracted and 71% was paid back by 2007 (Zink, 2007).

EBRD is active in Serbia, and funded Victoria Oil in creating the first bio-diesel factory in Serbia[49], as well as a number of projects in the energy and environmental sector (Stankovic et al., 2007). Private-sector investors have mentioned that doing business with EBRD is complicated compared to other IFIs.

EIB is active in Serbia, working in part through the Western Balkan Energy Efficiency Fund. The EIB is working to approve loans worth as much as 1 billion euros in five western Balkans countries this year to support the region's integration with the EU (Savic and Gomez, 2013), most of it going to Serbia.

The **WB** provided technical assistance and financed 39 projects in Serbia since 2001 totalling approximately 2 billion US$, including budget support. The current portfolio consists of 12 investment projects under implementation worth around US$ 845 million (The World Bank, 2013a). Of the 56 total World Bank projects, 9 were related to either the general energy sector, power sector, energy efficiency, CHP, or transmission and distribution (The World Bank, 2013b). One such is the Serbian part of the EC South East Europe programme project (ECSEE APL3-Serbia) which provides investment support and technical assistance for Serbia in developing EMS and creating AERS obligations that Serbia has to fulfil under the Athens Memorandum. Because Serbia was a transition country at the time, help was offered with regards to transmission line improvements and the construction of 110 kV substations after the war. The WB has also worked on the Serbian Energy Efficiency Project for energy efficiency improvements in public buildings as part of the NEEAP of 2010.

The **Central European Initiative (CEI)** is a small player in Serbia, offering grants up to 40,000 euros for projects in the area of climate and environment protection in the non-EU CEI Member States through a special fund for climate and environmental protection (CEI, 2013). Even though CEI is a small player and only finances small proportions of projects, the funds are given as grants. According to an expert at EPS very few funds were allocated to Serbia.

United Nations Economic Commission for Europe (UNECE) actively awards funds to undertake regional analysis of policy reforms to promote energy efficiency (and renewable energy) investments (EC, 2012a).

The **WBIF**, an initiative of the EC, the EIB, the EBRD, the Council of Europe Development Bank (CEB), with the endorsement of EU Member States and in association with KfW, the

[49] With little results as of now (Zivkovic et al., 2013), (MEDEP, 2013)

WB as well as 19 bilateral donors including the Netherlands, has funded energy investments in the region since its inception. To date, investments in the energy sector under the WBIF account for 27% of related WBIF grants. Energy policy in the Western Balkans is guided by the ECT, signed between the EU and the countries of the Western Balkans and effective as of July 2006 (WBIF, 2013). The EU and EBRD together provided financing for energy efficiency projects through the Western Balkan Sustainable Energy Credit Line Facility. The WBIF is considered small according to EPS. According to a stakeholder at the SEIO, in the strict sense, there have been no projects so far which have been nominated, selected or approved in the field of renewable energy. Projects completed or under preparation were distributed between gas and electricity sectors, thermal energy and energy efficiency in buildings. Renewable energy is seen as a possibility in the future for WBIF funds.

As mentioned **JICA** gave a 260 million euro loan for the desulphurisation of the Nikola Tesla thermal power plant, a very soft concessional loan with a 0.6% interest rate and a five year grace period (Djelić, 2011).

United Nations Development Programme (UNDP) is active in Serbia on three main fields, one of which being the strengthening of energy efficiency in Serbia (UNDP, 2013b). UNDP has had unproductive meetings with government officials in the past, raising hopes of a more serious stance on RE, yet these proved to be unfruitful. UNDP prepared a small biogas project at one point to demonstrate the technology[50], and created guides for the implementation of renewable energy in Serbia for private-sector investors (UNDP, 2013a). UNDP also claims to have greatly helped form the DNA, which raised an eyebrow at the DNA which claimed little help was received apart from the Government of Norway which has provided financial funds to support the development of the Energy Sector CDM Strategy report.

Apart from IFIs, several bilateral cooperations have helped Serbia with so-called G2G cooperations. Finland is focussing on biomass technical assistance, Norway has helped the DNA with a CDM strategy report, Spain and Italy[51] with PDD funding, and the Netherlands currently[52] through providing technical assistance with setting up an enabling legal framework for foreign investments and setting up the NREAP (Dutch Embassy, 2013) together with UNDP, a crucial document which helps the Serbian government determine its energy portfolio[53] (UNDP, 2013a). In general Serbia receives technical assistance from bilateral cooperation, leading to significant technology transfer but no direct funds for (renewable energy) projects.

According to EPS, most funds are either concessional loans or pre-investment activities, such as technical assistance and capacity building. Technology transfer, for example, could be offered by allowing Serbian personal to observe how things are done in foreign companies for a few days. Some grants were given after the war in 2000, but this has steadily decreased.

[50] One energy expert called this peculiar as UNDP was essentially demonstrating a proven technology

[51] The Italian Ministry of Environment, Land and Sea compensates the amount of 20,000 euros, for co-financing the preparation of the Project Design Document (PDD) for the project "LFG Collection and Utilization at the Landfill Jovanovac" (CDM Executive board, 2006). There was a mutual agreement (Memorandum of Understanding) with Italian ministries to run CDM projects in Serbia (Stankovic et al., 2007).

[52] As previously mentioned, the Dutch Ministry of Environment directly invested in a Serbian G2G biogas project in 2009 which also led to technology transfer (G2G, 2009)

[53] The idea is to develop a National Renewable Energy Action Plan as identified by the Commission Decision 2009/548/EC of 30 June 2009; to establish a template for National Renewable Energy Action Plans 9/28/EC and to develop a new mechanism for streamlining the Serbian rules relating to procedures, permissions and licenses. Download the NREAP at (MEDEP, 2013).

The numerous G2G projects have helped the Serbian government understand international legislation which was much needed. Only a few donations[54] have been received by Serbia after the war, something which has been steadily decreasing also due to the economic crisis.

It is important to understand that IFIs are development banks, and as banks they give loans. Since the loans are given partially through government negotiations and with the criteria of being backed by the government, the loans, which are considered a form of development aid, generally end up at projects which match host government policy. In the case of the Serbian energy sector, this means that the majority of loans end up at thermal power plants and even open-pit lignite mines. Whilst lignite proves to have serious societal impacts on aspects such as public health, resettlements for the expansion of mines and on the environment, the EBRD and other development banks continue to provide energy efficiency loans and loans for the construction of new modern thermal power/heat plants which run on lignite. These investments are justified by having a positive environmental impact as it leads to the construction of modern, more efficient plants (and overhauling of older, less efficient plants) - yet it consequently leads to further fossil-fuel technology lock-in. In its 'defence' - these power plants will continue to run till the end of its lifetime whether or not any IFIs provide funding for them. In fact, EU IFIs ended up funding the majority of thermal power plant overhaul and construction costs (EPS, 2009). KfW invested 74 million euros in the Kolubara lignite mine, controversial due to the high count of bronchitis in surrounding communities and stories of families not receiving enough compensation due to forced relocations for the expansion of the mine. KfW defends the move by stating that 30% of generated capacity in Serbia is already renewable which is very high (compared to Germany for example), and that importing energy is difficult due to the heavy price. It has been mentioned in literature that complex arrangements as well as a maze of funds can hinder mitigation (Tan, 2010), yet according to Serbian stakeholders this does not appear to be the case in Serbia. The taxpayer's money of several developed nations is reaching Serbia in different paths but each have their own necessary differences, for example through GGF, KfW or GIZ. It is also clear that in the case of Serbia the IFIs have little influence over Serbian policy, the political directives such as the LCPD and European pre-accession (emission) requirements, though related, have slightly more influence on Serbian (energy) policy, such as over the liberalisation of the energy market.

5-2-2-2 Liberalisation of the energy market

The Energy Act of 2011 which was adopted in July 2011, aimed to liberalise the energy market of Serbia, to regulate the free electricity market and provide the framework for the delivery of electrical power to the grid as well as free trading with electricity in line with EU regulations. Initially the market was opened for industrial clients connected to the high-voltage grid only, which started on the 1st of January in 2013. Currently all transmission, distribution and domestic electrical energy prices are regulated, but all consumers will be able to choose their energy provider as of January 1, 2015. Despite the theoretical opening of the market, several by-laws still hinder the full opening of the energy market (Energy Community, 2012). This leads to concerns over whether or not the market can fully open within the timespan obliged

[54] Examples include several ambulances which were donated to Serbia from the EU, and several busses which have been donated by the government of Japan

under the new energy law[55], also AERS does not expect the legal complications to be solved in time (AERS, 2013). Even though industrial consumers, which make up approximately 50% of energy consumers, are now allowed to choose their supplier, eventually only German precision medical instrument manufacturer company Messer chose to make use of this right, and opted to buy foreign power through a Slovenian trading company, most likely coming from Bosnia and Herzegovina.

The main reason for a lack of investment in renewables, energy efficiency as well as even fossil fuel energy generation, is the artificially low price of electricity - the result of mixing social policy with energy policy. Reports from 2011 already stated the need of price increases (by 60% until 2013 (Zeković and Maričić, 2011), yet Serbian electrical energy prices still remain Europe's lowest (around 5 to 6 euro cents per kWh (AERS, 2013), which is roughly 30% lower than regional prices). The price of producing power in Serbia, though not public and thus unknown, can be assumed to be low due to the majority of electricity being produced by 1.3 GW old hydropower stations providing very cheap energy[56] and lignite being mined by EPS themselves. AERS, a product of the EC programme project with technical assistance from the WB, has its own methodology to calculate energy prices in Serbia and is accountable to the national parliament only. The electrical energy price is a function of all of EPS's power plants and companies' costs, and neither it nor the methodology is public[57]. Before AERS regulated prices, the government determined prices and EPS had to find a way to work with this, obviously cheaper lignite thermal power plants are a result, with minimal investments as was seen. All energy experts stated that the currently subsidised electricity price of roughly 5 cents/kWh is difficult for Serbians to pay for and discussions are being held whether or not to raise the price - raising the price is a very sensitive topic as people are struggling already with high unemployment and poverty. Whilst the price is traditionally kept low, there is no such thing as a *free lunch* - the energy market has remained stationary for years. The current Minister of Energy predicted that the energy price shall increase 5% annually up to 2020. This is a new phenomena as increases in prices is a highly sensitive issue for domestic consumers, but also due to the fact that traditionally any increases in prices required special government approval. Contrary to normal liberalisation situations which are generally implemented for price decreasing purposes (due to efficiency increases for example, or more competition), opening the energy markets in Serbia will lead to higher prices. This was already apparent when the market was opened for large consumers as the industrial electrical energy price increased by roughly 70% (Intelli, 2013). Therefore, the opening of the market and consequently the higher prices, will be a turning point for renewable energy, energy efficiency, businesses, etcetera. It could potentially be the beginning of major economic development as extra income could be used for renewable energy projects, with extra long-term payback income from renewable energy being reinvested. In addition, consumption will be lowered making it viable for businesses to invest in CHPs, something that was not feasible previously.

SKGO, which deals with representatives of public utility companies regularly and is part of several energy related committees, mentioned that there are uncertainties on the municipal level whether or not liberalisation and possible privatisation will be beneficial. New legal frameworks have made privatisation possible, yet there is no experience with this regard mak-

[55] More on this later in section 5-2-3-2

[56] The so-called iron curtain hydroplants

[57] A stakeholder at EPS agrees this happens behind the scenes

ing local politicians reluctant. One reason for the lack of excitement towards the opening of markets is because it has always been social and it is assumed that liberalisation/privatisation will lead to price increases. Municipalities are realising though that the situation now cannot hold as it is not sustainable. The importance of Serbian municipalities in this regard is that district heating is mostly under municipal control. Local authorities are aware that renewable energy for district heating for example can be very beneficial, but little is happening on the municipal level either wat. Whilst not being reluctant to take loans in general, municipalities might rather take loans for infrastructure such as paving streets or at least for something more visible[58] than renewable energy.

In 2008 Gazprom took over the public Serbian oil and gas company NIS. Most energy stakeholders believed that since Gazprom took over in 2008, it was turned into an efficient and profitable business. NIS, similar to EPS, used to be subjected to complete management turnovers at every change of government. NIS/Gazprom is now planning investments in wind energy projects and gas-powered CHP throughout Serbia, to compete with EPS on the electricity market. These activities do not seem to worry EPS as they do not consider these plans any realistic form of competition[59].

As of March 2013, all Serbian domestic electrical energy consumers will see a new, separate renewable energy fee on their electricity bills (SEEB, 2013). Contrary to popular belief, however; stakeholders at EPS suggested that the funds, estimated to be a small 10 million euros annually, shall go to a new energy efficiency fund which could be established in 2014 due to the new energy efficiency law which was adopted by the Serbian Parliament 15 March 2013 (BDK Legal, 2013). There seems to be disagreement upon most energy experts as to what exactly will happen with the limited funds of this new bill.

5-2-2-3 Serbian feed-in-tariffs

The views on the Serbian FiT differ greatly. Initially, Serbia lacked government support mechanisms for renewable energy as no feed-in-tariffs were in place to increase the level of self financing and prolonging the pay back period for investors. As a response, Serbia introduced a FiT in 2009 (EPS, 2011), which was not very successful due to several reasons. The current, 2013 FiT has had some alterations, and can be seen in Annex A-3 on page 141. It is hoped that the FiT can help attract private-sector investments as over the next five to seven years; Serbia has the potential to attract at least 2 billion euros in renewable energy facilities investment (UNDP, 2013a). In order for a private-sector developer to be included in the FiT and receive such funds the developer must acquire the status of Privileged Power Producer (PPP) as holding an energy permit is not enough to receive the FiT. The only way of acquiring such a status however is at the end of a project; a process which has not been smooth and led to problems for several developers.

The original FiT had already disappointed investors before the tariff structure was changed at the end of 2012. Whilst the new FiT structure increased hydro tariffs from around 7 cents to around 10.5 cents, which is higher than region[60], wind, biomass, biogas and solar tariffs

[58] This political phenomena was evident in Nicaragua also

[59] EPS has a firm belief in lignite to counter this competition on the electrical power market (Serbia-Times, 2013)

[60] And "unreasonably high" according to some private-sector investors

were reduced. Even though the FiT for solar power has gone down in 2013 (Laković, 2012), previous studies as well as correspondence with private-sector investors have already shown that even the previous higher FiT framework had not been sufficient to attract significant investments into PV in Serbia (Stevanović and Pucar, 2012). Being the highest, the solar power FiT has been limited to 5 MW (Savic and Gomex, 2013). According to Biogas Energy d.o.o. (part of GL&A Holding GmbH) the Serbian political environment is not enabling for private-sector investment in RE, whilst officially appearing to be positive the political & legal environment is in fact negative. The Minister of Energy is considered to be positive towards renewable energy, yet local cabinet advisers have most of the influence and are responsible for determining the FiT. Biogas up to 1 MW used to be 14.2 euro cents per kWh, but this has been lowered 15% to 12.3 cents. The previous FiT on biogas was already the lowest in the region (regional FiTs were around 20 euro cents/kWh) and only three or four biogas projects were developed by developers who had a waste problem which had to be disposed of so no specific investments were made. The only dedicated renewable energy biogas project is Alubinar which decided to invest due to the promise of large CDM benefits (more on this in section 5-3 later in the chapter on page 68). Reasons of the lowering of the FiT could be a lack of knowledge; there was no inclusion of developers/investors or developers to the process of determining a FiT, and everything was done hastily. Policy makers did not advice any external parties such as the Biomass Association which was offering help and technical assistance to introduce the advisors into the core of the business. In the case of biomass, policy makers assumed the substrates are free as was mentioned to a project developer, which fundamentally incorrect due to there being production/supply/transport costs involved - there is even a market price for these substrates. Politically it might now be difficult to come with any more large changes (increases) in the FiT as the opposition could accuse cabinet advisers of incompetence. It might therefore be politically safer to leave the price low, if investors don't come to Serbia then investors can be blamed as not taking Serbia seriously, similar to EPS blaming international investors or the economic crisis for little movement in the energy sector of Serbia and the difficulties of reaching LCPD targets. On top of that, according to a private-sector developer, at the moment projects have to be completed before one can apply for the FiT permits to reach the so-called status of PPP. A private-sector PV developer reached this horror scenario when a solar farm was constructed after consultation with the government regarding the maximum capacity of the project, yet was not given the FiT permits (status of PPP) after completion as the total PV FiT capacity limit was reached. Grid connection[61] issues with EMS/EPS of particularly wind power projects remain a factor which increases risks for private-sector investors and therefore justify a higher FiT than countries without these added risks.

Stakeholders at KfW think the FiTs are decent regarding the political (social) push to keep energy prices low, yet it is agreed that problems with bureaucracy and PPP models are existent. It is believed that private-sector investment will come when the ministry gets their contracting methods ready regarding FiT technicalities such as when a project can be labelled as being a PPP. KfW in addition thinks that EPS is well aware of their obligations also regarding grid connections for wind. They furthermore stated that it is only normal for project developers to express their dissatisfaction with FiTs. Remarkably, energy experts at

[61] Developers have to pay for the infrastructure to connect to the grid, partly a fixed price, and a variable price dependent on distance from the grid. A biogas project called Alibunar, currently at validation for being registered as a CDM project, had to pay 160,000 euros to prepare the grid for their power supply.

KfW compared the Serbian FiT to those of Germany and noted that the Serbian FiT for most technologies are higher than German rates[62], not taking into consideration risk differences or other disadvantages for investing in renewable energy in Serbia. Energy prices and therefore the FiT is a sensitive political/social subject as the tariffs continue to the end-user, and people are having difficulties paying for energy costs already with the current record low prices. KfW's main worry are the FiT caps, such as the 500 MW cap on wind energy, but they recognise this could have to do with transmission/distribution limits. According to KfW, the main issues have been the legal barrier being too *"fresh"* nobody has experience yet with new laws[63] which in theory should be a lot better.

An energy stakeholder at EPS stated with pride how high (particularly the solar) FiT was, and showed general contempt to the Serbian FiT similar to KfW (and their comparison to the German FiT). In general it can be said that hydropower is certainly being promoted over other renewable energy technologies, most likely because hydropower is a stable energy type and thus cheaper and easier to handle for EPS/EMS. According to an energy stakeholder at the MEM, over the years little renewable energy has been added to the Serbian capacity due to a lack of subsidies and the low electricity price. The FiT now is seen as the answer to reaching the 27% target. The (relatively low) level of the FiT was not denied, but defended as it is better to have a tariff which the budget (or, because the FiT is paid for by end-user; the electricity price) allows, and it is better to have something than nothing. A social aspect has to be considered as people might not be able to cover the expenses.

In conclusion, the FiT sparks much debate. Politically it is sensitive to keep changing the tariffs, and as mentioned the appearance is already there that politics is enabling for renewable energy due to the existence of a FiT which, if compared to western European FiTs, appear quite reasonable. Whilst being an effective way to promote investments in renewable energy, it is important to realise that a FiT can also be a tool for the government to hinder or steer renewable energy whilst appearing to be enabling towards renewable energy. Stakeholders at KfW agree with private-sector developers that several legal issues have had a negative impact on private-sector investments, but believe most issues to be fixed - new policy is still fresh for developers and time is needed to adapt to the new meso landscape. Private-sector developers on the other hand have a simple way of working; they are in no way tied to Serbia and if conditions are not advantageous they will simply go and invest somewhere else. Private-sector developers do not have to look far as in neighbouring Hungary for example RE investment is incentivised by offering grants between 40-70% of investment costs parallel to a feed-in-tariff (EREC, 2009). Possibly the permits system shall be made much easier, as a *one-stop-shop* process for permits could be introduced as of June 2013 at the Ministry of Energy (Laković, 2012). Private-sector developers believe temporary PPP permits should be allocated during construction with perhaps a fine if construction is not finished in time, to lower risks of not receiving the FiT after investments have been made. The current (horror) stories going around private-sector developers of failed investments increases risks, and thus makes other regional countries more attractive for investment. Another suggestion could be to lower the FiT cap per renewable energy technology to afford a higher FiT. This mathematically avoids political/social issues as electrical energy price increases remain controllable, and could also avoid the Bulgarian scenario where suddenly such excesses of renewable energy capacity[64]

[62] See the German rates at (GEB, 2013) to compare to the Serbian rates in the annex at chapter A-3
[63] Which shall be discussed later in section 5-2-3-2
[64] Of novel, "low-quality", renewable energy (mostly PV)

were introduced by means of a FiT (860 MW in a year) that the price of electricity created unrest and demand decreased, creating over-capacity and grid instability (and thus even higher costs to tackle that problem) (Bauerova, 2013). Private-sector investors would always agree with a policy as long as it is clear, concise and consistent.

5-2-2-4 Energy trading

Several related unofficial suggestions were offered as a motive for the Serbian energy sector having largely stayed stationary for the last decade. Possible lobbies which trade electricity and also influence policy making could be profiting from current policy. There are large private energy traders in electricity in the region which trade significant amounts of electricity even though the net import/export appear to be roughly zero (exact figures are not published). It has to be noted that the way the energy price is determined, and the true price of production of energy, is not published by AERS and unknown even to energy researchers in Serbia. Furthermore, statistics on the quantity of energy trading are also undisclosed.

Sometimes energy which is bought from EPS is immediately re-sold to EPS, possibly without ever crossing an international border. One of these private traders is EFT which has been linked to numerous scandals. The Serbian parliament never acted on suggestions of a parliamentary commission which proposed in 2004 that independent audits be conducted of EPS's links to its contractors - EFT being the main business partner of EPS. Allegations are that EPS could have sold electricity to EFT at a price below production costs, and allegedly bought electricity back from EFT even though it had enough production to meet demand, in this case after it has crossed borders into Bosnia & Herzegovina and back. There were various investigations, but in the end nothing was done with those at the time; the chairman Vuk Hamović was a suspect of the Serious Fraud Office (SFO) yet charges were dropped 6 months later even though the SFO has insisted that charges could be laid (Peel, 2008). EFT has invested hundreds of millions of euros in a Bosnian lignite mine, and have been investigated by US prosecutors for possible insider trading involving US Agency for International Development (USAID) funds. More recently on June the 22nd 2013 the Serbian Minister of Interior Affairs confirmed that criminal charges have been filed against Vuk Hamović (FoNet, 2013). Many experts carefully believe that such traders could contribute to an anti-renewable energy environment. A suggestion could be that larger scale applications of novel renewable energy technologies such as wind energy could stir the balance within the electrical power market (regarding energy traders) because less energy can be exported, prices will increase, and more existing capacity must go into energy storage to handle the inevitable grid instabilities.

