

# **What motivates Vietnam to strive for a low-carbon economy? – An explorative case study on the drivers of climate policy in a developing country**

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*Against the intuition of standard economic theory on collective action problems a number of developing countries engage in unilateral climate change mitigation policy. Ostrom (2010) gives several potential reasons why conventional theory fails to explain this observation, including the existence of multiple benefits from emission reduction policies. By analyzing the case of Vietnam, this study intends to provide insights on the potential motivation for climate policy in a developing country. By means of qualitative interviews with Vietnamese policy makers and other stakeholders we examine the factors that have shaped recently launched climate related policies, focusing on renewable energy policy and fossil fuel pricing policies. We confirm that multiple policy objectives related to multiple benefits arising from policies that reduce emissions played important roles for Vietnam's national as well as international policies and that emission reductions were not the major motivation for the adoption of these policies. Along the lines of Kingdon's (1995) 'multiple streams framework' our analysis suggests that changes in several factors that provide incentives to adopt mitigation measures occurring simultaneously have opened a 'window of opportunity' enabling a policy change from a climate policy focused on adaptation to one in which increased emphasis is put on emission reductions.*

# 1 Introduction

In recent years high rates of economic growth in developing countries have resulted in a rapid increase of greenhouse gas (GHG) emissions (see e.g. Raupach et al. 2007; Steckel et al. 2011). As a consequence, stronger involvement of developing countries – which currently do not face binding emission reduction targets under the United Nations Framework Convention for Climate Change (UNFCCC)<sup>1</sup> – is regarded as essential in order to achieve ambitious climate goals (see e.g. UNFCCC 2011).

However, from the view of standard economic theory, climate policies appear particularly unlikely to be implemented in developing countries for two reasons: first, in the past economic development has been closely related to fossil fuel resource use and thus rising GHG emissions (Jakob et al. 2012). This apparent trade-off between economic development and climate change mitigation (Jakob and Steckel, in press) provides a clear disincentive for developing countries to reduce their emissions as they likely prioritize other human development goals (such as economic development and poverty alleviation). Second, mitigating global climate change is generally perceived to raise a collective action problem that requires a global solution. Conventional collective action theory predicts that individual countries will not voluntarily engage in reducing GHG emissions without a globally binding and externally enforced regulation (Brennan 2009, Ostrom 2010). That is, there is a pronounced incentive to free-ride on the global public good of climate change mitigation provided by countries that would join an international environmental agreement (Carraro and Siniscalco 1993, Barrett 1994).

Yet, in contrast to theoretical predictions, some developing countries have recently announced unilateral emissions abatement policies (see Townshend et al. 2013). Ostrom (2010) argues that conventional theory fails to explain this behavior as abatement actions are actually decided and implemented in a ‘polycentric’ way, i.e. by different actors (e.g. national governments, cities, etc.) operating on different levels (e.g. international, national, etc.). These actors may face benefits other than the global benefit of mitigating climate change (‘co-benefits’) that are usually ignored by conventional approaches using game theory to model international negotiations on climate change. Hence, policy makers will usually pursue multiple objectives, among which climate change mitigation is only one. As a consequence, policies aiming to achieve local or national benefits may also be beneficial in terms of climate change mitigation even without a global climate agreement.

This study examines the underlying motivations for unilateral climate measures adopted in Vietnam. Ranked 32 concerning its share in global emissions (in 2010) and 14th in population size (in 2012) while exhibiting high growth rates in both economic terms as well as with respect to GHG emissions (data from World Bank 2013, see also Section 2) and at the same time being highly vulnerable to climate change, Vietnam constitutes an interesting example. As this study argues, co-benefits and multiple policy objectives provide a plausible explanation why Vietnam has announced a package of unilateral climate change mitigation policies in recent

years. As pledges made on the international level will first need to be discussed and finally implemented and enforced on the national policy level, a better understanding of individual countries' reasons to voluntarily engage in mitigation policy would also generate important insights on how to improve global cooperation on climate change mitigation.

Despite the important role of developing countries for achieving a low climate stabilization target, the number of studies examining the motivations of national climate policy making in developing countries – especially on smaller countries - is relatively scarce. Atteridge et al. (2012) examine drivers for climate policy in India on the international, national and state level. Dubash (2013) provides an assessment of the role played by co-benefits and equity considerations in India's climate discourse. Escribano (2013) analyses the interplay of divergent political, economic, social, and environmental factors driving the formulation of energy policy in Ecuador. Quitzow et al. (2011) compare environmental governance (including climate issues) in India, China, Vietnam and Indonesia. Recently, a selection of case studies has been conducted, summarized in Garibaldi et al. (in press), comparing and assessing mitigation action concepts of Brazil, Peru, Chile, South Africa, and Colombia.