5-2-2-5 Local employment and sustainable development

Renewable energy projects in Serbia have the opportunity to contribute to local employment and sustainable development. The Alibunar project[65] for example, is going to be implemented in an underdeveloped area of Serbia and will thus lead to the intensification of economic activity in the area through the employment of locals and an increase in the payment of taxes to the local budget. As is often the case with renewable energy projects, local people are employed as new employers are required to operate the plant. In addition to the addition of

[65] More on the Alibunar project in section 5-3 on page 68

jobs for the local community, knowledge is transferred on how to operate modern equipment used in these projects(CDM Executive board, 2006). To promote job creation, projects might be eligible for Serbian grants of 4,000 to 10,000 euros per job created if certain conditions are met, according to the Serbian Government Decree On terms and conditions for attracting direct investment (SIEPA, 2012), other tax breaks might might also apply if local jobs are created (KEMA, 2011). Serbian policy makers are not putting priority on environmental issues, rather they are focussing on the economy and unemployment. It is not always believed that renewable energy is the best way to promote job creation for local authorities according to a stakeholder at SKGO. The Kolubara mine, which provides lignite for power plants that produces 52% of electricity in Serbia, creates 10,000 jobs despite leading to direct & indirect health problems to surrounding communities and anyone in the vicinity of lignite thermal power plants. In addition, 1180 households in the village of Vreoci had to resettle to allow for further development of another mining field in Kolubara (field D)[66]. Hydropower could be an added value to employment in Serbia, it is believed that the government might try to revitalise an old hydro turbine production industry which was active in Serbia until 15 years ago. On top of that, Siemens is expanding its wind turning production facility in Serbia, employing 650 locals (Stanisic, 2013).

Biomass especially comes with several co-benefits if it were to be implemented on a larger scale. Since most of the biomass potential is located in remote and rural areas of the country, utilisation of this resource could foster sustainable rural development, preserve nature and provide additional sources of income. Currently there is mostly 1st generation biomass in Serbia, a switch over to 2nd generation biomass is under way due to EU regulations (related to land usage, and competition with food prices), in relation to the EU's and UN's indirect land use change (ILC) policy of social sustainability[67].

[66]There are numerous reports which state that families are not receiving enough compensation

[67]This European policy is not without controversy as it could be a measure of the EU to protect it's own market as occasionally Latin American biofuels are not allowed to be imported because questions are raised about the sustainability of these biofuels (European Commision, 2013)

5-2-3 Political, legal & societal

This section shall cover the political, legislative, and societal aspects of the (renewable) energy sector of Serbia.

5-2-3-1 Political situation & government capacity

Serbia had a late start to Kyoto and consequently the CDM & renewable energy in general. Serbia had several opportunities to ratify Kyoto earlier yet it was pushed forward and delayed until the sixth ministerial UNECE conference "Environment for Europe" which was held in Belgrade in October 2007 which was the tipping point for the Serbian government to commit themselves to Kyoto. According to most of the energy energy experts and stakeholders interviewed the delaying was done purposely; the hosting of the environmental conference could have been the last drop as it would be a shame for Serbia to host such a conference without being serious about the environment and climate issues. One theory is that Serbia's entrance to Kyoto was delayed due to low human resources, other theories are that the government was resisting climate related politics and costs. Most likely the initial delays of Kyoto and sustainable development between 2000 and 2008 are not only due to a lack of political will, but also due to severe poverty after the 1990s. The first priority was to secure the energy supply - thus the expansion of thermal power plants and the refurbishing of older and broken hydro plants. In the 1980s some renewable energy was starting to get put up but this all collapsed when the wars started in the 1990s. Either way, because of the delayed start and despite the broadly accepted hard work[68] of the DNA to get CDM projects, Serbia missed out on a lot of credits. The Serbian government has not[69] been sending Serbian representatives to all Conference of the Parties (CoP) conferences lately[70], so little is known about the New Market Mechanism (NMM) discussions which have been taking place there. It has to be noted that the job of the DNA is not to help with or check PDD methodologies, the job of the DNA is to check whether or not everything is in compliance with national procedures and legislation.

The reliability of the Serbian government is also a factor which hinders private-sector investors, not only in the field of renewable energy. During the last change in government the entire DNA was paralysed, much to the frustration of the head of the department. CDM applications were ignored for a long period of time during the change of government and developers who were in need of a letter of no objection and letter of approval from the DNA received no responses during this timeframe. A continuous long-term policy, avoiding a stop and go nature, is important to create a sound investment climate and to lower the (societal) transfer costs due to the increase in risk premiums[71]. Future national legal acts should include a mentioning that members of DNA are not tied to a certain Ministry to avoid such idiosyncrasies which are seen throughout Serbian politics in general.

[68] the head of the Serbian DNA is generally seen as the most competent person in the Serbian government regarding renewable energy and climate change

[69] Due to unclear reasons, suggested was that as a non-Annex I country there are no obligations to visit conferences

[70] the last CoP attended by Serbia was Doha however

[71] The length of time to acquire all the licenses adds to the risk of investment, which in turn leads to higher risk costs

Currently according to most stakeholders interviewed it seems like the government might be leaning more towards renewable energy than previous governments, and the years of passive resistance to renewable energy could change because of this. Government policy has always been to keep energy prices low, afraid of turmoil when for example a FiT drives the price of electricity up. But now important documents have been created such as the NREAP, and the Minister of Energy has spoken, for the first time, of electrical energy price increases. Either way, and as was mentioned previously, only 3 out of 12 NAMA proposals Serbia submitted to the UNFCCC involve renewable energy technologies, whilst other proposals mainly focus on fossil fuelled methods or energy efficiency measures (UNFCCC, 2013e).

Political influences in state companies is seen as an obstruction to the efficient functioning of institutions crucial to the proper functioning of the energy sector. Public (utility) companies in Serbia are traditionally politically oriented meaning that processes can be steered. There also seems to be a unanimous opinion that management of such public companies is particularly afraid of *mistakes* or mismanagement, for which management can be held (politically) accountable. This leads to 'soft' decision making; if little is done the worst that can happen is precisely that.

A stakeholder at SKGO spoke with a state secretary about the abolishment of the environmental fund in 2012 when the new government was installed. The environmental fund was also to finance renewable energy and energy efficiency projects. The state secretary believed that the fund was not used in the best ways by investing in end-user energy efficiency (via municipalities for example) and that investment in the energy efficiency of production is a wiser decision. It has to be noted that, whilst investments in the energy efficiency of production is obviously important, investments in end-use can start an investment cycle[72] due to the reinvestment of savings and raise societal awareness co-benefits.

In October 2011, 16 current and former members of EPS management, including directors of the Kolubara mining complex, were arrested for embezzlement[73], raising awareness of fraud issues in the public sector of Serbia. According to recent news, due to corruption within state-owned enterprises[74], between 500 and 800 million euros could have been lost due to corruption during the previous government. The new government created a new Serbian Law on Public Procurement which came into effect on the 1st of April 2013 in a fight against corruption (Maric, 2013). Corruption risks always exists and it could complicate some procedures such as obtaining permits and compliances. Usually corruption is linked to structures in the authorities which are issuing permits or licences, prolonging or even ceasing the whole process, or corruption could be in relation to public tenders. The unclear nature of the AERS and undisclosed determining of electricity prices can fuel corruption in the energy sector, particularly because the energy sector is a lucrative sector due to the high numbers associated with it.

[72] If you for example invest in the housing sector (for example heat, high energy consumers) so that demand is lowered and the savings can be reinvested, a cycle is started

[73] EBRD loans in for EPS projects including the Kolubara mine still continued during the investigation

[74] Public enterprises such as EPS, Serbiagas, NIS, water, railway, mayor infrastructure, etcetera.

5-2-3-2 Legislation

One commonly seen[75] barrier to private-sector investments currently, is the length of the process of applying for a renewable energy project due to legislative reasons. These delays, also due to the aforementioned political reasons such as the paralysis of the government during a change of government, lowers the certainty of renewable energy projects and thus make private-sector investment in Serbia less attractive. The length of time necessary to acquire all the licenses adds to the risk of investment. Legislation needs to be such that foreign companies can get the required PDD form from the government to produce and sell electricity in Serbia. The PDD is not only needed to get bank loans, but also to acquire funds or grants from one of several (development) banks and IFIs. Some renewable energy sectors have laws into place now which inhibit this, proving that the electricity market has not yet been sufficiently opened to foreign investors as can be seen in an AERS report (AERS, 2013) as well as an energy community report (Energy Community, 2012) on the status of the Serbian energy sector. This is one of the focal points of the Dutch embassy in Serbia, helping to create a legal framework which can simplify the process for foreign companies to set up business in Serbia.

Whilst differing per technology type and project, for the construction energy production process currently the main formally required stages (not including the often required environmental or water permits) are[76]:

- Regarding the construction process:
  - Pre-feasibility study
  - Feasibility study
  - General design
  - Preliminary design
  - Main design
  - Location permit
  - Construction permit
  - Operating permit
- regarding the energy production process:
  - Technical conditions for connection
  - Connection agreement
  - Rights to energy generation
  - Licence for energy related activities
  - Energy permit
  - PPP Status
  - Power purchase agreement (FiT)

Many processes are interrelated, with certain decisions or permits from one process required for proceeding to the respective next stage. Another problem is that holding an energy permit is not enough to receive the FiT, as was mentioned one has to have the status of PPP which can only happen at the end of a project. On top of that another phenomena is that developers must prove sustainability of the project before one can apply for the permit, this delays things further and increases risks that projects will not receive the expected FiT as tariffs can change, quotas change, and conditions change all the time as politics change. There is no

[75](Whitley and Ellis, 2012)
[76](KEMA, 2011)

interaction between construction and energy related legislation or permit allocators, except via the developer itself. Even between ministries communication is minimal, someone can get an energy license for biomass but to get a license to log a forest one needs to go to the state-run company *Serbia Forests* which handles forestry and agriculture and is regarded, according to some stakeholders interviewed, as being a "state-in-a-state". These issues are worse for biomass[77] as more stakeholders are involved (municipalities, setting up a supply chain (which is the main technical problem according to SKGO), buying land from an owner (which is most likely the state), etcetera) which is a worrying thing as biomass is the most abundant resource in Serbia with 63% of the renewable energy potential being biomass. Most forests are state owned[78] so a longterm supply contract has to be set up. Out of 80 permits issued to renewable energy projects between 2006-2011, very few are advancing (Energy Community, 2012). According to a private-sector renewable energy develop experienced with biomass, the legislation for Biomass is just as inefficient as it is anywhere else in the region.

It has to be noted that the legal difficulties and miscommunications between ministries or agencies are not limited to the (renewable) energy sector, and independent energy stakeholders believe that there is progress and the legal hassle is less now than what it used to be. EPS stakeholders also stated that many things are now happening to resolve these problems through a so called *one-stop-shop* for all permits and contracts as of June 2013 at the Ministry of Energy (Laković, 2012), however problems were still being reported as of May 2013. As previously mentioned, KfW believe that private-sector investment will come when the ministries get organised regarding FiT technicalities such as when a project can be labelled as being a PPP, but also mentioned another aspect of the legal barrier being too 'fresh', nobody has experience yet with new laws which in theory should be getting better. The NEEAP which saw funds from the WB and KfW was less successful than planned, mainly due to the missing supportive legal and financial framework in this area (Energy Community, 2012).

According to SKGO the legal framework now is already quite advanced, what is lacking is that the ministries have to come up with model contracts for selling electricity produced from renewables - essentially a simpler and more consistent approach. The Energy Efficiency Law which was adopted by the Serbian Parliament in March 2013 (BDK Legal, 2013) allows Energy Service Companies (ESCOs) to be formed to allow investment in the implementation of energy efficiency whilst the investor(s) receive the resulting energy savings. Since these energy savings are made in the public sector, private ESCOs activities lead to Public-Private Partnerships (PPPs). It has yes to be seen whether or not the Energy Efficiency Law which allows ESCOs will conflict with the budgetary Law on Public Private Partnerships and Concessions since ESCOs function as PPPs. If the framework functions well, the Energy Efficiency Law will allow private-sector investors to come up with a plan such as energy efficient buildings or efficient street lighting, and after the implementation the savings are transferred to the ESCOs using this PPPs construction. According to SKGO the changes in the law on energy efficiency incorporated these points, so as of the beginning of 2014 these changes should occur.

[77] In order to increase the use of biofuel production potential, a certification scheme of sustainability criteria for biofuels as well the establishment of a relevant certification body is necessary to enable producers to enter the EU biofuels market (Energy Community, 2012) due to the EU's biofuel sustainability requirements.

[78] approximately two thirds of Serbian forests are state owned (KEMA, 2011)

5-2-3-3 Societal awareness

As previously mentioned, as of March 2013 all Serbian domestic electrical energy consumers will see a new, separate renewable energy fee on their electricity bills (SEEB, 2013). Although there is disagreement as to the destination of the *renewable energy* fund which is only expected to raise approximately 10 million euros annually, stakeholders do not believe the fund will lead to much societal awareness for renewable energy. It is suggested that the notion of renewable energy on the bill will just be regarded as yet another one of the aspects of the cumulative energy bill.

New buildings must abide to stricter sustainability criteria as there is a new construction law dictating a certain efficiency of buildings for the allocation of building permits. There are also municipal incentives to help pay (sometimes up to 20%) for increasing the energy efficiency of buildings, but not all municipalities have this in place[79]. Municipal incentives are not always successful in triggering homeowners to invest in their home, particularly in cities where most people live in large apartment buildings, as associations of homeowners often resist expensive investments as such.

One of the problems biomass is facing is the low awareness of the potential and possibilities of biomass in Serbia, mainly due to a low level of promotional activities of this renewable energy form (Bogunovic and Bogdanov, 2009). On top of that, and perhaps more so than in Western European countries, there seems to be a focus from developers to acquire subsidies from the state instead of via for example CDMs. This can be a result of political history, as state help and interference was traditionally high. The same goes for the CDM, low awareness of the CDM amongst (small) project developers could explain the relatively few CDM projects in Serbia. There is disagreement as to whose responsibility it is to promote such facilities, the already overworked DNA has underlined the function of the office, which is to compare PDDs to national legislation and see through the process of acquiring legal documentation required for the registration of the project. Public awareness is often regarded as being crucial for further renewable energy development, if people were to understand what *their* benefits could be to sustainable development then social pressure could lead to political change. Yet even Civil Society Organisations (CSOs) in Serbia do not fully appreciate the affects of climate change or the need for RE as only two or three now have climate change mentioned set as a priority.

5-2-3-4 Operational practicality

The capacity of the MEM and Serbian government can be seen as insufficient for the complex tasks at hand to improve the environment for private-sector investors in renewable energy in Serbia. Renewable energy is not the only thing in the portfolio of the MEM, oil, gas, lignite, grid stability, national electricity production, etcetera are all pressing subjects. The department of sustainable development and climate change has low human resources with just 4 in total, dealing with different things such as climate, the Energy Community, environmental protection in the energy sector, etcetera - regarding two parallel processes; the UNFCCC and EU/Energy Community imposed obligations. Sometimes help is received from the ministry of forestry or energy, but it can be concluded that capacity is not assumed to be sufficient. As

[79] according to SKGO

it is the responsibility of municipalities to reach an arrangement with private-sector investors particularly when it comes to district heating, the many permits due to the combination of many laws means that the capacity of municipal authorities is of equal importance[80]. According to SKGO the capacities of local authorities regarding permits can be lower than those of the national authorities.

When it comes to the NMM, ministry capacity is certainly not ready for a large sectoral scheme as has also been indicated by representatives of the Serbian DNA. Ministry administrations should therefore evaluate where the weak points are that have to be strengthened with more human resources. Renewable energy project developers sometimes feel like the minister, who has a positive stance towards renewables, pushes the developers on to her advisors[81] who also lack the capacity to deal with solicitations. Policy analysis and technology assessment to bring such dynamics to light was virtually non-existent in Serbia, and only started recently due to foreign technical assistance.

[80] Municipalities often search for what a project can offer to the local authorities and what can be of interest to them, and thus carry a great deal of influence

[81] As previously mentioned, there seems to be a belief that officials prefer to remain idle as when nothing is done there is lower room for error

5-3 CDM in Serbia

Since 2008 the DNA, legal framework and procedures for CDMs in Serbia was activated. Preparation for this began before Kyoto ratification, with the help of UNDP and bilateral technical assistance from Norway which has helped set up a report for the "Strategy for Incorporation of Republic of Serbia into the CDM".

Serbia currently has 6 registered CDM projects with a further 5 projects at validation (UNFCCC, 2013d). 4 of the registered projects are wind energy projects; Cibuk 1 (171 MW), Plandiste 1 (102 MW), Kosava 1 + 2 (123 MW), and Kladovo 1 (54 MW), located between Belgrade and Romania. The other registered CDM projects include the JP Serbiagas methane leakage reduction project, and an LFG recovery and electrical energy production project (0.3 MW) at the Budanj landfill site of former state company NIS (now owned by Gazprom). None of the wind projects are complete or running due to aforementioned reasons, and thus no CERs have been administered to these project yet. According to the UNFCCC the other 2 registered CDM projects have thus far not received CERs either (UNFCCC, 2013d). Of the five projects at validation there are 2 biogas projects (Alubinar (3 MW), and Mlekara Lazar (1 MW)), Ljubovija wood biomass cogeneration project (7.5 MW), a methane recovery project (Becej - 2 MW) and another LFG landfill project of 0.3 MW (Jovanovac).

All interviewed stakeholders seemed to unanimously agree (though perhaps unexpectedly[82]) that the CDM was no real success in Serbia, despite having a generally positive view of a crediting system such as the CDM. Several reasons for this have been offered; the most broadly accepted reasons were:

- The project cycle is too complicated, particularly for smaller developers, difficulties for developers to assemble the PDD
- Fears of not receiving Certified Emission Reductions (CERs) after a costly and lengthy application process, which is inadequately synchronised with the Serbian permits cycle[83] and adds to the risk of the project
- Due to the low price of the European Union Allowance (EUA) and CERs it does not make any sense to apply for CDM projects

Other suggestions include:

- The Serbian energy system is very centralised, big state companies were not interested in the CDM and small projects did not know enough about it (obviously a private-sector investor is much more motivated to go through trouble to acquire CDM funds, state companies less so)
- A lack of knowledge, financing, and support from the ministry, general lack of information regarding the CDM for developers

[82] It was believed that the implementation of CDM projects in Serbia could significantly contribute to the modernisation of the country's existing economic structure (Stankovic et al., 2007)

[83] which, as mentioned in section 5-2-3-2, takes a significant amount of time for developers the way it is

- Insecurities about whether or not a project will be registered or not, and whether the CERs can be sold on the market later at the expected price

Just when the DNA was properly active and CDM projects were starting to get registered (around the second half of 2012) the whole programme basically came to a halt worldwide due to low carbon price, and the nearing of the EU's Least Developed Country (LDC) policy[84] which was actually already announced in 2009. Although non-EU-ETS countries could still accept the Serbian credits, little is known currently, either by the DNA or private-sector developers, whether or not this will actually happen. After August 2012 few letters of approval arrived at the DNA, but those which did arrive could not be processed until 7 to 8 months later because of the change of government; due to current Serbian procedures the entire DNA had to be reestablished even if the 4 civil workers employed for the DNA remained in their place. After the DNA was operational again developers were informed to resubmit documents but none had arrived approximately 2 months after that. It is also unclear, even for the DNA, what will happen with the DNA now that 2012 has passed. Perhaps the DNA will have to switch roles to some sort of international point of negotiations for NAMAs or other UNFCCC interactions (such as the NMM).

In general (and particularly regarding smaller-) project developers are afraid and frustrated with the system of applying for the CDM, it should be much simpler than it currently is. According to SKGO the burden falls in the hands of the project developer, and from a municipal perspective bilateral agreements (such as KfW) have been more fruitful regarding renewable energy projects in Serbia. Op top of that, energy academics believe that ESCOs could be more popular and effective than the CDM for smaller developers.

5-3-1 Alibunar CDM project

The most interesting CDM projects of Serbia to look at regarding private-sector investment in renewable energy are the Alibunar (3 MW) and Mlekara Lazar (1 MW) biogas projects, mostly because the issues the wind projects have had to deal with have been mentioned in previous sections and the remaining CDM projects do not qualify as renewable energy projects. Due to their inherent similarities[85] the focus shall be on the Alibunar project.

Whilst the technology of biogas & methane recovery from pig manure is proven and widely used where applicable and financially viable, in the case of Serbia this form of renewable energy production has only been applied by parties with a waste problem - no dedicated projects have been implemented with the purpose of producing renewable energy. In the case of the Alibunar project, investments in methane recovery & biogas production with the purpose of producing energy to sell to the grid would not be viable were it not for the combination of the (relatively low - compared to the region) FiT and the acquiring of CERs via the CDM. Camco Global approached the developer (Biogas Energy d.o.o. (part of GL&A Holding GmbH)) with a deal of taking 30% of CERs income in return for taking care of all PDD documentation costs and all further transaction costs except for the yearly validation costs estimated at 20,000 euros per year which were to be split in half. According to estimates of Camco Global, due to heat production (3.6MW of heat (29 GWh/year)) and electricity

[84] As mentioned in chapter 3

[85] both have had to deal with the same issues with the same broker - Camco Carbon

production (3MW of electricity (24 GWh/year)), as well as methane avoidances the project could receive 111,000 tonnes annually of CERs. Considering the price of CERs were around 10 euros at the time the project was now a business plan[86] as the FiT is barely enough for the project to break even. The contract with Camco was signed in the summer of 2011.

Three things happened. First of all, due to a mistake in the methodology of Camco which was used to estimate the amount of CERs which should be allocated to the project due to methane avoidance, the project only received 30,300 tonnes annually (down 70% of what was expected) (CDM Executive board, 2006). Initially a type III methodology was used: *AMS-III.D - Methane recovery in animal manure management systems Version 19.0*, yet the applicable methodology which should have been used was *AMS III.A.O - Methane recovery through controlled anaerobic digestion Version 01*[87]. Secondly, the price of CERs fell from 10 euros per tonne to roughly 0.40 euros per tonne. Lastly, due to the FiT in Serbia being allocated after all documents including the status-of-PPP being ready as previously mentioned in section 5-2-2, the expected FiT was lower than originally thought (in theory the project could have lost the FiT entirely in the mean time due to political changes or changes in the FiT cap, as was mentioned earlier in section 5-2-2). Initially the expected FiT was 14.2 cents per kWh which was enough to cover expenses and earn back money in 15 years including the 160,000 euro payment to prepare the grid for their power supply, but was lowered to 12.3 cents per kWh. Thus, 4.5 million euros were invested with the CERs and FiT in the back of the investors' minds, but now the developer barely cuts even.

Other points are that the Serbian DNA was considered extremely helpful despite the paralysis of the government for most of 2012. The project was eventually submitted on December the 31st 2012. Technically, the project has three generators for power production. Each genset is capable of producing 1,190 kW output but is electronically limited only to 999k because of legal requirements that the equipment should be under 1MW to allow licenses to be obtained at the local rather than government level. In short it can be concluded that it was decided to invest in the project due to estimates of broker Camco yet this proved to be wrong as an incorrect methodology was chosen (Camco has been affected by the current CERs price in general as offices were closed and people people laid off) which put the investor at risk. We can see that firms are trying to earn their piece of the pie without having a true interest in renewable energy. Another point is the complexity of the methodologies which creates uncertainties; even a specialised firm such as Camco made the error. The phenomena also happened with the separate Mlekara project (with a different project developer), and a legal dispute is now underway as Camco is trying to retrieve the 100,000 euro PDD costs. Lastly, the collapse of the carbon price and unreliability of the FiT have had a serious impact on the project.

[86] According to the PDD, Internal Rate of Return (IRR) without the CDM is 7.74%, with 770k income from CERs it would be 12.83% at a benchmark of 12.5% local lending rate (CDM Executive board, 2006)

[87] Emission reductions are eventually calculated for the swine manure component of the anaerobic digester feedstock, and no emission reductions are calculated for the maize silage and other culture anaerobic digestion

5-4 Views on the NMM

When interviewing energy experts and key stakeholders, in general very positive reactions were triggered when discussing the possibilities of having a NMM in Serbia. Disregarding the obvious concerns of the low carbon price, the suggestions are discussed below.

According to academics a sectoral scheme could certainly help tackle problems, especially due to the vagueness of the destination of the (small) renewable energy section on the electricity bill of consumers and the lack of funds for covering the FiT, or, as an expert at the SEIO bluntly stated; *all grants or loans are welcome.* A NMM could help with the further penetration of renewables. As with the obligations of the Energy Community, a sectoral scheme could help push the government with further obligations, and thus a NMM with a penalty system was suggested as an additional obligation for the government to reach goals and further develop renewable energy in Serbia. EPS is not expected to contribute to renewable energy investments due to it only having an interested in large hydro and lignite and lacking funds to invest in other renewables. The combination of having new players on the market due to the newly liberalised electrical power market as well as a NMM to finance and enforce policy could be what Serbia needs for renewable energy increases. In any case the streamlining of the legal framework and permits systems is necessary as a prerequisite.

According to a stakeholder at SKGO, municipalities hardly ever cooperate with themselves. For the implementation of a NMM in Serbia a higher authority would therefore have to organise the formalities (the national authorities; which currently lacks capacity). Stakeholders at KfW think that perhaps Serbia now is not ready for a sectoral scheme as there is no competition in the power sector and EPS functions as a monopoly, yet KfW believes that a sectoral mechanism could be an effective means in the future. The experience of KfW as a bank is that it is important for developers to have money up front, there could be a problem when goals are not met and credits consequently not allocated. Therefore a penalty-system could be most beneficial. It is believed that the main thing which has to be solved by the NMM is to give investors more security - a problem could be whether or not the government would be willing to take the risk of committing itself to targets. In essence though, this would depend on the negotiations which the government conducts with the UNFCCC.

An energy expert at the Dutch embassy thinks the NMM is a good idea if the ministry can allocate resources and be independent. State subsidies are often short-lived, international crediting could be advantageous if due to international reasons the terms & conditions are more reliable than national subsidies. If a subsidy ends due to political reasons, development in the field of the subsidy usually ends also. Experts at the MEM, DNA & EPS were also carefully optimistic of the NMM, and believe it could be beneficial for Serbia but are unsure regarding a possible penalty-system. According to the DNA the greatest improvement of the NMM is the inherent simplicity, yet a proper sectoral system of monitoring, reporting and verification (MRV) is required to make it work which could be an issue as Serbia at the moment has no capacity yet for such an MRV, particularly in other sectors than the electrical power sector. For the energy sector, in fact, academics are still trying to piece together the current energy balances of the government stating that some data is confidential and shall only be presented to ministry officials. Under the NIPAC approved IPA 2012 programme (as well as the to-be approved 2013 IPA programme), in the scope of the section "Strengthening system of Environment Protection and Climate Change", the measure called *Creation of*

a MRV system for the successful implementation of the European Union Emissions Trading Scheme (EU ETS) will gradually start to prepare Serbia for a system of MRV. Had a sectoral approach been active since 2007 instead of the project-based CDM, processes could have been easier but it is difficult to quantify the level of benefit. In general however, the sectoral approach is considered advantageous compared to a project-based approach. Combining countries in a regional sectoral crediting scheme sounds like a potential idea, yet could be a challenge to realise due to different starting points, specialities (type of renewable energy per country), technologies, capabilities, capacities, priorities, etcetera. It has to be noted that (perhaps due to Serbian government officials not attending all CoP meeting) many stakeholders were unaware of the current global discussions on the NMM.

5-5 The NMM & private-sector investments in renewable energy projects in Serbia

The main barriers to private-sector investors in renewable energy in Serbia are:

- the legal framework
- the FiT
- an unreliable political (meso) landscape which lacks capacity
- the low price of electricity (due to several reasons, mostly the mixture of social & energy policy)
- the energy market being closed
- infrastructural issues (transmission systems)
- centralised energy system (and the influences of public utilities company EPS which has a monopoly on both power production & lignite mining)
- IFIs, which invest a lot in Serbia, cannot reach private-sector developers on a large scale
- grid-connection issues

The main shortcomings of the CDM in Serbia are:

- lack of knowledge
- inherent complexity of the project cycle
- added risk to projects (due to getting the project registered or not)
- low CERs prices

The NMM has the prospects of being a source of funds (as a 'grant' as opposed to the soft-loans which are typically offered by IFIs) for Serbia to be able to raise the FiT. The FiT is the best means for private-sector investors, particularly in the region, to fund renewable energy projects. On top of this, the NMM takes away insecurities, and thus risk (and consequently: costs), from developers with regards to whether or not a project shall be registered under the UNFCCC and thus eventually receive CERs. These CERs prices, as discussed in section 3-1-2 (on page 21) in the case of CERs which originate from CDM projects, are typically much lower than the costs of the EUA (or for example Australian Carbon Units (ACUs)) due to project risks, approval risks, and several other factors related to the typical shortcomings of the CDM and the functioning of markets in general. Although it is unclear as to what the price of CERs originating from a NMM would amount to, in all likeliness these prices will be higher due to the bypassing of expensive consultants and brokers which are currently in the middle of processes and each take their piece of the pie. The UNFCCC, as part of negotiations, could demand a more concise and transparent FiT system which further reduces risks for developers and halts delays. Even though the MEM has already stated that it plans to introduce a *one-stop-shop* system to simplify the legal requirements for developers, the most recent indications indicate that the system remains messy.

Before the NMM can be implemented in Serbia, the capacity of the MEM currently responsible for climate change and all related matter must have an increase in human resources. There are currently 4 people working in the devision which includes the DNA. Another prerequisite for the implementation of the NMM is the opening of the market, a strong indication that the Serbian energy market is nog yet ready for a sectoral crediting mechanism as of this time. Even though the theoretical opening of the energy market should be complete in 2015, reports indicate that the implications of by-laws can hold the procedure back. Key to the opening of the markets is the raising of the energy price. If social policy is split from energy policy (at least in the way of keeping electricity prices low by effectively directly subsidising it) large investments in the energy market can be expected. This is related to the FiT, as higher electricity prices means a higher "starting-point", as the difference between the price of the FiT and the price of electricity is reduced. This, combined with the NMM as a means to fund the FiT, could lead to very competitive prices compared to the region, perhaps even similar to Hungary's system where the government grants a certain percentage of investment costs of renewable energy projects - parallel to a FiT.

A large barrier to renewable energy in Serbia is the difficulties particularly wind energy developers are having with connecting their projects to the national grid. The UNFCCC, as part of the negotiation process for a NMM, could press for a change in policy regarding this vital aspect of large renewable energy projects. A greater challenge could be the infrastructural issues regarding transmission lines. As was found, due to political reasons the transmission lines towards Romania, vital for the 0.6 Mtoe wind power potential of Serbia, will most likely not be expanded in preference for transmission lines towards Republika Srpska which so happens to benefit hydropower. It is not clear whether the NMM or UNFCCC in general can have any influence on such decisions.

All typical CDM-related issues experienced by developers can be *solved* by the NMM, except for the global price of CERs which remains the reverse salient of the NMM. Either the European Parliament must re-vote for the backloading proposal[88], or an increase in non-EU

[88]On July the 3rd 2013 the European Parliament voted in favour of a second, slightly amended, backloading proposal. Insecurities on long term carbon prices remain as only half of surplus allowances will be taken off

ETS demand for CERs is required to drive up the carbon price. Perhaps Australian ACUs or other international emissions trading schemes can play an important role in the future for the NMM.

As to be expected, governmental stakeholders were positive towards a non-penalty (crediting) version of the NMM as it basically boils down to extra funds for Serbia. Either way, the NMM incentivises structural policy transformation as a top-down system and will lead to more influences of the UNFCCC in policy in exchange for those credits. Independent energy experts were supportive of the idea of having a penalty to force the government to act, even though in that scenario the system would resemble more of a flexible national Emissions Trading Scheme (ETS) as opposed to a crediting mechanism. Whilst such policy can push Serbia more towards a future ETS, it is only a matter of time before Serbia joins the EU ETS anyway as pre-accession talks continue. The NMM could in that way be a stepping stone towards an eventual ETS. Under the NIPAC approved IPA 2012 programme (as well as the to-be approved 2013 IPA programme), in the scope of the section "Strengthening system of Environment Protection and Climate Change", the measure called "Creation of a MRV system for the successful implementation of the EU ETS" will be prepared for implementation. Once Serbia is part of the EU ETS in the future, regional carbon prices will have to be synchronised to avoid unfair competition, leading to higher energy prices in Serbia and thus more investments in renewable energy technologies as the financial feasibility of renewables increase. It is currently impossible to make concrete predictions on the direct effects of Serbia joining the EU ETS.

In general, a large advantage of the NMM could be the fact that an independent entity can study the Serbian energy sector through policy analysis, much as how that has happened in the case study of this thesis report. Large differences in opinions of the Serbian energy sector were noticed during interviews, and there is room for efficiency increases and improvements just by bringing together key stakeholders to exchange ideas. If such an entity, be it the UNFCCC, could run such an independent analysis and influence policy whilst simultaneously offering funds for the implementation of that policy, then a much more enabling (meso) landscape for (private-sector) renewable energy developers can be created. The fact that corruption scandals were brought to light during expert interviews as well as literature studies, and Serbia's relatively poor score on the Corruption Perceptions Index of 2012 ranking 80^{th} out of 176 (TI, 2012), the advantages of an external party (the UNFCCC) exerting influence with funds (via the NMM) after independent policy analysis under strict rules and regulation which could potentially bypass corruption methods (i.e. through external verification of the Serbian system of MRV) could be of game changing proportions in the case of Serbia.

5-6 Multilevel framework & flexibiliy of meaning

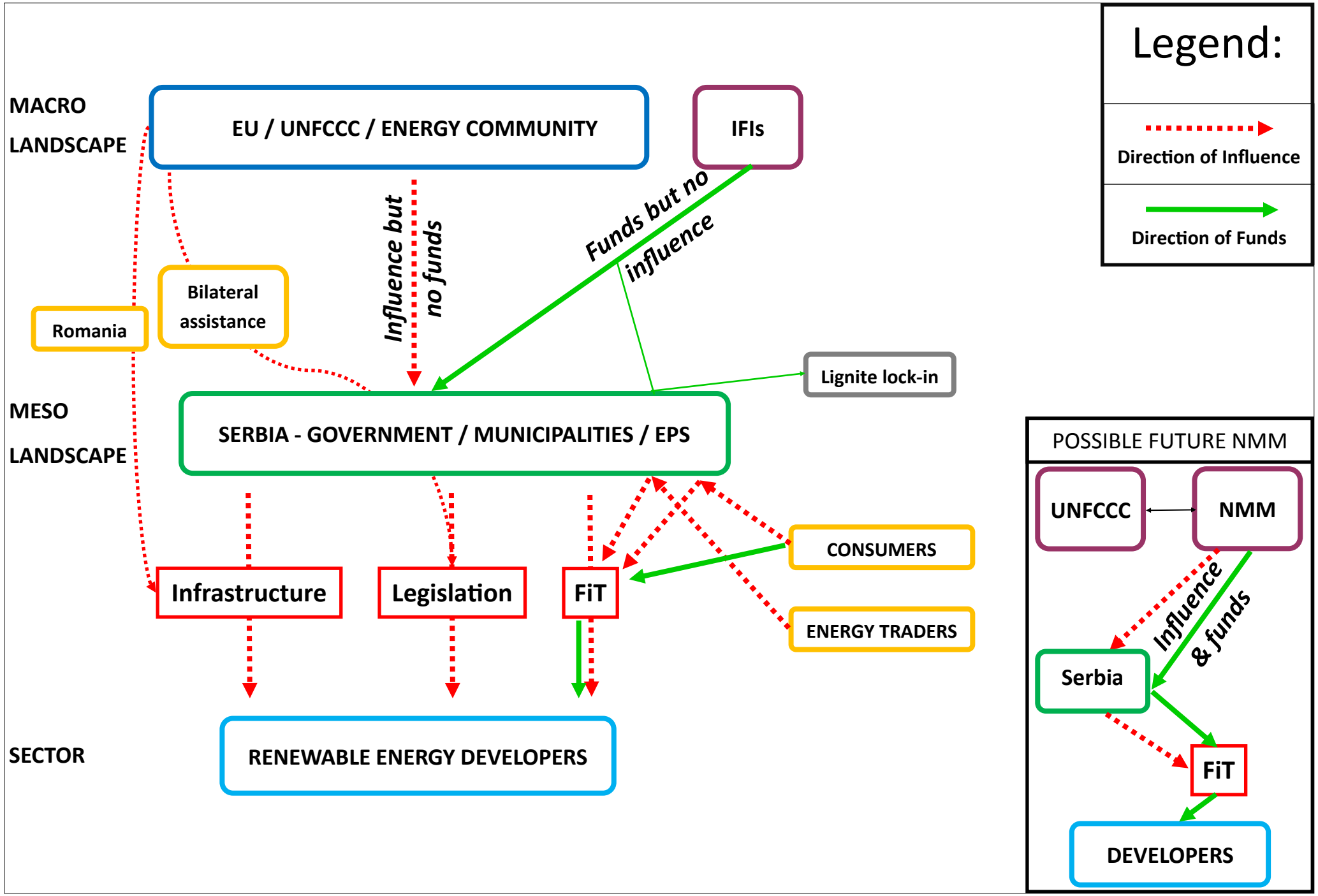
The proposed multilevel analysis strives to bring the interactions between actors in the macro landscape, meso landscape, and sectoral levels to light. The flexibility of meaning assesses the differences between the desires and motivations of these actors.

Whilst the players in the macro landscape (the EU, UNFCCC, Energy Community) have an influence on Serbian energy policy (the meso landscape), without the funds necessary to pay

the market (EL, 2013), so the UNFCCC's flexibility mechanisms remain in an unsure state.

for difficult policy and stimulate mitigation & sustainable development, not enough seems be getting done in the (renewable) energy sector of Serbia judging by the low increases of renewable energy in the national energy portfolio. This can be seen, for example, in the way that Serbia is current hoping for flexibility from Energy Community's LCPD regulations as the imposed goals shall not be met. Other macro landscape actors, such as IFIs, which do provide funds to Serbia, lack influence on Serbian policy. This is mainly due to the fact that development banks give loans to government-backed projects, which are consequently directly related to government policy. An example of this is KfW's and EBRD's investments in controversial open-pit lignite mines and thermal power plants. The biggest advantage of the NMM is that it can combine influence with crediting, yet prerequisites for the NMM to work (for example the opening of the energy market to enable competition) have been made possible due to the EU's pre-accession requirements.

The FiT, Serbia's main incentivising tool for renewable energy, inherently favours hydropower and insufficiently incentivises the more novel renewable energy technologies. Energy traders try to influence Serbian policy makers in an attempt to keep the price of electricity low (by keeping renewable energy away from Serbia) by keeping the FiT low - this in turn enables energy traders to export energy at higher profits. End-users in the form of domestic/industrial consumers, who eventually pay the price of a FiT, generally like to see low energy prices especially in country which suffers from poverty, even though some consumers are aware that the current situation on the electrical energy and district heating market are unsustainable. Combined with infrastructural deficiencies and issues regarding the legal framework of Serbia, renewable energy developers run into a barrier when trying to invest in Serbia. Transmission lines to the east of Belgrade (towards wind power potential) are running on maximum capacity to allow Romanian energy exports towards Europe, and the Romanian government is trying to push for an expansion of these transmission lines through the Energy Community which is being hindered by Serbia's traditionally political ties with Republika Srpska towards the west of Belgrade, which is also the direction of hydropower potential. Problems with the legal framework influence the Serbian energy market in the same ways as it affects basically all Serbian sectors where permits are required. Bi-/multilateral technical assistance is now given to Serbia to help Serbia streamline its legal system. The chart on the following page shows the main relations and flexibility of meaning between actors.


Legend:
Direction of Influence
Direction of Funds
MACRO LANDSCAPE
EU / UNFCCC / ENERGY COMMUNITY
IFIs
Influence but no funds
Funds but no influence
Bilateral assistance
Romania
Lignite lock-in
MESO LANDSCAPE
SERBIA - GOVERNMENT / MUNICIPALITIES / EPS
CONSUMERS
ENERGY TRADERS
Infrastructure
Legislation
FiT
SECTOR
RENEWABLE ENERGY DEVELOPERS
POSSIBLE FUTURE NMM
UNFCCC
NMM
Influence & funds
Serbia
FiT
DEVELOPERS

5-7 Summary & conclusions

Currently 40% of Serbia's electrical capacity is hydropower (2.8 GW), producing 29% of electrical energy (0.86 Mtoe). Thermal power plants powered by locally mined-lignite produce the majority of Serbia's energy, which, combined with other fossil fuels such as oil and gas, make up 79% of Serbia's total energy consumption (7.11 Mtoe, combining the power, transport and heating & cooling sectors). Serbia has committed itself to reducing this level to 73% (27% renewables in the entire energy consumption of Serbia). The total renewable energy potential is approximately 4.3 Mtoe, most of which biomass, yet over the last decade only 3 MW of non-hydro renewable energy has been added to the national capacity grid. Since the transition period Serbian policy has led to further fossil fuel lock-in and dedication to it's national resource; lignite of exceptionally low quality. The strategy for the development of the energy sector in Serbia until 2015 clearly favours the interests of state utility company EPS which has close personal connections between ruling political parties and a monopoly on power production as well as lignite coal mining.
Essential to the current state of the energy sector has been Serbia's traditional approach of combining social & energy policy. In part due to the state of the economy and significant levels of poverty and unemployment, policy has been to keep energy prices low (often below production price), and the energy market closed and public. This led to few (private-sector) investments in the energy sector, high debts in district heating systems, high energy intensity and emissions, inefficient (and fraudulent) state companies, expensive fossil fuel imports, and undisclosed energy pricing (leading to dubious energy trading practises).
After the Yugoslav wars, the first priority regarding the Serbian energy sector was security of supply. IFIs & bi-/multilateral organisations helped set up transmission lines, repair (thermal) power plants, and increase capacity. For years renewable energy or climate action was of little importance to Serbia and the ratifying of Kyoto was delayed. Due to this Serbia missed out on a lot of CDM credits. Even after the ratification of Kyoto, passive resistance towards renewable energy other than (large) hydropower remained. A mixture of a lack of finances, little foreign direct investment, a closed energy market and cheap local lignite resources - which are all related to the low energy prices (and, in-turn, because of the mixture of social & energy policy) - as well as the influence of energy traders, delays in grid-connection, a lack of capacity, (dubious) political motives and incompetence can be named as possible reasons for the passive resistance towards renewable energy in Serbia. Slow and politically motivated infrastructure developments and insufficient transmission capacities became apparent through expert interviews; as was shown, most hydro potential is to the south-west of Belgrade towards Republika Srpska (in Bosnia and Herzegovina), and wind power potential is to the north-east of Belgrade towards Romania whom is trying, through the Energy Community, to push for an expansion of the transmission capacity through Serbia to export energy. As Serbian political relations are historically strong with Republika Srpska, Serbia shall focus the expansion of transmission capacity towards the west (towards Republica Srpska) which consequently favours hydropower and hinders wind power. The eastern transmission capacities are running on maximum capacity and a grid connection of wind power to these lines will hinder Romania's export, raise energy prices, interfere with grid stability, and due to all these reasons - frustrate powerful energy traders.
IFIs, due to being largely limited to providing government-backed loans, have little influence on Serbian policy regarding the (renewable) energy sector, and are thus actively funding the

policy of the Serbian government which has been steering IFIs to the funding of open-pit lignite mines and the desulphurisation/overhauling of thermal power plants. This whilst, to the frustration of Serbian energy experts and supposedly due to a lack of funding, a large hydropower potential has been sold to Italy, including the full rights of renewable energy capacity for the purposes of international obligations as all electrical power shall be directly exported to Italy via an under-construction marine transmission-line.
Much is expected of the full liberalisation of the electrical power market in 2015 which could be a turning point for renewable energy in Serbia. Competition could develop on the Serbian energy market and prices will increase to realistic (production cost) levels which will lead to a lower energy intensity, and more financially viable abatement and renewable energy investments from both domestic as well as industrial energy consumers. The move could also lead to more transparency on the energy market, and academics are already underway to make detailed (yet still semi-confidential) energy models for policy makers to make scenario predictions.
Private-sector renewable energy project developers are subjected to several barriers in Serbia; financial, legislative, political and operational. Whilst legislative idiosyncrasies exist in all fields of Serbia's legal framework and receive abundant international attention in the form of bi-/multilateral technical assistance in an attempt to streamline processes, the financial and operational barriers are related to the main reverse salient - the political barrier, which is steered by dubious and inefficient economic motives. Contrary to IFIs, the UNFCCC, EU & Energy Community, through the international (macro) landscape, can influence the political (meso) landscape of Serbia. This is a limited influence, however; as the organisations in the macro landscape lack funding to help Serbia reach goals means that the Serbian government can feel pressured but not necessarily helped. It was seen that IFIs, whilst providing funds, lack the influence to steer Serbian policy as most funds are in the form of concessional loans which have to be backed by the government and are thus steered by government policy. The NMM, through direct negotiations between the UNFCCC and the Serbian government, has the opportunity to implement tailored policy influences and have a more direct impact on the (meso) landscape which private-sector investors in renewable energy sector have to operate in **as well as providing critical funds** for financing said policy. Policy could for instance impose a more serious FiT, which can currently be seen as no more than a method for the Serbian government to limit support to cheaper hydropower whilst appearing as being enabling towards renewable energy in general. The NMM could also be a way to set up a system which bypasses national authorities whose unreliabilities such as a complete bureaucratic paralysis lasting for up to 8 months of important sectors during a change of government have grave impacts on the investment environment for developers. The UNFCCC's other tool in the making; NAMAs, might not be as effective in reaching the climate goals of the UNFCCC as could be thought; the Serbian government's dedication to reaching climate goals with lignite became apparent when it submitted 12 NAMAs to the UNFCCC, the most NAMAs of all nations, of which 5 involve (fossil fuel) powered projects and only 3 are focusses on renewable energy technologies. The NMM could capitalise private-sector investments by putting an international body (through the negotiations) on top of policy, this body could run independent policy analysis and come with powerful new plans to boost private-sector investment, taking into account the demands of private-sector investors as well.
The CDM, considered complex, risky, and cumbersome, has not been successful in Serbia. Typical CDM issues such as additionality, high transaction costs and the related indirect effects, as well as the collapse of the carbon price have led to troubled renewable energy projects.

The EU imposed that as of 2013, countries under the EU ETS, the largest creator of demand for CERs, can only acquire CERs for compliance from an LDC, and Serbia does not qualify as a LDC. Apart from the NMM, regional CO_2 prices in Serbia could be inevitable as eventually, with a future EU membership, Serbia will become a part of the EU ETS. Under the NIPAC approved IPA 2012 programme (as well as the to-be approved 2013 IPA programme), in the scope of the section "Strengthening system of Environment Protection and Climate Change", the measure called "Creation of a MRV system for the successful implementation of the EU ETS" will be prepared for implementation and is meant to ready Serbia for an ETS. The NMM could be used as a stepping stone towards an ETS, if a penalty (trading) system is chosen. Once Serbia is part of the EU ETS, regional carbon prices will have to be synchronised to avoid unfair competition, leading to even higher energy prices in Serbia and thus more investments in renewable energy technologies as the financial feasibility of renewables increase. The EU ETS is-, much like the carbon price, going through turmoil at the moment so it is impossible to make concrete predictions on the direct effects of Serbia joining the EU ETS, but the effects of the possible implementation of the NMM could be related through the carbon price. Disregarding the carbon price the NMM, in the case of Serbia - and combined with the planned liberalisation of the energy market by 2015 (and therefore higher electricity prices), could be game changing for private-sector investors in renewable energy.

6

Nicaragua

Figure 6-1: Nicaragua in green (source: author, map data from wikimedia)

6-1 Brief overview

Nicaragua, a Central American country with a steadily growing[1] population of around 5.9 million[2] is the poorest and least developed country in Central America and the second poorest in the western Hemisphere, with widespread un(der)employment and more than 40% of the population living below the poverty line. Nicaragua also has the region's lowest electrification rate of just 65%[3] (just 32% of the rural population) which could possibly rise to 85% in 2014 due to the government's Sustainable Electrification and Renewable Energy National Program

[1] 1,067% annually - CIA Factbook 2011
[2] July 2011 estimate - CIA Factbook 2011
[3] in 2010

(PNESER) grid extension and renewable energy program, as well as the National Rural Electrification Plan (PLANER) plan (IADB, 2010). Nicaragua is located entirely between the latitudes of the Tropic of Cancer and the Tropic of Capricorn and is therefore affected by a dry/rain season pattern, with temperatures averaging between 20 and 24 degrees Celsius throughout the year.

Augusto César Sandino led the Nicaraguan resistance against United States (US) intervention[4] of Nicaragua throughout the 1930s. The current ruling party Sandinista National Liberation Front (FSLN), led by Daniel Ortega, are labelled as having *Sandinista* political views. Throughout the 1980s the Sandinistas of FSLN, condemned by the US as supporting Marxist revolutionary movements together with Cuba, were at war with the *Contras*[5], backed by the US. US public support of the Contras didn't slow until after 1987 when US citizen Benjamin Linder, a mechanical engineer who remains in the name of Nicaraguan leading hydropower NGO Association of Rural Development Workers - Benjamin Linder (ATDER-BL), was shot by Contras whilst working on a weir site to bring electricity to off-grid rural villages in the mountainous areas of northern Nicaragua (ATDER-BL, 2008). In 1990 the first woman in the Americas, Violeta Chamorro (who represented a basket of opposition parties), was elected as president by popular vote and peace came to Nicaragua. In 2006 Daniel Ortega's FSLN won the elections again, yet the November 2008 municipal elections were scarred by allegations of fraud on the part of the FSLN. Because of these allegations the FSLN government has lost budget- and bi-/multilateral support of several countries.

Immediately upon beginning his term as president in January 2007, President Ortega signed Nicaragua onto the Bolivarian Alliance for the Americas (ALBA) treaty. ALBA is an alliance between Latin American and Caribbean countries[6], and states itself as having the goal of joining the capacities and strengths of Latin American and Caribbean countries to produce structural transformations, and the relations system necessary to achieve integral development (ALBA-TCP, 2010). The signing of ALBA has had a great impact on the Nicaraguan energy sector, as shall be discussed in section 6-2-2-1 on page 94.

6-2 Evaluation Criteria

6-2-1 Energy

As was the case in the previous chapter of Serbia, the first evaluation criteria shall analyse Nicaragua's (renewable) energy sector.

6-2-1-1 Reliability of the grid

As was mentioned, Nicaragua has the region's lowest electrification rate of just 65%[7] (including a mere 32% of the rural population). The Atlantic coast with its rough terrain and

[4] with the intention of preventing the construction of the Nicaraguan Canal by any nation but the US

[5] *Contrarrevolucionarios* in Spanish

[6] Nicaragua, Venezuela, Cuba, Bolivia, Commonwealth of Dominica, Antigua and Barbuda, Ecuador, Saint Vincent and the Grenadines (ALBA-TCP, 2010)

[7] in 2010

isolated villages, as can be seen in Figure 6-2, has the lowest electrification rate, followed by the mountainous central departments. The Nicaraguan government remains committed[8] to increase the electrification rate, and could already reach 85% by 2014, 90% by 2020 (GTR, 2012) and 95% by 2024 according to the newest PLANER 2014-2024 rural grid extension plan (IADB, 2010). International Financial Institutions (IFIs) or bilateral cooperations typically finance grid extension projects if the grid extension is for currently isolated communities further than 20 km from the national grid, yet even in the more developed regions such as around Estelí, villages and communities exist which are less than 3 km from the grid yet remain without power (van Duinen and Negenman, 2012).

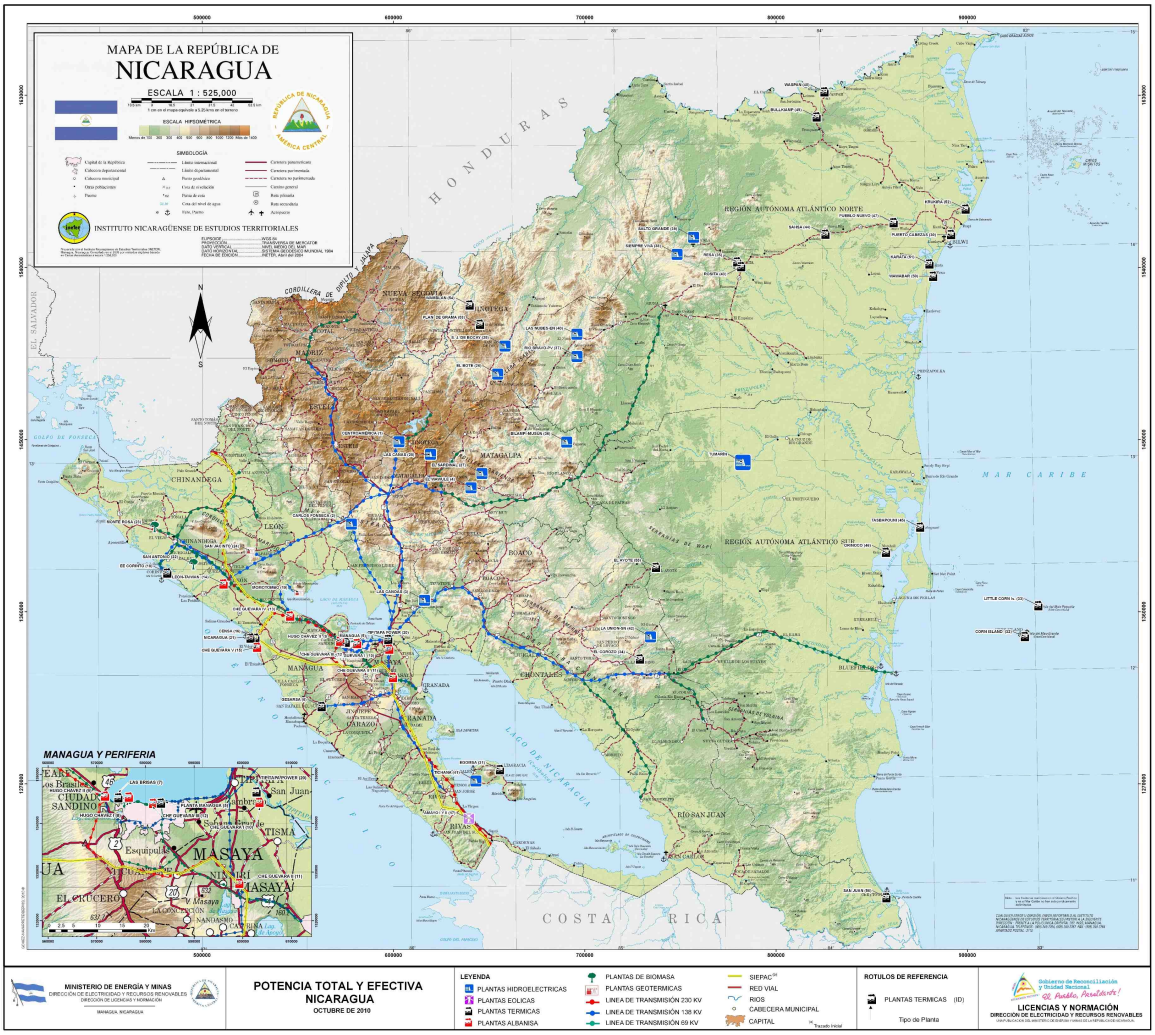


Figure 6-2: Transmission and power plants map of Nicaragua 2010 (source: INE)

The Nicaraguan grid remains infamously unreliable, with frequent blackouts and fluctuations which can damage sensitive electronics. Wealthy businesses or home owners typically own

[8]Previous PLANER plans have expanded the rural electrification of roughly 700,000 people in 3,600 communities, normalised households that currently have illegal electricity connections, installed 214 KM of new transmission lines for renewable energy sources such as wind and geothermal power, and installed 2 million efficient bulbs in the residential sector (IADB, 2010)

their own back-up generator or solar systems with energy storage as protection against grid failures. Nicaragua also has the region's lowest electricity generation and installed capacity. A large percentage of 25.4%[9] is lost during transmission & distribution, of which approximately 70% is non-technical mostly due to illegal connections, theft or insufficient capacity to collect energy bills. In November 2000 during the *privatisation spree* of the governments between 1990 & 2006, a controlling share in the distribution company Dissur/Disnorte was purchased by Unión Fenosa, a Spanish company. Since the takeover Dissur/Disnorte has operated at average annual losses of around US$ 50 million[10] partly due the significant amount of consumption for which the energy distribution industry is not reimbursed (Wood, 2005). This of course contributes to the high costs[11] of electricity in Nicaragua, which are also the highest in the region.

6-2-1-2 State of the energy sector

The electrical energy sector of Nicaragua is a dynamic and continuously evolving sector which has gone through revolutionary changes in the last decade. As seen in table 6-1, the latest 2012 data of the Nicaraguan Energy Institute (INE) show an installed electrical capacity of renewable energy sources of around 42.7%, yet this has obviously not taken into account the 44 MW of extra wind power capacity which was grid-connected in May 2013 (Rogers, 2013) nor the 1.38 MW solar farm which was grid connected in February 2013 (Agencia EFE, 2013). In 2014 another 40 MW of wind power shall be added to the grid, followed by the 253 MW Tumarín hydropower plant which is expected to start producing renewable energy as of 2016 (Nicaraguan Dispatch, 2012). The Plan Estratégico del Sector Energético 2007-2017 (Ministry of Energy and Mines (MEM)) states that between 95.2 and 98.1 % of the estimated electricity demand should come from renewable sources by 2017 (Dolezal et al., 2013), a remarkable achievement yet Nicaragua is well on its way of reaching this threshold. This extra capacity, if combined, is roughly equal to half of all currently installed thermal power plants' capacity, and the traditionally high capacity factor of hydropower will lead to a higher share of renewable energy generation as well. The recent quick pace of development in the electrical power sector becomes apparent when compared to the meagre 142 MW which was added to the national grid between 1996 and 2006 (REEEP, 2012).

The majority of residential energy consumption[12] is provided by biofuels, mostly in the form of unsustainable fuel wood burning for cooking. There are no reliable numbers as to how much energy precisely is consumed and how much fuel wood comes from unsustainable resources, yet currently 50% of the country is covered by forests with an annual depreciation of forests of around 1.3% for industrial and agricultural reasons with the majority of the wood ending up as fuel wood (RA, 2013). Total annual energy consumption of Nicaragua is estimated to be around 1.7 million tonnes of oil equivalent (Mtoe), the majority of which therefore being fuel wood consumption (IEA, 2012b). One of the reasons for the choice of fuel wood for cooking is not only the low cost (most urban houses typically also have gas bottles for gas cooking) is the typical Nicaraguan dish[13] *gallo pinto*, the *frijoles* (black beans) of which need to cook

[9] 2010, World Bank (WB)
[10] (Rogers, 2013)
[11] as can be seen in table 6-5
[12] estimates differ greatly; approximately 90% of total energy consumption
[13] in some places eaten for breakfast, lunch & dinner

Table 6-1: Installed electric generation capacity by source in Nicaragua in 2012 (INE, 2013a)

Source	**Capacity** (MW)	**Percentage**
Hydro[a]	105.70	8.2%
Solar	Unknown[b]	-
Geothermal	164.50	12.8%
Wind	145.73[c]	11.3%
Thermal power[d] (diesel & fuel oil)	736.21	57.3%
Thermal power (biomass[e])	133.80	10.4%
Total	1,285.93	

[a]including 0.4 MW off-grid hydro capacity

[b]an unknown number of off-grid solar home systems exist in Nicaragua, mostly on rural schools or on the houses of more wealthy home owners, yet as of February 2013 the country's first solar farm was completed with a capacity of 1.38 MW (Agencia EFE, 2013)

[c]this does not include the 44 MW of extra wind power capacity which was grid-connected in May 2013 (Rogers, 2013)

[d]including 18.71 MW off-grid thermal power capacity

[e]mostly in the form of sugarcane bagasse

for hours making natural gas a particularly expensive choice.

The biomass electrical power capacity is mostly in the form of sugarcane bagasse as the wastes of two sugar cane mills in the country[14] are burnt for energy. Waste management is a problem in many Nicaraguan municipalities and yet whilst energy production from waste (so called *waste-to-energy* was uncommon only last year (van Duinen and Negenman, 2012) plans are being taken to use waste[15] for electrical energy production in up to 12 municipalities at 2 to 4 MW each (Belsey Priebe, 2013). Small scale biodigestors are uncommon, yet they could be used to generate biogas from biological wastes. Whilst this biogas could be used for cooking as well, a problem could be the duration of required cooking for national dishes.

Aside from the several micro-, mini- and pico- hydro plants and turbines around the country, two larger public (privatisation of the state-owned company Hidrogesa failed due to legislative problems at the time of privatisation) hydro plants are responsible for the highest share of hydropower in the country's renewable energy electrical capacity; the Centroamerica & Santa Barbara hydro plants of 50 MW each. Several large and small[16] hydroelectric projects are in the process of being developed due to the high quality of Nicaragua's hydropower potential, including the 253 MW Tumarín hydro project which is expected to be completed in 2016 (Nicaraguan Dispatch, 2012). Several small hydro plants are operational in Nicaragua as seen in Figure 6-2 but dozens of micro and mini hydro plants, including ones used solely for (coffee) grinding, are not registered.

Law 443 of 2002, the Geothermal Resource Development Exploration Law[17] kick-started the exploring of geothermal resources and the development of geothermal projects. The high energy yield & capacity factor of geothermal power plants combined with the high

[14]the Ingenio San Antonio & Ingenio Monte Rosa sugar cane mills

[15]from general trash

[16]30 small scale hydro plants (REEEP, 2012)

[17]Ley de Exploracion y Explotación de Recursos Geotérmicos

Table 6-2: Gross electrical energy generation by source in Nicaragua in 2012 (INE, 2013b)

Source	Consumption (GWh/ktoe[a])	Percentage
Hydro[b]	418/35.9	10.4%
Solar	Unknown[c]	-
Geothermal	523/45.0	13.0%
Wind	329/28.3	8.2%
Thermal power[d] (diesel & fuel oil)	2,295/197.3	57.1%
Thermal power (biomass[e])	453/39.0	11.3%
Total	4,021/345.7	

[a] kilo-tonnes of oil equivalent
[b] including 1.46 GWh off-grid hydro
[c] an unknown number of off-grid solar home systems exist in Nicaragua, mostly on rural schools or on the houses of more wealthy home owners, yet as of February 2013 the country's first solar farm was completed with an expected generation of 1.98 GWh (Agencia EFE, 2013)
[d] including 46.7 GWh off-grid thermal power
[e] mostly in the form of sugarcane bagasse

economically viable potential of 0.8 to 1.2 GW[18] in Nicaragua make it an excellent renewable energy source. Geothermal power is currently being explored in the volcanic regions around Managua and Ometepe with bilateral (Icelandic and Canadian) technical support. Canadian companies Polaris Geothermal and Alterra Power have worked together on the now active plants of San Jacinto and Tizate to push the capacity of the plants up to 72 MW through renovation and expansion projects.

Though small scale solar home systems or individual solar panels are frequently found around Nicaragua, the country only since recently boasts a 1.38 MW photovoltaic solar farm (Agencia EFE, 2013). Though worries exist of the solar farm's generating capacity during the rainy season, the further potential of large scale photovoltaic solar farms is being investigated by renewable energy developers. The total potential of this renewable energy resource in Nicaragua is currently undetermined.

The current installed wind power capacity is equal to 189 MW, and a further 40 MW is expected to be grid connected in 2014 (Nicaraguan Dispatch, 2012). The prevalently windy southwestern region called Rivas, close to the Costa Rican border and around the largest lake of Nicaragua, offers the most wind potential. The Amayo project, Central America's largest wind park at 63 MW[19] is located here; a total of 30 2.1 MW type S88 windturbines from Suzlon Wind Energy (India). Danish Vestas signed a 39.6 MW contract for a wind farm at La Fé, San Martin in September 2011 and another 39.6 MW (22 V100 1.8 MW turbines) contract (also for Rivas) was signed in June 2012. In April 2012 Globeleq Mesoamerica Energy Limited (GME Wind, the subsidiary of Globeleq) purchased 100% of the interest in the Eolo de Nicaragua S.A. wind project. The project will create 44 MW of electricity through the use of 22 2 MW Gamesa G90 wind turbines which will be sold to the distribution companies DISSUR and DISNORTE. The mountainous central regions of Nicaragua also have a wind power potential; Estelí's previous mayor, Pedro Pablo Calderón, proposed a US$ 28 million wind power project in Estelí in 2007, however this project never took off and little is known

[18] (Mostert, 2007)
[19] with a high capacity factor of 40%

of the location or build-up of the wind park that was being planned at the time.

6-2-1-3 Off-grid electrical power

Off-grid communities which do not immediately qualify for grid connection are often so economically underdeveloped that at most government support is limited to the empowering of schools or public buildings such as churches via solar photovoltaic systems. It is not an uncommon practise that the energy storage of solar systems (mostly lead-acid batteries) fails just a few years after installation rendering the system useless (van Duinen and Negenman, 2012). Some communities, particularly in the centrally located mountainous regions, opt to (micro/small) hydropower to provide off-grid power. In Nicaragua, most micro hydropower sites are of high-head[20] with relatively low flow rates. Since Nicaragua is located entirely in the tropics it is subject to a dry/rainy season type of climate with river flow rates approximately 6 to 10 times lower during the driest months of March of April at the end of the dry season, meaning that water is scarce in the dry season. This means that low flow rate sites are preferred since, when combined with higher head, the system can tap an equal amount of potential energy for the turbine to benefit from whilst 'saving' water. Furthermore, higher-head turbines such as the Pelton, Turgo or Francis turbines are more efficient than low head turbines such as the Archimedes or hydraulic wheel turbine (for lower head applications). Moreover, the higher head (higher velocity) Pelton and Turgo impulse turbines are lighter and cheaper to make; in the case of the Pelton turbine it is even possible to make the runners in a local workshop[21] with relatively little specialised tools (importing cast-brass paddles, commonly from Peru). When designing micro hydropower systems in the tropics for off-grid locations in most cases a dam site with water storage has to be incorporated in the design to provide sufficient power during the dry season. Even then nearly all off-grid hydro plants in Nicaragua have problems covering electric demand during the dry season; the majority of micro hydropower systems will not have much more than a daily reservoir and in any case will not be running all day during the dry season. The solution is to operate the plant for a limited amount of time daily to allow it to build a water reserve. Community members need to get together and reach an agreement as to which hours of the day that they want to operate the plant; decisions which vary from one community to another. During the time when the plant is shut down water can accumulate in the reservoir so that it may be available for use when the plant is switched on, usually during peak demand hours from 6 pm - 9 pm when lighting requirements can be met and refrigerators can run for a sufficient amount of time to keep food from spoiling (van Duinen and Negenman, 2012).

Small-/micro hydropower has the potential of being approximately 6 to 7 times cheaper as an off-grid energy solution compared to solar home systems or small-/micro wind turbines, the main reason being the simplicity (and thus economic effectivity) of storage. Still, in many cases where small-/micro hydropower systems are introduced to a community, some communities could be so spread that it would not make financial sense to extend gridlines to a single house on the other side of a small hill (for example). Small-/micro hydropower developers will not get financing if the transmission lines do not abide to safety and quality standards (it is not a solution to simply run a cable over the ground to the house in question) and therefore running lines to isolated houses is relatively expensive. In these situations the

[20] the height difference between the power generator/turbine and the start of the penstock at the dam site
[21] ATDER-BL assembles its own turbine runners in El Cua

solution is to install a solar home system to such isolated houses, which sometimes leads to communal unrest[22] even though the costs are often roughly equal for all households.

6-2-1-4 Renewable energy potential

The estimated electrical renewable energy potential of Nicaragua, though and widely differing and thus somewhat unreliable, typically has a capacity around 3 to 4 times higher than the current installed capacity. This not only gives Nicaragua the opportunity to provide power for future demand, it also potentially puts the country in an excellent position to export its energy through the new Central American Electrical Interconnection System (SIEPAC) project[23]. The Plan Estratégico del Sector Energético 2007-2017 (MEM) states that a total of 4,500 MW of renewable energy capacity needs to be identified.

Table 6-3: Renewable energy potential in the electrical power sector of Nicaragua

Source	Potential (MW)
Hydro	1,700[a]-2,000[b]
Solar	Undetermined
Geothermal	852[c]-1,200[d]
Wind	200[e]
Biomass	100[f]-800[g]
Total	3,000[h]-4,200[i]

[a](Mostert, 2007)
[b](ProNicaragua, 2011)
[c](ProNicaragua, 2011)
[d](Mostert, 2007)
[e](Mostert, 2007), as can be seen the currently installed capacity of wind power is 189 MW, and in 2014 another 40 MW shall be added thus also this data is inaccurate
[f](Mostert, 2007)
[g](ProNicaragua, 2011)
[h](Mostert, 2007)
[i](ProNicaragua, 2011)

As mentioned, the scope of Nicaragua's renewable energy potential is largely unknown (Dolezal and Ochs, 2012) and reports or published data often contradict each other. Regarding Nicaragua's hydro potential, there is little to no data on flow rates of even its main rivers, and data which is available dates back to the 80's and is no longer relevant. Flow duration curves[24] are often set up using manual methods using ageing maps once drawn by hand using aerial photographs; often google earth data & images are more reliable. Potential hydro sites,

[22]Unlike inhabitants receiving electricity from the hydro plant, homeowners with a solar home system will not have to pay a fee per kWh of electricity usage as it is their own system. This can create confusion as hydro users will perceive it as unfair, not realising that the solar home users have to pay for the replacement of their storage batteries, and not taking into consideration that solar users might not be able to afford or save enough for the battery replacement rendering the system useless just years after instalment.

[23]more on this in section 6-2-1-5

[24]necessary for determining the potential, capacity factor as well as the seasonal spread of energy yields of hydro plants

particularly smaller (off-grid) sites, need participation of local inhabitants to estimate flow rates throughout the year (van Duinen and Negenman, 2012).

Nicaragua's second largest renewable energy potential is geothermal power. Bilateral technical assistance has helped Nicaragua with the exploration of the potential of geothermal locations throughout the volcanic regions of the country. Whilst initial reports on the country's wind energy potential indicate a potential of around 200 MW[25], the currently installed capacity of wind power is 189 MW, and in 2014 another 40 MW shall be added totalling 229 MW, the true potential is therefore being underestimated. The potential of biomass certainly seems underestimated. Not only is there a high potential in rural areas in the form of biodigestors, only now are plans for *dedicated*[26] biomass power plants taking off. ViaSpace is a company currently negotiating a Power Purchase Agreement (PPA) for the implementation of a 12 MW biomass power plant burning locally grown *Giant King Grass* on 740 hectares of land. The Giant King Grass, similar to other biomass resources such as eucalyptus plants[27], could also complement sugarcane bagasse as a fuel for existing power plants connected to sugar mills to extend their season and produce more electricity whilst providing several economic and societal benefits as shall be discussed in section 6-2-2-5 on page 99.

The possibilities of solar thermal applications, particularly the social embedded benefits and inclusiveness of future potential business in Nicaragua, could be of significant proportions in Nicaragua. Solar cookers, dryers, and stills are systems that provide various benefits while being easy to construct offering several entrepreneurial opportunities. As the country develops it is expected that, much like its developed southern neighbour Costa Rica, Nicaraguans will want warm (shower) water in their houses. The cheap and easy solution is often to use electric shower heads, which normally have a rated capacity of around 4-5 kW each. These shower heads, though much cheaper than a passive thermosiphon system which can easily be installed on most Nicaraguan houses and provide a relatively reliable source of warm water even for morning showers, are often more expensive on the long run due to high electricity prices and payback times of slightly more than 3 years[28] in the case of imported thermosiphon systems. Passive thermosiphon systems are inherently simple and easy to fabricate, maintain & instal; solar thermal technologies therefore allows for scaling by including local universities (in the design phase), local production facilities and installation & maintenance companies and thus increase activities at the bottom of the economic pyramid. Solar thermal energy in the form of solar cookers and dryers can benefit the lives of rural families and plantation owners and help improve the profit margins of local businesses such as farms or coffee producers, and solar stills can provide additional revenues or clean water to the most isolated villages[29].

6-2-1-5 Infrastructure

The Nicaraguan grid, as seen in Figure 6-2, does not reach much of the eastern parts of the country. The transmission lines which pass to the east are transmission lines of lower voltage (97 kV) and thus less efficient and less capable of transmitting large capacities. The 253 MW Tumarín hydro project, in the middle between two distant 97 kV transmission lines,

[25] (Mostert, 2007)
[26] as opposed to the bagasse situation, where waste is burnt partially to get rid of a waste problem
[27] (van den Broek et al., 1998)
[28] for a detailed calculation please see (van Duinen and Negenman, 2012)
[29] most rural villages in Nicaragua have access to clean drinking water

will thus require new higher capacity transmission lines in order to provide for 20-25% of the country's electrical energy needs once complete. An 81 km 230 kV transmission line will be built, funded by the Nicaraguan government, as well as 50 km of roads (Petrova, 2011).

Figure 6-3: Route of the SIEPAC grid (source: (EPR, 2013))

As previously mentioned, the PNESER program has been working to expand rural electrification to 117,000 new users (702,000 persons) in 3,666 communities, as well as *normalise* 164,000 households (984,000 persons) that currently have illegal electricity connections. Part of the program is to install 214 KM of new transmission lines for renewable sources of energy such as wind-, hydro- and geothermal power as well as support the installation of 2 million efficient bulbs in residential sector[30] as part of a national energy efficiency program (IADB, 2010).

SIEPAC, a Central American project wishing to connect the power grids of six Central American countries (Panama, Costa Rica, Honduras, Nicaragua, El Salvador and Guatemala), originally had the intention of reducing power shortages in the region, reducing operating costs, and optimising shared use of renewable energy technologies, as well as creating a competitive market in the region and thus attract Foreign Direct Investment (FDI). Project development started in 1998, and completion has been predicted in 2003, 2006, 2011, 2013 and now 2014, creating uncertainty about when it will actually be completed[31]. The 1,800 km, 300 MW and 230 kV transmission lines will run from Guatemala to Panama, as can be seen in Figure 6-3 (EPR, 2013). The latest developments are the exploration of options to integrate Belize, Colombia and Mexico into SIEPAC, as well as creating a streamlined renewable energy development and integration plan for the region via Central America's Regional Electricity Market (MER). There are also plans to increase the capacity to from 300 to 600 MW (Dolezal et al., 2013). Policy makers of all SIEPAC countries are debating whether to

[30] and 20,000 in the public sector

[31] the cause of delays could be related to the 7,000 right of way permits required to build the transmission lines (BNA, 2013)

apply a regional tariff mechanism and promote the implementation of a regulatory framework to permit transactions through fixed contracts and transmission rights schemes by the end of 2014 (BNA, 2013). SIEPAC will offer the opportunity for Nicaragua to export renewable energy over-capacities via Central America's MER, but it is unclear whether that is compatible with current political beliefs (this will be discussed in section 6-2-3 on page 101).

6-2-1-6 Energy independence

The recent state of the Nicaraguan energy sector, heavily dependent on oil imports, has put Nicaragua in a very dependent position - not just on Venezuelan oil (and thus Venezuelan politics due to the ALBA construction - more on this in section 6-2-2-1) but mostly the international price of oil. The 2012 International Monetary Fund (IMF) Article IV consultation's near-term prospects and risks section states[32]:

> *Output growth is projected to moderate in 2012 as the global economy remains weak. Oil price increases are significant risks to the near-term outlook given Nicaragua's large oil import bill. Tax revenue collections are expected to remain strong but expenditure pressures are building up. Key fiscal risks for 2012 are higher electricity subsidies[33] and other increases in current expenditures, including the absorption of the wage bonus (granted since 2010) into the wage bill.*

Throughout 2006, Nicaragua paid 65% of the value of its exports to import oil and other petroleum derivatives (REEEP, 2012). Due to higher Nicaraguan exports this level has dropped to 38% in 2008, and 24% in 2010[34] yet insecurities remain high. As seen in table 6-4 oil imports (in US$) are expected to continue to rise, yet in 2013 Nicaragua is expected to import almost two million fewer barrels of oil from Venezuela, at a saving of US$ 200 million (García, 2013).

As seen in table 6-4 electrical energy exports really took off in 2010, whilst imports declined steadily up until that year. It is noteworthy to see that, whilst oil imports remained high, electrical energy exports are equal to roughly 2% of oil powered electrical energy production in 2010.

6-2-1-7 Technology transfer

Whilst technology transfer has been a key driver in the development of geothermal power, wind power & photovoltaics in Nicaragua, smaller hydropower turbines have been assembled in Nicaragua for quite some time. Particularly the higher head (and thus higher velocity) Pelton and Turgo impulse turbines are cheap and easy to make, in the case of the Pelton turbine it is even able to make the runners in a workshop with relatively little specialised tools[35]. ATDER-BL is currently Nicaragua's main hydropower specialist, and the main local

[32] (IMF, 2012a)
[33] more on the ALBA energy subsidies in section 6-2-2-1 on page 94
[34] (IMF, 2012a)
[35] importing cast-brass paddles, commonly from Peru

Table 6-4: Electrical energy imports & exports in GWh and oil imports in million US$ for Nicaragua from 2006 to 2012

	2006	2007	2008	2009	2010	2011	2012
Electricity imports (GWh)[a]	53.32	63.95	28.20	1.69	10.25	9.93	20.02
Eectricity exports (GWh)[b]	0.07	0.00	0.03	1.50	43.29	40.56	3.19
Oil imports (million US$)	666[c]	777[d]	963[e]	676[f]	751[g]	1,216[h]	1,332[i]

[a](INE, 2013e)
[b](INE, 2013e)
[c]CIA World Factbook
[d]CIA World Factbook
[e](IMF, 2012a)
[f](IMF, 2012a)
[g](IMF, 2012a)
[h]estimated - (IMF, 2012a)
[i]projected - (IMF, 2012a)

manufacturer of hydropower machinery equipment such as turbines, sluice gates and grillage[36]. ATDER-BL's mechanical shop in El Cua employs five multidisciplinary people working as machinists, welders and electricians amongst others. ATDER-BL uses its own Pelton turbines for all their own projects, and sells runners for other projects in Nicaragua. There is insufficient capacity, however, to provide for all of the demand for (small/micro) hydropower turbines in Nicaragua, thus the MEM has already opted to importing equipment at higher prices from countries such as Bolivia and Peru. For smaller projects the generators are often second-hand donated generators, whilst for larger projects generally new generators are used.

6-2-1-8 Environmental impact

As previously mentioned, the overwhelmingly rural Nicaraguan population depends on wood for cooking, which over the course of several decades has led to deforestation and bare hillsides. This can ultimately lead to increased erosion, loss of soil fertility and dangerous landslides in the rain season. Indirectly this also poses as a barrier to small-/micro hydropower plants in rural areas, as it is not uncommon for off-grid projects to not be implemented as the position of the powerhouse, which will always be at a location of lowest relative altitude (and thus often between hillsides next to a river), is at too high risk of at some point being affected by mudslides. Often community members are educated about the dangers of mudslides, particularly if there is a risk of a powerhouse getting damaged. Soil erosion also poses severe constraints on the future development of Nicaragua as Nicaragua's primary exports are agricultural (Wood, 2005). 9% of the country's agricultural production is estimated of being lost due to climate impacts (Belsey Priebe, 2013).

Diesel or fuel-oil use have environmental impacts on communities close to the generator set. Caribbean islands such a Corn Island & Little Corn Island have stringent environmental rules as even road-going vehicles are kept away from the islands (RCALVET, 2010), yet the 3.56 kW of diesel generators offset much of this environmentally friendly policy (Jargstorf, 2008) and

[36]ATDER-BL also produces Ram pumps which are used to pump water and irrigate land at higher elevations *passively* using hydrokinetic energy

renewable alternatives are being researched. With regards to biomass in Nicaragua, current capacity is sustainable as biofuels come from wastes of the sugar industry, and planned large-scale applications such as the use of Giant King Grass will use land previously not used for agriculture.

6-2-2 Economic

The next section will cover the economic evaluation of the (renewable) energy sector of Nicaragua.

6-2-2-1 ALBA & ALBANISA

Political issues play a decisive role in the economics of the energy sector in Nicaragua, most notable is the ALBA Energy Agreement[37] which was the result of Daniel Ortega pushing for Nicaragua to be part of ALBA right after taking office for his second presidential term in 2007. ALBA is an alliance between some Latin American and Caribbean countries; Venezuela, Cuba, Bolivia, the Commonwealth of Dominica, Antigua and Barbuda, Ecuador, Saint Vincent and the Grenadines. ALBA seeks to promote solidarity and emphasise social welfare policies rather than competitive capitalist agreements or strong interaction with the US - even though Nicaragua has simultaneous membership in the United States free-trade agreement with Central America and the Dominican Republic (CAFTA-DR)[38] (Rogers, 2011). In the case of Nicaragua, joining ALBA meant the creation of the private company ALBA Nicaragua S.A. (ALBANISA) which is owned jointly by Venezuela's state-owned oil enterprise PVDSA (with a 51% stake), and PETRONIC (with a 49% stake); a semi-private Nicaraguan petroleum conglomerate. The purpose of the creation of ALBANISA was to manage the investment funds which were expected to be received through ALBA. This was quickly followed by Venezuelan oil transfers to Nicaragua and the signing of the ALBA Energy Agreement (Riley, 2010).

The direct effects of the ALBA Energy Agreement for ordinary Nicaraguans can be seen in the form of a subsidy on the electricity bill of any Nicaraguan who has an electrical energy consumption less than 150 kWh per month (generally 80% of Nicaraguan residential electrical energy consumers receive this subsidy (INE, 2009)). For Nicaraguans this subsidy means a drastic lowering of their electricity costs as the ALBA subsidy can cut the total bill up to an approximate amount of 63%[39]. The money for this subsidy is created by the participation of ALBANISA in ALBA's oil cooperation model, in the form of concessional *oil loans* and through additional soft loans via Venezuela's development bank BANDES. The way this works is that ALBANISA pays 100% of oil imports from Venezuela[40] of which 50% goes to PDVSA; Venezuela's state-owned oil enterprise. The remaining 50% is transferred to a (private) financial credit cooperative - in the form of long-term loans[41] of which 40% is sent to the social fund which makes electricity subsidies available amongst other subsidies and micro credits, and the remaining 60% returns to PDVSA to be used for purposes approved by Venezuela (IMF, 2012b). Due to the fact that in 2012 the Nicaraguan government borrowed US$ 107 million from ALBA just to keep energy prices low, with a further US$ 52 million in 2013, financial experts[42] do not expect any short-term reductions in the electrical energy

[37] signed at Tinotorero, Venezuela April 28 & 29, 2007 (ALBA-TCP, 2010)
[38] which was initially blocked by the Sandinistas as a call against *evil* and *savage* capitalism (Rogers, 2011)
[39] more on this in section 6-2-2-3 on page 96
[40] with a 90 day delay
[41] 25 years with a two year grace period
[42] including David Castillo - chairman of the Nicaraguan Institute of Energy

price as any savings which do come from renewable energy[43] will first be used to pay off debts from ALBA (García, 2013).

While at first glance ALBA has a positive influence as it keeps oil prices, and the electricity bill of Nicaraguans low, the long term effect is debatable. As ALBANISA is technically a private company it is not monitored by the National Assembly of Nicaragua, nor does it have constraints from the national budget or have any obligations to publish what happens to its funds. The amount of money, whereabouts of this money, and the spending pattern is unclear; additionally there have been suspicions of illegitimate activities[44]. For these reasons the electricity subsidy is unreliable, and could fall through at any moment which would drastically increase the cost of electricity for Nicaraguans. Particularly regarding the death of Hugo Chávez; Venezuelan opposition parties have already stressed that they will end the "solidarity price" of oil to Nicaragua[45]. The IMF stressed the fiscal risks associated with a possible sudden interruption in the oil-cooperation flows from Venezuela, given the social costs of ending the programs funded by them (IMF, 2012a). Current reports coming from Nicaragua after Chavéz' death as well as looking at the history of cooperation between the two countries indicate an unchanged situation. Furthermore, while ALBA states in its Energy Treaty that they will stimulate alternative energy usage as well as try to maximise the usage of hydroelectric and thermoelectric power, the low price of electricity combined with the fact that small residential energy users have no legal means to sell electricity to the grid (and are thus limited to the use of a *net meter* to limit end-consumption by generating one's own electricity (van Duinen and Negenman, 2012)) means that it is not attractive for residential consumers to invest in renewable energy for their own use, be it to protect oneself from grid failures.

6-2-2-2 Sources of investments & bi-/multilateral cooperation

Despite several IFIs and much bi- & multilateral (financial & technical) assistance having been been ended in response to the November 2008 electoral fraud, much support remains with an eye for the wellbeing of Nicaraguans. Nicaragua remains indebted[46], however, it succeeded in reducing the debt-burden in 2011[47] and 2012. In 2004 Nicaragua secured US$ 4.5 billion in foreign debt reduction under the Heavily Indebted Poor Countries (HIPC) initiative.

Some examples of active IFIs investing in the Nicaraguan energy sector are:

The **European Investment Bank (EIB)** has granted a US$ 70 million loan to Nicaragua to finance investments designed to upgrade the country's power transmission grids under the PNESER program, total funds shall be US$ 185.4 million together with the **Inter-American Development Bank (IADB)**, the **WB**, the **Central American Development Bank of Economic Integration (BCEI)**, the **Nordic Development Fund (NDF)** and the **European Investment Fund (EIF)** to reach the goal of providing approximately 1.2 million people with electricity and increasing the electrification rate an additional 20% (IADB, 2010).

[43] an energy price decrease of 15% is expected in the next 5 years (Belsey Priebe, 2013)

[44] President Ortega has used funds generated by an ALBA oil monetization scheme to increase the participation of his party, the FSLN, in the economy

[45] (García, 2013)

[46] 59.4% of GDP in 2012 - CIA World Factbook

[47] 61.4% of GDP in 2011 - CIA World Factbook

In April 2012 Globeleq Mesoamerica Energy (Wind), the subsidiary of Globeleq, purchased 100% of the interest in the Eolo de Nicaragua S.A. wind project. The project will create 44 MW of electricity through the use of 22 2.0 MW Gamesa G90 wind turbines which will be sold to the distribution companies Dissur/Disnorte. This project received a US$ 91.5 million loan from the Dutch development organisation **Financieringsmaatschappij voor Ontwikkelingslanden (FMO)**, the French **PROPARCO**, and the German **Deutsche Investitions- und Entwicklungsgesellschaft (DEG)** (FMO, 2012). FMO also funded the Amayo II wind project in 2010, together with the **Central American Bank for Economic Integration (CABEI)**, the **Belgian Investment Company for Developing Countries (BIO)** and the **Danish Export Credit Agency (EKF)** (FMO, 2010a), as well as the San Jacinto-Tizate geothermal expansion project together with **Export Development Canada (EDC)** (FMO, 2010b).

The **Japan International Cooperation Agency (JICA)** has supported Nicaragua with several grants as well as loans, including the country's first photovoltaic solar farm where a total of US$ 11.9 million was invested in the project, US$ 11.4 million of which came from a Japanese government donation and the rest out of the Nicaraguan Treasury (Agencia EFE, 2013) (JICA, 2011). Other contributing IFIs in the Nicaraguan energy sector are the Korean **Exim-bank**, the **Climate Investment Fund (CIF)**, the **Latin America Investment Facility (LAIF)**, the **Andean Investment Corporation (CAF)**, the **Norwegian Investment Fund for Development (Norfund)** and the **Spanish Agency for International Development Cooperation (AECID)** amongst others (CFO, 2013). Most loans come with technical assistance, for example via Germany's **Energy in Development (EnDev)** and **German Agency for International Cooperation (GIZ)**, the **US Agency for International Development (USAID)** or Dutch ***Agentschap NL***. A private investment fund is the **Central American Renewable Energy and Cleaner Production Facility (CAREC)**, supported with capital by the CABEI, the BIO, the **Finnish Development Finance Company (FinnFund)** and Dutch **Triodos bank**. On top of that the **European Union (EU)** and **United Nations Development Programme (UNDP)** are also active in the region and installing off-grid solar home systems (Dolezal et al., 2013).

CABEI's Accelerating Renewable Energy in Central America (ARECA) program, which interviewed representatives of the largest banks in each country, found that only one local Nicaraguan bank had experience in financing a renewable energy project (Dolezal et al., 2013). This confirms the importance of international institutions in the renewable energy sector of Nicaragua. German GIZ, together with CABEI, are trying to tackle this problem via capacity building.

6-2-2-3 State of the energy market & electricity prices

Nicaragua has the highest energy costs in Central America, despite having the poorest economy. The prices have risen sharply over the past ten years, as can be seen in Figure 6-4 and table 6-5. The increase in the number of clients (INE, 2013d) due to the PLANER grid extension programs and tackling of illegal connections has led to demand increases and, together with oil price increases and inflation of the Cordoba currency[48], have contributed to

[48]the IMF has frequently warned against Daniel Ortega's substantial salary increases of government workers, paid by the ALBA loans, as this could lead to inflation increases (IMF, 2012a) (IMF, 2012b)

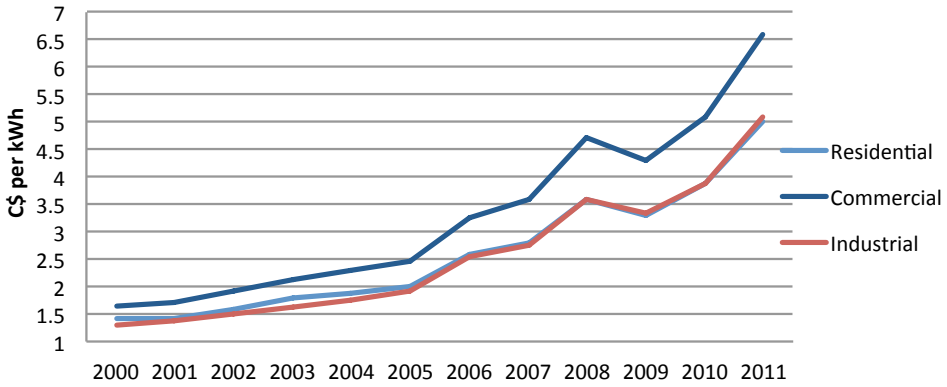


Figure 6-4: Price of electricity in Nicaragua from 2000 - 2011 per consumption sector (source: author; data from (INE, 2013c))

the increase of electrical energy prices. As previously mentioned, plans to lower Nicaragua's dependence on oil imports should be given high priority (IMF, 2012a).

Electrical energy production costs from renewable resources (as will be discussed in more detail in section 6-2-2-4) are roughly 75 to 50% cheaper than current prices. Policy makers in Nicaragua were quick to incentivise private-sector investment in renewable energy projects once oil prices reached unaffordable proportions; the main reason for the explosion of renewable energy in Nicaragua in the last few years can therefore be allotted to the simple fact that energy from renewable sources is cheaper - a unique phenomena due to the extraordinarily high production price of electricity in Nicaragua.

As previously mentioned, the Nicaraguan government subsidises electricity for consumers to keep prices artificially low. Besides the ALBA subsidy, there are also cross-subsidies in the tariff structure that benefit the lowest consumption users (0-50 kWh/month) the most as they experience reductions between 45% and 63%. Consumers under 150 kWh/month also benefit from this subsidy, but to a lesser extent (INE, 2013c). The advantage of this form of subsidising is that it has kept consumption low; Nicaraguans are very careful with their electricity consumption in order to remain in low subsidy levels.

Table 6-5: Average Nicaraguan electrical energy prices per kWh from 2004 to 2012 in Córdobas, US Dollars, and euros (INE, 2013c)

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
C$/kWh	1.96	2.12	2.74	3.01	3.87	3.54	4.19	5.41	5.74
US$[a]/kWh	0.13	0.13	0.17	0.17	0.20	0.18	0.20	0.25	0.25
€[b]/kWh	0.10	0.10	0.14	0.13	0.14	0.13	0.14	0.18	0.19

[a]NOTE; as an exchange rate the historic exchange rates on January the 1st of the respective year have been used and rounded

[b]NOTE; as an exchange rate the historic exchange rates on January the 1st of the respective year have been used and rounded

As was previously mentioned, in November 2000, during the *privatisation spree* of the governments between 1990-2006, a controlling share in the distribution company Dissur/Disnorte was purchased by Spanish company Unión Fenosa. Since 1992 INE was allowed, by law,

to negotiate contracts and concessions with private investors. In1994 state energy company Nicaraguan Energy Company (ENEL) was created and then split in 4 parts as an attempt to privatise them separately in 2000. Due to legal issues and a lack of interest the sales failed and the reforms did not achieve their objectives to increase capacity, lower prices and increase the reliability of the grid. Only the state distribution company was privatised, yet since the takeover Dissur/Disnorte has operated at average annual losses of around US$50 million (Rogers, 2013).

6-2-2-4 Nicaraguan FiTs & PPAs

Whilst Nicaragua theoretically has a Feed-in-Tariff (FiT) in place[49] as a result of the law for the promotion of energy generation with renewable sources (Law number 532 - May 2005), the tariffs are thus low (between 5.5 and 6.5 US$cents/kWh)[50] and broad[51] that it is unclear whether any serious renewable energy producer has made use of the FiT. The reason for the boom in renewable energy investments in Nicaragua (in 2011 foreign investment in the renewable energy sector was valued at US$ 217 million - an increase of 37 percent from the previous year (García, 2013)) is not the FiT therefore, but rather a combination of an enabling legal framework (as will be discussed in section 6-2-3-2 on page 102), tax (and other) incentives, a system of tendering (creating PPAs) and the (be it limited) opening of internal power sales contracts.

Because of Union Fenosa's demand-side dominance as the owner of distribution company Dissur/Dosnorte, Nicaragua's power market is best described as a monopsony (Mostert, 2007). More recently, though, *large consumers*-; currently companies that require more than 1 MW (in 2011 there were 19 companies which qualify as a large consumer (ProNicaragua, 2011)) but previously companies which require more than 2 MW (in 2007 only 5 companies qualified as such (Mostert, 2007)) have the opportunity to receive the authorisation from the regulating entity INE for direct PPA contracts with private energy producers. This takes some of the *power* away from Dissur/Disnorte and allows private-sector renewable energy developers to sell electricity directly to companies after paying a certain transmission fee.

Government mandates are in place requiring electricity distributors to tender PPAs for a minimum of 10 years, thus the tendering schemes represent a good mechanism for Nicaragua to drive down project costs and increase competitiveness (Dolezal et al., 2013). Renewable energy developers; however, point to the importance of introducing an international market and to expand the national market (by reducing the 1 MW limit) to avoid underbidding and non-fulfillment of contracts, as well as expand demand beyond the mark of 100% renewable energy production after 2017. To a degree Nicaragua is currently maxing out on its renewable energy potential, and without a modernised legal framework which allows Disnorte/Dissur or private energy producers to export excesses (for example via MER and/or SIEPAC) there is no motive to expand renewable capacity past 100% (Rogers, 2013).

The limited tariffs of the Nicaraguan FiT become apparent when looking at the price of PPAs of some renewable energy projects. Whilst not easy to find, searching around in Project Design Document (PDD) documentation one can occasionally[52] find the stray PPA agreements

[49] (Energypedia, 2008)
[50] this is low when compared to PPA prices, as shall be shown later in this section
[51] little variance in price between the different renewable energy technologies
[52] the PDD of San Jacinto shows no PPA price (UNFCCC, 2005)

between developers and Dissur/Disnorte. The Amayo wind project got a PPA of 0.08625 US$ per kWh according to the PDD, combined with several incentives (UNFCCC, 2009), whilst at the time the price of electricity was 18 US$ cents per kWh (production) (LAHT, 2008). The expansion project, Amayo II, document states a PPA of 0.092 US$ per kWh (UNFCCC, 2011). The PDD of the EOLO wind project states a PPA of 0.1045 US$ per kWh (UNFCCC, 2012d), equal to the PPA of the La Fe wind farm (UNFCCC, 2012e). Most PPAs have variable rates, for example for the latter projects the agreed price escalates over time as indicated in the PDD: 3% annually during years 1-11; 1% during years 12-13; 0.5% during years 14-15 and remains constant for the last five years. Whilst these PPAs come with tax incentives for the first 7 years of operation (Law number 532 establishes a seven year income tax holiday); as many wind projects suffer losses during the first years of operation it is not affected by income taxes and thus do not often benefit from the incentives foreseen in Law 532.

It is clear that PPAs differ greatly. For example the PDD of the Hidro Pantasma Hydro project states a PPA of 0.1073 US$ per kWh and the San Jacinto-Tizate geothermal project is obligated to sell initial energy yields to Dissur/Disnorte at a price of US$ 0.0595 per kWh for a period of 20 years (Business Wire, 2006). Interestingly, the Board of Directors of Hidropantasma S.A. will consider the alternative of selling the project after the PPA contract expires at year 15 since they do not have a guarantee of subsequent business conditions (UNFCCC, 2012a). Whilst this might create the impression of Nicaragua not being enabling for renewable energy producers, Nicaragua frequently places high in international rankings for creating an enabling investment environment in renewables. Nicaragua made the third position in the FDI Strategy category of American Cities of the Future 2013/14 ranking in a division of The Financial Times (PN, 2013). As a country, Nicaragua placed 2nd only after Canada[53]. Nicaragua placed 2nd after Brazil in Bloomberg's Climate Scope Latin American investment report (Bloomberg New Energy Finance, 2012) as the country most attractive for climate related investments. The 2011 World Bank *Doing Business Report* ranked Nicaragua as the country that best protects its investors in Central America. Nicaragua also represents the most active micro-finance market for sustainability initiatives in Latin America, with nearly one-third of its micro-finance institutions providing some kind of green product and more than 3,500 low-income borrowers being served. On top of that private renewable energy companies are establishing partnerships with micro-finance institutions to offer loans to low-income families for the purchase of solar PV systems for their homes (Dolezal et al., 2013).

6-2-2-5 Local employment and sustainable development

Renewable energy projects have proven to be a boost to local employment and sustainable development in Nicaragua. The first Amayo wind project, for example, employed 90 to 125 Nicaraguans during construction, plus 18 permanent operational personnel and created 60 indirect jobs in the area (UNFCCC, 2009). On top of that, reports on biomass indicate that when power is produced from eucalyptus 73% of the selling price of power from eucalyptus remains in the Nicaraguan economy, while this is only between 14 and 30% in the case of electricity from fuel-oil. Employment generation is more than 3 times higher in the case of eucalyptus than with fueloil (van den Broek et al., 1998), dedicated biomass from Giant King Grass has similar benefits. Rural hydropower projects always come with capacity building to

[53]Nicaragua's capital Managua was the only city in Central America ranked in the top ten within this category

rural communities. For example the El Bote Forest Reserve was established together with Green Empowerment to protect the watersheds, forests, and longevity of the ATDER-BL El Bote hydro project, teaching locals that the traditional and common "slash and burn" farming practices are unsustainable as well as posing a risk to the water supply and jeopardising the hydro project (GE, 2010). Community members are taught to protect and grow vegetation on bare hillsides to protect against landslides.

Whilst the flooding of the Río Grande de Matagalpa will lead to the destruction of several square kilometres of land for the construction of the 253 MW Tumarín hydroproject, 300 families will be displaced and relocated to a newly constructed town called Nuevo Apawás with "modern homes", a market, evangelical and catholic churches and a health centre (Nicaraguan Dispatch, 2012). Even though the full costs and benefits to society of specific renewable energy development options remain unclear, it can be said that Nicaragua pays an enormous socioeconomic price for its current reliance on fuelwood and imported fossil fuels (Dolezal et al., 2013).

6-2-3 Political, legal & societal

This section shall cover the political, legislative, and societal aspects of the (renewable) energy sector of Nicaragua.

6-2-3-1 Political situation & government capacity

In general it is obvious that Nicaraguan policy makers have aggressively created an enabling environment for renewable energy in Nicaragua. Some political issues still remain. Nicaragua scores relatively poorly on the TI Corruption Perceptions Index of 2012, ranking 130$^{\text{th}}$ out of 176 (TI, 2012). Evidence of political interference can also be seen on a smaller scale, for example in the case of the off-grid village of Jocomico in the municipality of San Nicolas[54] which was given a government gift of several solar systems. Whilst plenty of surrounding villages in the politically liberal municipality of San Nicolas are also off-grid, it was only the Sandinista voting village Jocomico that received solar panels (van Duinen and Negenman, 2012).

President Ortega has frequently made his feelings towards capitalism known and has said it was a mistake to privatise some of the energy industries. While such remarks are commonly made, policy has been open towards private-sector investments and Nicaragua has signed and ratified bilateral investment agreements with several countries[55] as well as Free Trade Agreements with the Dominican Republic, the U.S. and Central America, which include investment protection obligations[56]. Still, and perhaps most importantly, Ortega has manipulated the judiciary to allow him to seek re-election despite constitutional term limits (Hirst, 2011). This creates unrest for investors as the combination of *"anti-capitalist"* remarks and the apparent power to change the constitution could mean future trouble in case Daniel Ortega does decide to make energy companies public once again.

On the regional level, despite having shared sustainable energy ambitions and policy statements, the seven countries of Central America have been unable to design or implement synchronised policy measures necessary to boost regional renewable energy capacities (Dolezal et al., 2013). The SIEPAC, combined with the MER, are a necessary tool for future renewable energy expansion for Nicaragua as the limit of 100% renewable energy in Nicaragua is reached. Policy makers are debating whether to apply a regional tariff mechanism to implement a regulatory framework to permit transactions through fixed contracts and transmission rights schemes by the end of 2014 (BNA, 2013), yet currently the resources, politics, economics and incentives have proven to not be in-line, and priorities differ greatly. All members of the Central American Integration System (SICA) have, however, adopted the *Central America Sustainable Energy Strategy 2020*, in cooperation with the United Nations Economic Commission for Latin America and the Caribbean (ECLAC). The goal of this is to make sure regional energy development happens sustainably, yet this plan on the macro landscape has had little influence on Nicaraguan renewable energy developments (the meso landscape).

[54] in the department of Estelí
[55] Mexico, Spain, Taiwan, Denmark, the United Kingdom, the Netherlands, Korea, and Ecuador
[56] that supersede provisions regular bilateral investment agreements

6-2-3-2 Legislation & investment climate

Nicaragua offers standard policy incentives to project developers to implement renewable energy in Nicaragua, as well as *tailored* policy such as Build-Operate-Transfer (BOT) contracts[57] (similar to the Serbian Public-Private Partnerships (PPPs)) to provide security and predictability to private investors (Dolezal et al., 2013). Nicaragua also scores considerably higher than most of its Central American neighbours in contract enforcement and investor protection, two important signals for (renewable) energy investors (Dolezal et al., 2013). Nicaragua does not set any target or legal obligation for the development of renewable resources in the country.

Nicaragua's FDI Law number 344 provides[58]:

- equal treatment of foreign and domestic investment
- eliminates restrictions on the way in which foreign capital can enter the country
- recognizes the foreign investor's right to own and use property without limitation, and in the case of a declaration of eminent domain, to receive proper indemnification
- total currency conversion
- 100% international ownership permitted; there is no discrimination against foreign investors, whether it be on total ownership of the company or as shareholders
- property protection and security
- freedom to repatriate all capital and profits

In 1991, the Government of Nicaragua approved a series of laws aimed at supporting the Export Processing Zones. These laws are currently being modified to provide even more benefits to the companies governed by this program; however, they currently provide the following benefits for a 10 year period, renewable for another 5 years[59]:

- total tax exemption on income and property taxes
- total exemption on municipal taxes, taxes for machinery, equipment and raw material, and on transport and support services for the Free Trade Zones
- total tax exemption on value added tax
- all permits can be obtained in less than six week
- tax exemptions related to project implementation: value-added tax on design/engineering and construction services

[57] i.e. the government approved a law to give tax incentives to investors of the Tumarín hydroelectric project at a rate of 3 percent income tax for 15 years (García, 2013)
[58] (Molina, 2008) & (EPB, 2013)
[59] (Molina, 2008)

- exoneration of import duties and taxes and of the value-added tax for the local purchase of construction materials and fixed building accessories
- tax incentives can be extended if the project undergoes extensive expansions

Over the years particularly forestry and tourism investment incentives were greatly expanded, as well as renewable energy incentives. The aforementioned renewable energy incentives law number 532 states[60]:

- exemption of customs duties on the importation of machinery, equipment, material and raw material necessary for all construction of stations, including sub transmission lines necessary for energy transportation from the generation facility to the grid
- exemption of the value-added tax levied on machinery, equipment, material and raw material utilized during pre-investment stage, construction of structures, including the construction of the sub transmission lines necessary to transport energy to the grid - for off-grid scenarios with their own generation facilities, this exoneration covers pre-investment, construction and all the investment made in distribution grids associated with the project[61]
- exemption of income tax for a maximum period of seven years - during this same period, the income derived from the sale of Certified Emission Reductions (CERs) will also be exempted
- exemption of all the Municipal Taxes on real estate, sales and registrations during the construction of a project, for a period of ten years[62] - fixed investment in machinery, equipment, and hydroelectric dams will be exempted from all taxes and duties, for a period of ten years
- exemption of taxes on the exploitation of natural resources for a maximum period of five years after the beginning of operations
- exemption of Fiscal Seals Tax incurred by the construction or operation of the project or expansion of a project for a period of ten years

Whilst successful, Nicaragua's current legal framework for renewable energies is getting outdated and requires an overhaul as the share of renewables in the installed electrical energy capacity mix approaches 100%. Policy makers need to create a bigger market for investment in renewable energy, particularly the possibility of creating a wholesale energy market that would allow power companies to negotiate PPAs directly with private buyers in Nicaragua which fall below the previous capacity limit of 1 MW. Nicaragua could also look for ways to increase demand in Nicaragua (Rogers, 2013) to allow the expansion of renewable energy as such. According to some private-sector developers the current largest barrier to regional exports are the fact that it is currently impossible to get a longer than 1 year contract on

[60](Molina, 2008)

[61]i.e. panels and solar batteries for solar energy generation

[62]to be applied in the following manner: exoneration of 75% during the first three years; 50% the following five years and 25% for the last two years

transmission rights to export power. This insecurity makes it hard for developers to get loans. Furthermore Nicaraguan policy makers, similar to their Serbian counterparts, are looking for the creation of a one-stop shop for foreign investors in general at the Ministry of Development, Industry, and Trade (MIFIC).

6-2-3-3 Societal awareness

Societal awareness for climate change is increasing, but still quite low in the generally undereducated country Nicaragua. As previously mentioned, unsustainable "slash and burn" farming practices are very common in Nicaragua (as well as the region). Generally the expansion of renewables in Nicaragua has an economic motive, be it to lower the price of electricity for consumers, or the lowest price option of off-grid rural electrification. NGOs are getting increasingly active in Nicaragua to promote sustainable development and increase societal awareness of climate change, next to relevant issues such as gender equality, children's rights, education as well as all sorts of cultural developments.

6-2-3-4 Operational practicality

The national government of Nicaragua and ministries such as the MEM & Ministerio del Ambiente y los Recursos Naturales Nicaragua (MARENA) have large, professional departments working on grid extension projects and hydro projects for off-grid situations. The capacity and reliability of particularly municipal authorities are a different story. Depending on the size and state of isolation of the municipality, capacity to handle topics such as (sustainable) waste management, grid extensions or off-grid electrification is limited. According to an expert at EnDev, municipal cooperation for grid extension or off-grid electrification projects is generally avoided due to bad experiences - it is preferred to work with entrepreneurs or businesses who appreciate the aid and are more reliable to contribute to inevitable payments.

6-3 CDM in Nicaragua

Nicaragua, as all other Central American countries, was quick to sign Kyoto. Whilst initially private-sector project developers in renewable energy were excited about the possibility of the Clean Development Mechanism (CDM) in Central America, the general sentiment now is that the CDM has not met the region's expectations in providing significant funding, mostly due to the low carbon price. In addition to the low carbon price, the exclusion of CERs coming from non-Least Developed Countries (LDCs) from the European Union Emissions Trading Scheme (EU ETS) after 2013 means that - as of now - the future of climate financing is expected to come from Nationally Appropriate Mitigation Actions (NAMAs). Either way, regionally only Costa Rica has submitted a NAMA (Dolezal et al., 2013) and more recently Guatemala and Belize (UNEP, 2013).

9 CDM projects have been registered in Nicaragua, 4 projects are at validation, and one project was rejected[63] by the CDM Executive board (UNFCCC, 2013d). Of the 9 registered CDM projects there are 4 wind projects (the aforementioned Amayo (I & II) and Eolo wind farm projects, as well as the 40 MW La Fe wind farm), 1 geothermal project (the aforementioned San Jacinto-Tizate project), 1 hydro project (1.9 MW La Mora hydro project), 1 biomass (bagasse) cogeneration project (the 55 MW Monte Rosa project), 1 methane avoidance project of a Nicaraguan liquor company (the Vinasse Anaerobic Treatment Project) and finally 1 reforestation project in southern Nicaragua (UNFCCC, 2013d). Of the 4 projects at validation 2 are hydro projects (5 & 13 MW), 1 is a 42 MW wind project, and finally a methane avoidance (from wastewater treatment) project.

The biggest issue of private-sector investors in renewable energy in Nicaragua with regards to the CDM and whom have successfully registered their projects, is the unexpected lower income of CERs. A striking example can be found in 3[64] of the 4 CDM wind projects of Nicaragua, each from the same developer - Globeleq Mesoamerica Energy. As stated by the country manager of the internationally active project developer and confirmed by FMO[65], the addition of CERs income from CERs has been of great importance for the decision to finance the project. Failure of constructed projects to attain the pricing per tonne that was assumed when project developers were doing feasibility (and additionality) analyses can have a crippling impact on there CDM projects. Without the *additional* revenues that were required by the investors initially the projects run the risk of not meeting the investment criterion of the equity providers or even running into problems paying back their lenders. There is a particularly high risk of this occurring in places like Nicaragua where conversion factors are so high and projected revenue streams are very dependent on the CERs sale proceeds.

The most noteworthy Nicaraguan CDM project is ATDER-BL's El Bote hydroproject which was rejected by the CDM Executive Board (UNFCCC, 2010b). The project demonstrates the differing views on the CDM & United Nations Framework Convention for Climate Change (UNFCCC) between small and large project developers.

[63] see section 6-3-1
[64] Amayo I & II as well as the Eolo project
[65] (FMO, 2012)

6-3-1 El Bote CDM project

El Bote is a small, locally-inspired-and-executed project with a capacity of 930 kW which supplies enough power to meet present demand in the northern central mountainous region east of El Cua, with significant surplus power to sell or export to the national grid during the rainy season. The El Bote Forest Reserve was established together with Green Empowerment (and a grant from the World Conservation Union (IUCN)) to protect the watersheds, forests, and longevity of the small-hydro project, and traditional "slash and burn" farming practices have been put to an end to protect the watershed, water supply, and micro-hydro system which could otherwise have been put in jeopardy (GE, 2010). As all of ATDER-BL's other projects, as an NGO, the project did not have a lot of funds. The funds are particularly limited for the use of, say, a validation study. The validation costs for the El Bote project were US$ 15,000, funds which the NGO did not immediately have at hand. For the reason of not having sufficient funds available 3 or 4 years passed during which ATDER-BL could not immediately proceed with the validation study, yet workshops were organised and cooperation was kept with the Designated National Authority (DNA) at the MARENA in Managua.

Eventually the validation costs[66] were paid and the validation process started after the government of Belgium gave support funds for covering some of the validation costs in 2007 with the intention of purchasing El Bote CERs[67]. The UNFCCC's reviewers then indicated that, due to a relatively long *inactive* period of 3 to 4 years:

> *"ATDER-BL did not demonstrate continuous due diligence in pursuing carbon abatement credits"*

Eventually, therefore, the UNFCCC refused to accredit the project. ATDER-BL felt that it was impossible to *prove* that there were insufficient funds to pay even minimal personnel salaries during those years, and that the NGO was barely surviving whilst it sought to finance the construction of the El Bote project. US$ 15,000 for a validation study, which might or might not lead to eventual carbon credits, was not an expense that ATDER-BL could cover. This was a difficult situation to *prove* years after the fact. During the years of supposed *due diligence* ATDER-BL got letters of support from the national director of UNDP in Managua, and ATDER-BL collected and translated a large amount of correspondence related to carbon credits that had accumulated during that time. But ATDER-BL felt that the UNFCCC's reviewers refused to pay any attention to this support documentation, and that it was impossible to communicate about the matter. The NGO could not understand what the reviewers were thinking, how their process of review operated, nor what was lacking in their documentation.

The CDM executive board also decided that the project did not demonstrate sufficient additionality. When asked to the DOE what was defective in the demonstration of additionality even the validator could not explain what was the problem. The *additionality* chapter of the PDD was rewritten and resubmitted three times by the director of ATDER-BL Rebecca Leaf, yet the NGO could not understand what was wrong with the information and arguments which were sent as it was based on a "build, not build" decision model that appears

[66] the Designated Operational Entity (DOE) was Columbian ICONTEC

[67] via carbon offtake contracts in the form an Emission Reduction Purchase Agreement (ERPA)

in the UNFCCC's guidelines as one of the methods for showing additionality. El Bote is a small, community-requested and community-oriented hydro-rural electrification project that displaced petroleum-based electricity that otherwise would have been used to electrify this area of Nicaragua. The project is not economically viable[68], hence the carbon abatement credits were needed and thus justified, but according to the UNFCCC the project did not demonstrate additionality.

It was decided not to re-submit the project after it was rejected as ATDER-BL had already spent 8 years on the process as well as large amounts of funding. In addition to that both the validator and employees of ATDER-BL did not see how the request for registration could be improved for another round because large amounts of documentation had already been resubmitted with zero results. ATDER-BL's director decided to gave up on carbon credits and climate finance; it was considered a "blind alley" and irresponsible to waste any more of the organization's time and money. In addition, the Belgian government, who had supported the project at the Belgian Climate Change Program, had to be disappointed as the process could not be completed.

With regards to the New Market Mechanism (NMM), ATDER-BL believes it might work better if carbon credits were administered nationally (or regionally), either by the MEM or by the DNA at MARENA. Nicaragua's electrical energy sector is small and all actors know each other well, stakeholders at the MEM have always fully supported ATDER-BL's projects in general and the El Bote rural electrification and hydro power projects in particular as well. According to ATDER-BL a sectoral situation might have been better as large international organisations can not get to know projects from a closer perspective; the UNFCCC process being hindered by the fact that the people who make the approval decisions never have the opportunity of personally visiting projects. The local MEM could always make a quick trip and inspect a project themselves.

6-4 Views on the NMM

The NMM has been received well amongst (renewable) energy experts of Nicaragua. An obvious concern for those who benefit from CERs is the current low price of CERs, disregarding these concerns some suggestions are discussed below.

Small project developers could benefit from a much simpler system, with lower chances of not getting CERs due to the project not getting registered by the CDM Executive Board. Small project developers could also benefit from the fact that government officials, who are often personally acquainted with developers in the relatively small energy sector of Nicaragua, could take the time to travel to the projects and view the project and the positive influences it has on surrounding communities. Larger project developers in Nicaragua are often international and well organised, and experienced in what they are doing. In general, whilst the CDM project cycle is seen as a nuisance and unnecessarily complex, getting projects registered has not been a problem for large project developers. Either way a NMM could simplify and speed up the system which is always advantageous to all project developers by lowering risks and costs.

[68] ATDER-BL failed at paying the debt

An official at the MEM, whilst supporting the idea of a Sectoral Crediting Mechanism (SCM) such as the NMM, proposed an idea of a regional Central American sector. Whilst a regional sector could avoid carbon spillage/leakage, particularly regarding the future SIEPAC grid expansion, there is disagreement amongst energy experts whether such a system which is contained in Central America could work. The resources, politics, economics and incentives are not in-line, and priorities differ greatly. The lengthy delays of the SIEPAC system in itself shows the lack of effectiveness of inter-Central American cooperation.

According to an expert at EnDev, municipal cooperation is generally avoided due to bad experiences, a lack of knowledge, a lack of capacity, and a lack of accountability. As was the case with Serbia, stakeholders at German development bank Kreditanstalt für Wiederaufbau (KfW) believe that it is that it is important for developers to have money up front; there could be a problem when goals are not met and credits consequently not allocated (therefore a penalty-system could be most beneficial). The experience of KfW and GIZ which shall be acquired with (current and future) smaller scale NMM pilot projects in South America can be of relevance for Nicaragua.

6-5 The NMM & private-sector investments in renewable energy projects in Nicaragua

The current main barriers to private-sector investors in renewable energy in Nicaragua are:

- Lack of a (clear, transparent, relevant & broad) FiT
- The fact that there are no legal possibilities for distribution company Dissur/Disnorte to export renewable energy across borders; as a result of the overwhelming expansion of renewables in Nicaragua as well as a lack of an up-to-date legal framework which considers the recent renewable energy expansion in the country as it nears 100% renewables
- Demand increases are necessary for the continuation of PPA contracts
- Infrastructural issues (transmission systems & grid extension)
- Transmission, distribution losses & illegal connections

The main shortcomings of the CDM in Nicaragua are:

- Low price of CERs, and dependence of current CDM projects on CERs revenues
- Small project developers having trouble getting projects registered (if at all)
- In the future (apart from the Least Developed Country (LDC) limitations as of 2013), a baseline which has such a high count of renewables leads to a low emission factor[69]

[69] As the baseline improves, CERs allocations for future CDM projects decline, as discussed in section 3-1-2 on page 21.

As Nicaragua's (renewable) energy sector has gone through such radical and speedy development in the last 5 years as a result of policy measures to incentivise private-sector investment in renewables, and as Nicaragua approaches a level of 94 to 100% renewable (electrical) energy it is unclear whether the NMM could be of great benefit to private-sector investors in renewable energy in the future. The main theoretical barrier to private-sector investment in renewable energy in Nicaragua could be the lack of a transparent FiT system, and a reliance on individual, project-based PPAs. The flexibility of the NMM does not stipulate which tool should be used to reach a certain, to-be-specified abatement threshold, yet a concise FiT could be of benefit to project developers in any case.

The priorities of Nicaragua are to increase electrical energy demand, expand its grid to those currently not grid connected (mostly towards the east of the country), decrease distribution (and to a lesser extent: transmission) losses, and increase the reliability of the grid. The NMM, in all its flexibility, could be used as a means to increase energy efficiency by reducing transmission losses as transmission & distribution losses are around 28% (the highest in the region) yet a low emissions factor could limit the amount of funding which could come from this. It is unclear whether the NMM could pose as a tool to increase the sustainability of residential wood burning (primarily for cooking), or reforestation projects - there is a registered reforestation CDM project currently in Nicaragua so possibilities exist in this field, yet the same issue of a low emission factor exists here. CDM projects or carbon crediting in general is not used as a means to stop the unsustainable "slash and burn" farming strategies common in Nicaragua and the region (IFCO, 2004).

Had the NMM been present the last decade instead of the CDM, whilst some smaller benefits to renewable energy developers could be expected, it is unclear if the current high levels of renewable energy expansion would have been surpassed. Smaller renewable energy developers could have benefitted the most from a sectoral scheme, whilst larger developers could remain in a similar state of insecurity due to carbon price fluctuations and global market imperfections. It can be said that Nicaragua's aggressive incentives in the form of tax breaks, extraordinarily simple and reliable legal frameworks, PPAs and the marketing thereof have been exceptionally successful to attract private-sector investments in renewable energy.

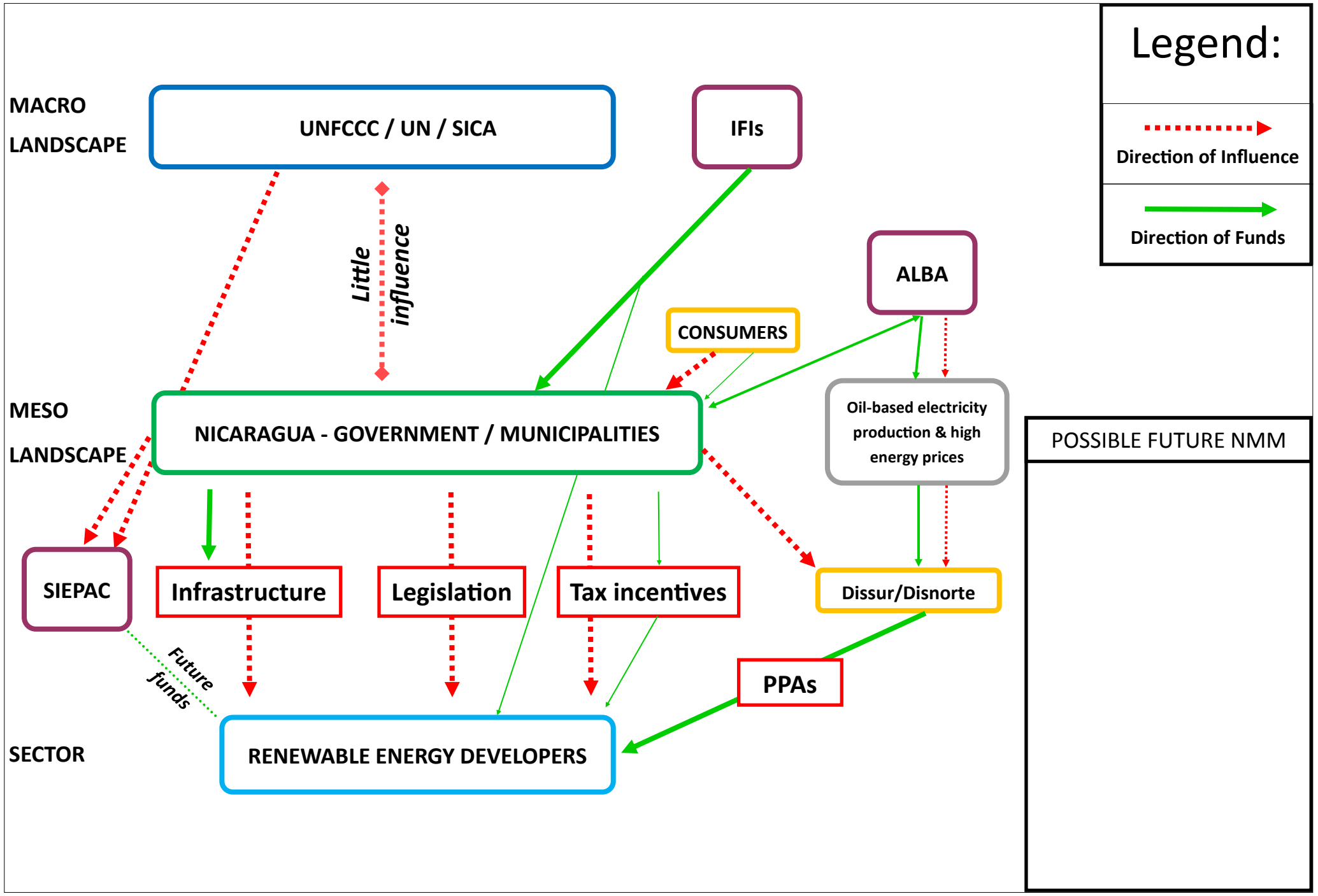
Whilst further renewable energy use can be of particular interest (and most viable from both a technical & economic standpoint) in the empowering of the most isolated communities in the jungles of Nicaragua, such as in the form of micro-hydropower or solar home systems, it is unclear whether the NMM can be of any use for this practise. The primary function of the NMM from the UNFCCC's perspective would be to scale up mitigation as compared to the CDM, so a CDM could be better suited for such projects were it not for the negative experience of a small but influential renewable energy producer[70] with getting a hydroproject registered. Whilst the UNFCCC has traditionally had a keen eye on sustainable development and gotten more lenient towards lesser developed countries and smaller renewable energy project developers, it remains to be seen if the NMM takes off in the future how this will be translated into actual protocol of the mechanism. Smaller project developers could deliver more co-benefits through their projects and consequently lead to more regional sustainable development, yet the focus of the NMM would be on scaled up abatement. As mentioned it is also unclear whether the NMM could play a role in the current unsustainable fuel wood burning practises as this a change in this does not automatically qualify as mitigation.

[70] ATDER-BL

6-6 Multilevel framework & flexibiliy of meaning

Looking at the multilevel interactions regarding the (renewable) energy sector of Nicaragua, a very different phenomena compared to Serbia can be observed. The traditional macro landscape (the UNFCCC, the United Nations (UN) (via the dedicated regional ECLAC), or SICA) has had little influence on Nicaraguan renewable energy developments (the meso landscape). Whilst SICA pushed for sustainable development in the energy sector and the UNFCCC tries to impose climate influences as always, none of these factors have contributed to the recent boost in renewable energy in Nicaragua. The main cause of the boost of renewable energy in Nicaragua has been the high price of fuel-oil/diesel powered electrical energy production, which has led the Nicaraguan government to alter the meso landscape in such a way via (tax) incentives, attractive legal frameworks and the willingness to invest in transmission infrastructure that private-sector renewable energy developers could and can thrive in Nicaragua. ALBA(NISA), by funding oil and providing diesel generators to solve initial capacity issues, has had an influence in the initial fossil-fuel lock-in in the electrical power sector of Nicaragua. Consumers indirectly pay for the high electricity prices via ALBANISA debts, and distribution company Dissur/Disnorte is being pushed by the government more and more to sign PPAs with private-sector renewable energy developers to eventually lower the price of electricity and dependence on foreign oil.

Contrary to the situation in Serbia, IFIs in Nicaragua are funding private-sector renewable energy developers as renewable energy is in-line with government policy, plans and interests. The government, together with SICA, should expand the future opportunities of the Central American mega-grid SIEPAC to open up the regional market via the MER and enable private-sector developers in renewable energy to continue investing in Nicaragua by allowing them to sell capacity through stable and longterm PPAs with foreign parties. As previously mentioned, it is unclear whether the NMM could be of benefit to Nicaragua under current circumstances.


Legend:
Direction of Influence
Direction of Funds
MACRO LANDSCAPE
UNFCCC / UN / SICA
IFIs
Little influence
ALBA
CONSUMERS
MESO LANDSCAPE
NICARAGUA - GOVERNMENT / MUNICIPALITIES
Oil-based electricity production & high energy prices
POSSIBLE FUTURE NMM
SIEPAC
Infrastructure
Legislation
Tax incentives
Dissur/Disnorte
Future funds
PPAs
SECTOR
RENEWABLE ENERGY DEVELOPERS

6-7 Summary & conclusions

Nicaragua's (electrical) energy situation used to be one of the worst in the western hemisphere, having the lowest percentage of population with access to electricity, the lowest electricity generation and installed (effective) capacity, as well as being largely dependent on oil imports for electrical energy production. The use of oil for the majority of electrical energy production, combined with record transmission & distribution losses consequently led to the costs of electricity in Nicaragua rising to the highest of the region. The majority of residential energy consumption is provided by biofuels, mostly in the form of unsustainable fuel wood burning. The share of renewables in the electrical power sector is expected to reach 94% as of 2017, whilst the economic renewable energy potential in the electrical power sector has a capacity four times higher than the current installed capacity. This puts Nicaragua in an excellent position to export its energy through the SIEPAC project once completed, yet this depends on (regional & national) political aspects.
Nicaragua's Foreign Investment Law, Renewable Energy Law and a series of other laws aimed at creating an enabling legal environment mixed with a collection of tax incentives, privatizations and free trade zones as well as the very high price of electricity have led to an explosion of renewable energy in one of the poorest nations in the western hemisphere. Nicaragua regularly places 1st or 2nd in international reports as offering the most enabling environment for FDI in general - or in renewable energy in particular. Nicaragua has also received recognition as offering green financial products (micro-credits) to low income rural citizens and rural micro-, small- and medium-scale enterprises to finance renewable energy projects. Notably, Nicaragua lacks a relevant FiT yet it has achieved large investments in renewable energy through tailored, project-based PPAs, and PPPs/tendering procedures. The PPAs vary greatly, possibly from as low as 0.056 to as high as 0.107 US$ per kWh, with an estimated current cost of electrical energy production (mostly due to oil dependence) of around 0.20 US$ per kWh. Remarkably, the further expansion of renewables in Nicaragua will therefore lead to a **lower** energy price.
It can therefore be said that the current explosion of renewable energy in Nicaragua is an indirect (and perhaps unexpected and unintended) result of the implementation of an oil-based energy electrical production system due to the help of Hugo Chávez through the ALBA alliance which was, at the time, a solution to the ongoing energy crisis since 2006 in Nicaragua. The installation of 20 to 60 MW diesel plants was a quick and easy solution to the energy deficiency and frequent blackouts. As 70.24% of Nicaragua's electricity generation in 2010 was powered by fossil fuels the country became dependent on international oil imports as well as susceptible to price fluctuations of oil. After social unrest due to high energy prices grew, the Sandinista government opted to state subsidies of energy, leading to massive amounts of unpublished debt. The resulting financially unsustainable situation meant that using Nicaragua's national renewable energy resources as a means to replace the diesel plants suddenly became a top priority; and the (renewable) energy sector became a top investment sector of the country. Had Nicaragua chosen for a coal-solution as in Guatemala, Panama or Mexico (perhaps imported from the US or Canada in the way many European countries currently do) instead of Venezuela's oil solution, the energy prices could have been so low that renewable energy might not have been a priority for Nicaragua.
To a degree, Nicaragua has currently maxed out its renewable energy potential - not technically, but politically. Without political changes to the meso landscape which the national

distribution company Dissur/Disnorte has to abide to and could enable it to export surplus energy, the private company has no reason to sign PPAs for more renewable energy than it can place locally. Another possibility could be the creation of a wholesale energy market that would enable renewable energy producers to negotiate PPAs directly with private (industrial) buyers of smaller scale (below 1 MW) in Nicaragua. Increases in demand as the country expands its grid are not seen as significant enough to continue the flow of (renewable) energy investments and capacity increases. The possibilities of renewable energy in remote off-grid communities remain present for the purpose of providing electricity in the most technically and financially viable way, the environmental sustainability of it can almost be considered a co-benefit. A project-based approach such as the CDM could be more suitable for such projects, as the function of the NMM is to scale up mitigation. The obvious problem of this is that CERs which originate from non-LDCs (including Nicaragua) are not allowed for compliance under the EU ETS, and the fact that at a (future) percentage of renewable energy of 94% the baseline (and resulting emissions factor) would be very low. These concerns also complicate future possibilities of afforestation/reforestation for carbon credits, and it is unclear whether or not the NMM could be of value for such projects. The avoidance of the common regional agricultural "slash and burn" techniques have historically not been recognised by the UNFCCC as a means to acquire carbon credits either.

7

Private-Sector Involvement and the New Market Mechanism - Conclusions

The report has assessed current global (political and economic) responses to climate change, the (non-)market-based mitigating solutions brought forward to counter climate change, the New Market Mechanism (NMM) as a suggestion currently under discussion and the possibilities of the NMM in Serbia & Nicaragua. In short, it has been shown that Nicaragua's share of renewables has expanded greatly in a very short timeframe through a series of laws aimed at supporting Foreign Direct Investment (FDI) in renewables as well as a collection of tax incentives, privatizations and free trade zones combined with - crucially - a high (production) price of electricity (due to an expensive oil dependence) which is subsidised at the energy bill of consumers lest they remain under a certain cap (to prevent a high energy intensity). A thorough analysis of Serbia's energy sector showed a very different scenario. The price of electricity in Serbia, compared to European standards, is very low due old large hydropower plants, the mining of its national resource lignite and because subsidies have lowered the price below production costs. Economic collapse after the Yugoslav wars led to high unemployment and poverty which, mixed with traditional policy and the fact that for Serbians the price of electricity is still relatively high, led to a mixture of social and energy policy with the intention of keeping the price of electricity affordable for the Serbian population. Contrary to Nicaragua's subsidy policy (which in all honesty harms its economy in its own ways as a consequence) the price of electricity in Serbia is kept low for all consumers by directly subsidising energy consumption without a cap. This practise, combined with a similar phenomena in its (mostly fossil fuel powered) district heating systems, leads to a high energy intensity and economic doom-loop scenario of high government debt and a stationary energy sector with regards to (private-sector) investments (in renewable energy, energy efficiency, etcetera) over the past decade.

The conclusions and responses to the (sub-)research-question(s) have been based on the two case studies used in this thesis report; Serbia and Nicaragua. This means that conclusions are limited in a sense that a more thorough analysis including more non-Annex I countries and, crucially, non-Least Developed Countries (LDCs) is required to make more sound conclusions.

The scope of this MSc. thesis report does not allow for a global analysis, and it was chosen to focus the thesis on two detailed case studies. The author has had the opportunity to study the energy sectors of both cases first-hand through visits and personal interviews - something which would not have been possible had the study been more global.

7-1 (Sub-)Research question(s)

To answer the main research question, first the sub-questions shall be addressed;

- *What changes could the implementation of the NMM as a scaled up, sectoral flexibility mechanism have on private-sector investments in renewable energy in certain non-Annex I countries if the NMM were to have complimented or been in place instead of the Clean Development Mechanism (CDM)?*

If the NMM were to have run parallel to- or as a replacement of the CDM in Serbia, project developers would have had a simpler mechanism to deal with. The CDM is considered too complex, and many project developers are repelled by the risks associated with complex mechanisms. In the case of at least two biomass CDM projects in Serbia, certain methodological errors would not have been made by a broker firm which contributed to the fact that those projects are now in financial trouble. Such (expensive) middlemen are not necessary under a sectoral scheme. In addition, project developers are afraid that projects will not get approval by the CDM Executive Board and that their project will not get registered, these are issues which would also disappear under a sectoral mechanism. Because the Serbian energy market is still largely centralised a NMM could have an impact on state companies Electric Power Industry of Serbia (EPS) & Serbian Transmission System and Market Operator (EMS); as of 2015 the market should be completely liberalised and more players can enter the market - this competition can be regarded as being particularly beneficial for a NMM to flourish in an energy sector.
In the case of Nicaragua; whilst a NMM could have had an impact by simplifying procedures and lowering costs and risks, it is not likely, had the NMM been implemented next to the CDM from the start, that there would have been any significant changes to the current outcome of renewable energy in the country. Nicaragua has seen a massive increase in renewable energy over the past decade by the policy implemented by the Nicaraguan government; incentivising legal frameworks, tax incentives & tax breaks, government cooperation, etcetera. Smaller project developers would most certainly have benefitted from a sectoral scheme, and ATDER-BL's hydropower project would have received funding; large and experienced project developers have reported no trouble acquiring project registration for Certified Emission Reductions (CERs), yet would always applaud a simpler and thus cheaper system.

- *What are the impacts of current flexibility mechanisms on private-sector investments in-, and technological innovation of renewable energy projects in comparison to potential non-market-based mitigating solutions?*

Serbia's proposed Nationally Appropriate Mitigation Actions (NAMAs), the most proposed NAMAs of any nation, are largely in-line with current and historic policy and therefore supportive of fossil-fuel powered energy and energy efficiency measures - only 3 out of 12 proposals

are focussed on renewable energy. These proposals could obviously have a positive impact on private-sector investments in renewable energy in Serbia. Another non-market-based mitigating solution; Serbia's Feed-in-Tariff (FiT), incentivises hydropower and disincentivises most other renewable energy technologies - particularly wind energy and biomass. Whilst being the main mechanism for private-sector investors in renewable energy, it was found that the method of acquiring the FiT (by reaching the level of Privileged Power Producer (PPP)) is unreliable, risky and cumbersome, but developers of Serbian CDM projects try to make use of the FiT nonetheless. The recently introduced Energy Service Companies (ESCOs) and Public-Private Partnerships (PPPs) offer private-sector investors in renewable energy the opportunity to invest in renewable energy or energy saving projects. Since the CDM is the only flexibility mechanism used in Serbia and is not considered successful, and the FiT (as the main tool for incentivising private-sector investment in renewable energy) has sparked mixed feelings, and considering that non-hydropower renewable energy projects have only marginally been introduced to the energy portfolio of Serbia over the last decade, it may be concluded that neither solutions have had an impact worth mentioning.
Nicaragua has not submitted any NAMAs, nor does it have a relevant FiT. Nicaragua's main distribution company; Disnorte/Dissur, negotiates a tailored Power Purchase Agreement (PPA) with individual (renewable) energy producers. These agreements will always lead to a price lower than current production costs. The high cost of producing energy from imported oils is so high that this by itself can be considered the main reason of the explosive expansion of renewable energy in the Central American country. The CDM (and to a lesser extent the Program of Activities (PoA)) has certainly contributed by providing project-developers with extra funds, but even without CDM funding renewable energy would still be more economical than oil imports.
As mentioned in chapter 3, technological innovation can best be driven by use of a carbon tax or a FiT - both potential policy measures which could be chosen for the sectoral NMM. As the use of low-carbon technologies becomes more profitable producers will have to innovate to improve those technologies. It was also suggested that the implementation of several renewable energy technologies, such as through a broad and relevant FiT, could benefit consumers & society in the long run by lowering transfer costs and promoting innovation. The NMM would reward low carbon technologies, and thus promote technological innovation.

- *What are the prerequisite factors which must be met to attract private-sector investments in renewable energy projects?*

As was seen during the case studies of Serbia & Nicaragua, certain prerequisites, which might or might not be able to be *fixed* by the NMM, need to be present in order for private-sector investment in renewable energy to flourish. Factors which were problematic are listed below:

- Serbia:
  - Grid capacity/stability
  - Political will/influences
  - Positive energy market conditions
  - The legal framework
  - Unreliable (local & national) authorities which lack capacity
  - Powerful, vertical public utility companies
  - Concessional loans of International Financial Institutions (IFIs) being limited to government-backed projects
  - Grid-connection issues
- Nicaragua:
  - Grid extension/stability
  - Regional energy export limitations
  - Transmission & distribution losses (also due to illegal connections)
  - Unreliable (local & national) authorities which lack capacity
  - A dependence on Bolivarian Alliance for the Americas (ALBA) funds and therefore oil imports from Venezuela
  - Insufficient demand for future renewable energy expansion as the share of renewables approaches 100%

The main complexities which would prove to be difficult to tackle via the NMM in general are grid capacity/stability/expansion issues and a lack of capacity and reliable national/local authorities. Either way the macro landscape has been known to influence meso landscapes, such as the European Union (EU) (through EU pre-accession criteria) influencing Serbian politics to gradually liberalise the energy market. This can be considered a prerequisite of development in the energy sector of Serbia in general. The infrastructural issues of Serbia, such as the political preference to expand transmission capacity towards Republica Srpska instead of towards Romania, could perhaps be influenced by the macro landscape - even though the Energy Community has had little success with achieving this so far. An enabling legal environment is also a crucial prerequisite for renewable energy investments, the system for acquiring permits should be streamlined and straightforward to simplify the process which lowers costs and risks. Bi-/multilateral support is being offered to Serbia for exactly this purpose. The Nicaraguan legal framework was quickly overhauled once the government had decided that making use of the country's renewable energy resources was the way to go to lower electricity prices, decrease pricey energy imports, and increase energy independence. The main consequence of the extraordinary boost in renewable energy is the fact that as the energy portfolio reaches a level of 100% renewable energy an increase in energy demand is required to allow further private-sector investments in renewable energy. This can be achieved by grid extension programs, or through use of the new regional grid which is expected to be completed soon.

- **How can the NMM, as a sectoral (crediting/trading) mechanism, be used to scale up and incentivise private-sector investment in renewable energy projects?**

As became apparent during the multilevel analysis of the case study of Serbia, the NMM can be used to scale up and incentivise private-sector investments in renewable energy projects

by being a means for an outside (*macro-level*) organisation (the United Nations Framework Convention for Climate Change (UNFCCC)) to exert influence whilst providing funds for to-be implemented policy measures. Through the necessary negotiations between the host government and the UNFCCC, the UNFCCC has the opportunity to demand certain policy changes. In the case of Serbia the UNFCCC could demand a *fairer* FiT; higher tariffs for non-hydropower renewable energy technologies, a simpler system for acquiring the status of PPP, and guaranteed grid-connection promises. Alternatively any other form of mitigating techniques as discussed in chapter 3 could be chosen and implemented. A strength of the NMM to incentivise and scale up private-sector investments in renewable energy is therefore the possibility to run a detailed policy analysis of a country's (renewable) energy sector, much like the case studies in this thesis report, to come with tailored policy demands. As the UNFCCC administers CERs in return for mitigation (as opposed to concessional loans which add to the country's debt) a host-government will be far more inclined to adhere to policy change demands. The fact that the NMM administers CERs is also arguably the biggest issue of the NMM, global carbon-price volatility and insecurity means that negotiated *rewards* for said policy changes are not guaranteed. Another issue is the required system of monitoring, reporting and verification (MRV) required for a NMM; in the case of Serbia the Designated National Authority (DNA) and Ministry of Energy and Mines (MEM) would require a significant increase in human resources. For most LDCs (and Nicaragua) the same issue will likely apply.
In the case of Nicaragua it is unsure whether or not the NMM can be of any relevance. Renewable energy projects currently under construction will lead to a share of almost 100% renewable energy in the total electrical energy portfolio of Nicaragua, leaving a possible NMM integration with little left to develop. The most pressing sustainability issue in Nicaragua in the near future is the unsustainable deforestation for firewood and agricultural "slash and burn" practises. As the UNFCCC's flexibility mechanisms traditionally exclude "slash and burn" practises for carbon credits, there could perhaps be opportunities for reforestation projects in exchange for carbon credits.

7-2 Conclusions

Nicaraguan policy makers, motivated by the fact that even renewables could produce energy at a cheaper rate than in the current situation, were quick to implement aggressive measures and the share of renewables is expected to reach 94% in 2017 upon completion of the Tamurin hydropower project. Serbia, on the other hand, further influenced by energy traders (which benefit from low energy prices), a lack of funding, scandals, public opinion and inefficient governance responded, partially through its centralised (and fraudulent) vertical state utility company EPS, in quite the opposite way. Apart from (mostly large) hydropower, the Serbian FiT, which can be used as a tool to both promote as well as hinder certain renewable energy technologies (steering technologies whilst appearing to be enabling towards renewable energy in general), clearly does not favour the more novel renewable energy technologies such as wind power, solar (thermal) technologies or biomass, the latter having by far the greatest potential in Serbia.
The multilevel framework analysis brought to light the little effects of the international community (the macro landscape) on the illogical policy measures of the Serbian government (the meso landscape) which directly affects private-sector investments in renewable energy projects

(the sector). It was found that whilst international organisations such as the UNFCCC, Energy Community, or EU come with regulations and industrial targets that Serbia *must* abide to, these organisations do not directly fund this policy. In fact, as was shown to be the case of Serbia, IFIs (which are effectively part of the macro landscape) provide funding for Serbian projects yet mostly limited to government-backed projects. This leads to IFIs funding Serbian government policy; investment banks therefore end up funding a further lock-in of lignite infrastructure, mining and energy production.

The NMM, in the case of Serbia - and combined with the planned liberalisation of the energy market by 2015 (and therefore higher electricity prices), could be game changing for (private-sector investors in) renewable energy. Due to the flexibility of the NMM and its sectoral approach, with the opportunity of penalising host-governments who do not reach thresholds, the NMM could be used as a means to combine *influence* with *funding* (in the form of grants instead of concessional (soft-) loans). This allows an independent body - the UNFCCC - to do thorough policy analysis of the meso landscape set up by the government of the country in question, come with a tailored policy proposal, and through negotiations with the host-government have this policy implemented in return for crediting in the form of CERs. In the case of Serbia, the UNFCCC could impose a fairer FiT. Another potential mechanism proposed by the UNFCCC: NAMAs, could not be as effective as, due to the influence remaining in the hands of Serbian policy makers, only 3 out of the currently 12 NAMAs submitted by Serbia involve renewables. In addition, NAMAs, though leading to measurable abatement, generally lack a certain threshold or means of penalising if goals are not met.

Nicaragua's energy sector can be seen as an exceptional case. Perhaps unintentionally but certainly unexpectedly, Venezuela's aid and solution to the ongoing energy crisis since 2006 in Nicaragua (a large energy deficiency crisis with frequent blackouts) came in the form of diesel plants and oil-loans through the ALBA alliance which fixed technical problems but led to unsustainably high energy prices. Without a relevant FiT and mostly through tailored PPA contracts for individual projects as well as a score of incentives and an enabling legal framework (and with the help of the CDM), Nicaragua's share of renewables increased rapidly and Nicaragua's projected share of 94% renewables will put it in the global top-15 renewable electricity producing countries. Many challenges remain for the Nicaraguan energy sector such as the expansion of its national grid, improvement of the transmission & distribution efficiencies, the enabling of energy exports (for the further expansion of renewable energy), and the empowering of off-grid isolated communities (in which renewables can play an important part), yet it is unclear whether the NMM can play a role in any of these aspects.

The primary function of the NMM is to scale up abatement through a sectoral approach. The NMM offers the possible use of the armament of the full catalog of tools to achieve this, be it the funding of a FiT, PPA, PPPs, ESCOs or even a carbon tax - as long as the abatement is achieved. This means that one negative aspect of the CDM; the tendency for larger and settled developers with vested interests to profit the most from the CDM (also due to the high transaction costs for particularly smaller project developers), could potentially not be solved through the NMM. If scaled up abatement is all that is looked at, then, in the case of a particular energy sector and the example of a FiT as a chosen means to reach the threshold, mostly the larger projects and cheaper renewable energy technologies shall be incentivised. This means that smaller projects, often relatively more expensive compared to larger projects due to smaller energy yields and higher levellised costs of electricity, are expected to once again *suffer* under the NMM. It is unclear whether or not the UNFCCC will keep sustainable development (in the case of less effective projects regarding energy yield

but with particularly advantageous co-benefits such as a micro-hydro power plant which empowers an off-grid isolated community in a Nicaraguan jungle) or smaller project developers under consideration during negotiations with host-governments. Looking at previous policy decisions the UNFCCC has given CDM project developers from LDCs as well as the smallest projects certain advantages such as lower registration fees - or the ability of developers to pay the fees once CERs have been (or will be - thus lowering project risk) allocated to the developer.

The NMM will lead to a power shift towards the host-government projects are no longer assessed individually by external parties and the CDM Executive Board. This inevitable leads to higher risks of corruption, bribing or rent-seeking. Current NMM proposals keep these risks into account by requiring independent external validation and verification of the system of MRV. Whilst this may seem cumbersome it is important to realise that the *infrastructure* for this is already in place as several firms offer independent verification and validation services to CDM projects, for example to verify the annual emission reductions coming from these projects.

Every country, every energy sector and every renewable energy (project) type is unique. The CDM is not unique. Whether or not a project is in Serbia where biomass should be incentivised above a methane reduction project, or whether a large hydro project in China has managed to squeeze past the additionality requirements, the UNFCCC and the CDM Executive Board essentially view them as equals. An advantage of the NMM is that crediting can be fine-tuned to fit each country. This requires knowhow, and thus deep independent policy analysis, technical analysis and technology assessment. If policy is analysed with an independent view, much how this research has been done, and stakeholders from private-sector investors to development banks & from energy experts at embassies to professors are asked for their views, often notable gaps, inefficiencies and frustrations can be found. Sometimes parties who rarely communicate with each other are unconsciously gridlocked as actions are expected from each other in order for renewable energy to be incentivised. Whilst this might sound cumbersome, the CDM and related maze of bureaucracy are debatably more cumbersome. If global CO_2 prices could be raised, not just through the European Union Emissions Trading Scheme (EU ETS), and thus demand for market-based flexibility mechanisms increased, the NMM could offer the international community a unique tool of funding whilst influencing national (renewable) energy policy, and thus lead to scaled up and more sustainable mitigation.

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Annex

A-1 Functions for the NMM (UNFCCC, 2012c)

Functions in new market mechanism		Undertaken by	Conditions as defined in modalities and procedures, and any relevant guidance	Report	Review	Implementation/Approval
Describe coverage (i.e. sectors and gases) – based on common definitions where possible		Host Government	Subject to requirements as defined in M&P	Initial Report	IRT	Yes, unless question of implementation raised by IRT and needs to be resolved by IC
National implementation arrangements		Host Government	Satisfaction of participation requirements Appoint competent national authority MRV and registry arrangements Measures developed to reach threshold/target Crediting or trading threshold Assessment of risk of carbon leakage	Initial Report	IRT	Yes, unless question of implementation raised by IRT and needs to be resolved by IC Facilitated participation: registry and/or auditing services can be provided by the UNFCCC.
Establishing MRV arrangements		Host Government	Subject to requirements as defined in M&P	Initial Report	IRT	Yes, unless question of implementation raised by IRT and needs to be resolved by IC
Determining baseline		Host Government	Subject to requirements as defined in M&P	Initial Report	IRT	Yes, unless question of implementation raised by IRT and needs to be resolved by IC
Determining crediting threshold or sector target		Host Government	Subject to requirements as defined in M&P	Initial Report	IRT	Yes, unless question of implementation raised by IRT and needs to be resolved by IC. Threshold/target are also assessed by IC
Monitoring and determining actual emissions		Host Government	Under nationally approved MRV subject to requirements as defined in M&P	Annual Report	IRT	Yes, unless question of implementation raised by IRT and needs to be resolved by IC
Issuance of units	Crediting	Host Government or IC through the international registry	Subject to requirements as defined in M&P Following satisfactory review	Annual Report	IRT	Yes, unless question of implementation raised by IRT and needs to be resolved by IC
	Trading	Host Government	Subject to requirements as defined in M&P Issuance prior to review, but host country would need to buy additional GHG units where actual emissions exceed target			

M&P: modalities and procedures
IRT: Independent Review Team
IC: Implementation Committee

Figure A-1: Functions for the NMM (UNFCCC, 2012c)

A-2 Map of power plants and coal mines in Serbia under control of EPS

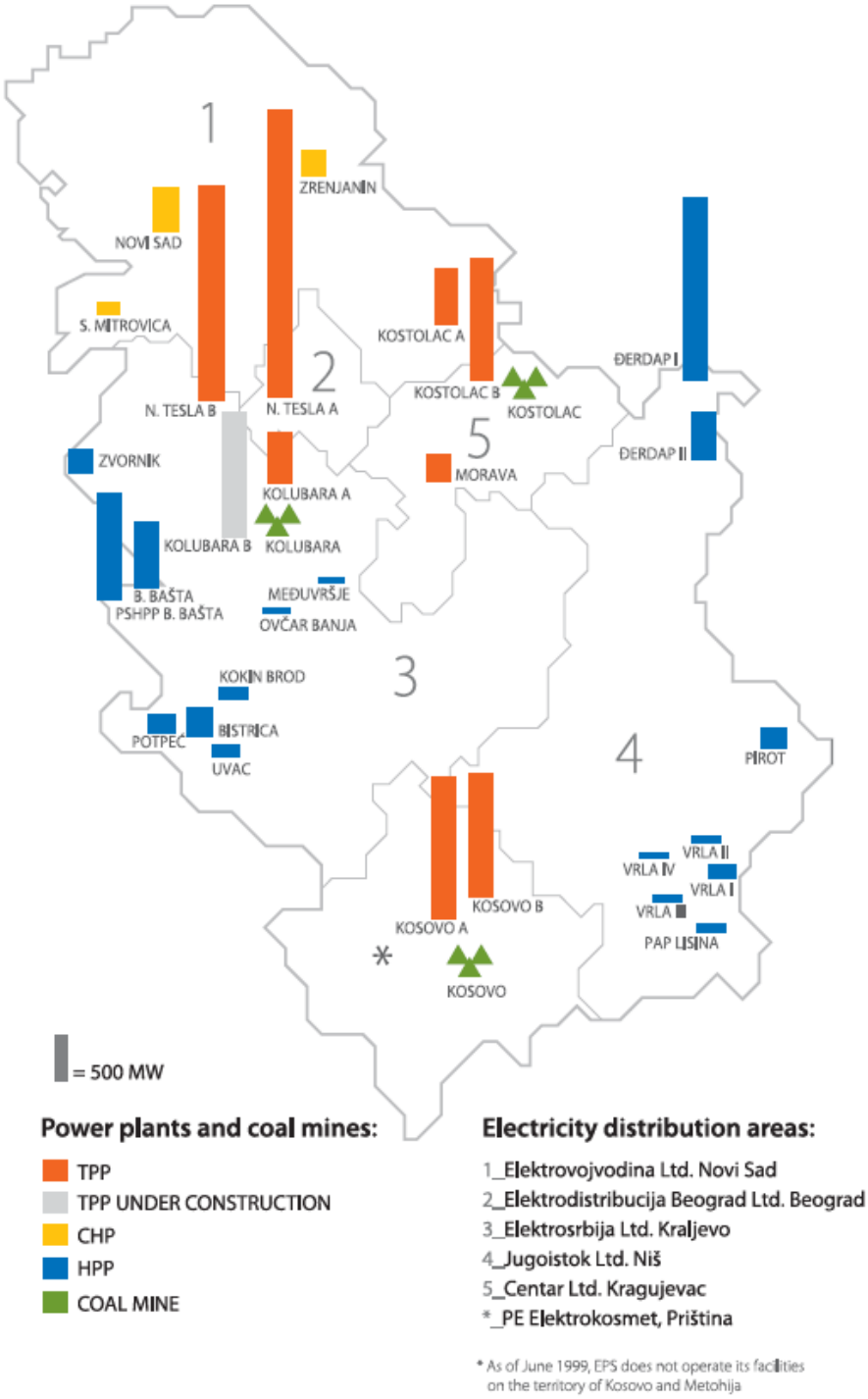

Figure A-2: Map of power plants and coal mines in Serbia under control of EPS (source: EPS)

A-3 Table of Serbian feed-in-tariffs 2013 (Ivezić and Živković, 2013)

Type of Power Plant	Installed capacity P (MW)	Feed In Tariff (c€/kWh)
Hydro power plants		
	up to 0,5 MW	9,7
	from 0,5 MW to 2 MW	10,316 – 1,233*P
	from 2 MW to 10 MW	7,85
On existing infrastructure	up to 2 MW	7,35
	from 2 MW to 10 MW	5,9
Biomass power plants		
up to 0,5 MW		13,6
from 0,5 MW to 5 MW		13,845 – 0,489*P
from 5 MW to 10 MW		11,4
Biogas power plants		
up to 0,2 MW		16,0
from 0,2 MW to 2 MW		16,444 – 2,222*P
over 2 MW		12,0
Landfill and sewage gas power plants		6,7
Wind power plants		9,5
Solar power plants		23
Geothermal power plant		7,5
Fossil fuel fired CHP plants		
	up to 0,2 MW	C_o =10,4
	from 0,2 MW to 2 MW	C_o = 10,667–1,333*P
	from 2 MW to 10 MW	C_o = 8,2
On existing infrastructure	up to 10 MW	C_o= 7,6
Waste fired power plants		
up to 1 MW		9,2
from 1 MW to 10 MW		8,5
Correction of purchase price for natural gas fired CHP plants	$C = C_o$ *(0,7* G/27,83 + 0,3) C – new purchase price of electricity C_o – reference purchase price of 27,83 dinar/m^3, specified for enterprises performing retail activities for tariff customers, which does not include expenses for use of transportation system of PE Srbijagas, according to the tariff element "energy carrier", G (dinar/m^3) – new natural gas price specified for enterprises performing retail activities for tariff customers, which does not include expenses for use of transportation system of PE Srbijagas, according to the tariff element "energy carrier".	

Figure A-3: Table of Serbian feed-in-tariffs 2013 (Ivezić and Živković, 2013)

A-4 List of consulted experts (documented or audio-recorded)

- Sean Porter - Senior Manager Business Development - Globeleq Mesoamerica Energy
- Rebecca Leaf - Executive Director of Association of Rural Development Workers - Benjamin Linder (ATDER-BL)
- Danijela Bozanić - Head of the DNA of Serbia at the Ministry of Energy and Mines (Serbia), former representative of Eastern Europe to the CDM Executive Board
- Hugh Kain - Coordinador de Ingeniería at the Ministry of Energy and Mines (Nicaragua), Programa PCH/FODIEN
- Rainer Suennen - Principal Manager Energy & Transport Southeast Europe & Turkey - Kreditanstalt für Wiederaufbau (KfW)
- Dragan Mrkalj - Serbian European Integration Office (SEIO)
- Nenad Mitosević - Senior Policy Officer - Dutch Embassy in Belgrade
- Miroslav Spasojević - Senior Advisor at the Serbian Ministry of Energy and Mines EPS
- Lachlan Cameron - Sustainable Energy Expert - ECN
- Jos Sijm - Senior Energy and Environmental Economist - ECN
- Jelena Simović - Ministry of Energy and Mines (Serbia) - *devision climate change*
- Aleksandar Macura - Former United Nations Development Programme (UNDP), Independent Energy Consultant
- Danko Vuković - Head of Renewable Energy - Biogas Energy d.o.o.
- Miodrag Gluscević - Head of the Department for Communal Issues, Urban Planning and Environment - SKGO
- Vassilis Evmolpidis - Team Leader - Western Balkans Investment Framework (WBIF) COWI-IPF Consortium
- Jasmina Vulovic - Deputy Director of KfW Office Belgrade & Project Coordinator Energy Sector Serbia - KfW
- Carl Kukkonen - CEO of VIASPACE Inc.
- Professor Dejan Ivezić - University of Belgrade, EU Seventh Framework Program for Research and Technological Development (FP7)
- Dr. Marija Zivković - University of Belgrade, FP7