Existing studies on Vietnam have mostly focused on specific aspects. Fortier (2010) provides a procedural critique of political processes in the run-up to Vietnam's National Target Program to Respond to Climate Change (NTP-RCC). Similarly Zink (2013) discusses the political and societal dimensions of climate change and donor involvement mainly focusing on the NTP-RCC. Rodi et al. (2012) carry out a policy analysis regarding the implementation of the Environmental Protection Tax, and Coxhead and Chan (2011) as well as Willenbockel (2011) examine its expected macroeconomic and distributional implications with numerical models. Toan et al. (2011) give an overview of Vietnam's energy system, provide forecasts on supply and demand, and review recent energy policies. Do and Sharma (2011) likewise review Vietnam's recent energy policy and discuss challenges faced by its energy sector. Nguyen and Ha-Duong (2009) assess the potential of Renewable Energy in Vietnam and discuss barriers to their diffusion, while Nguyen (2007) focuses on wind energy potentials and discusses policies to promote their uptake.

To our knowledge, there is no comprehensive assessment of recent climate policies and their underlying motivations in Vietnam to date. This is where this paper aims to make a contribution to the literature. Our policy analysis builds on 23 semi-structured qualitative interviews with policy makers and other stakeholders involved in the policy making process in Vietnam conducted early 2013 as well as available literature. A list of all interview partners can be found in the appendix. We concentrate on policies that (at least indirectly) aim to put a price on carbon or internalize technology spillovers, as these policies are generally regarded to be essential in order to achieve significant emission reductions (Jaffe et al. 2005). These policies mainly affect the power and industry sectors, which are hence the focus of this study.

This paper is structured as follows: First, we provide some general information about Vietnam, including an in depth analysis of energy related emission drivers. Second, we introduce climate and energy related policies in Vietnam. Third, using an inductive approach, we identify and evaluate the different motivating factors to engage in climate measures mentioned in the

interviews divided into domestic (e.g. vulnerability to climate change, energy security, economic growth) and external factors (e.g. donors, international setting). We continue with discussing how the observed policy change in Vietnam can be explained from the perspective of Kingdon's (1995) 'multiple streams framework' and finally conclude.

## 2 General background on Vietnam

Since its reunification in 1976, the Socialist Republic of Vietnam is a one-party state ruled by the Communist Party of Vietnam (CPV). In the mid-1980s, the CPV launched a socio-economic reform process ("Doi Moi", literally meaning "renovation"), which allowed private entrepreneurs to become economic subjects. It is usually perceived that the set-up of the "Doi Moi" process gave impetus to subsequent rapid economic growth, with GDP per capita more than tripling between 1990 and 2010, lifting a large part of the Vietnamese population out of (absolute) poverty. Around 2009 Vietnam has crossed the GDP threshold to be listed as a Low Middle Income country by the World Bank.

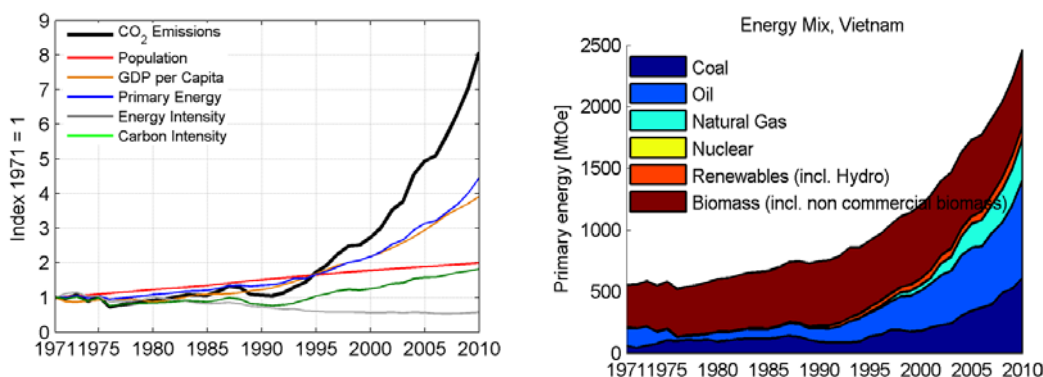
	1990	2000	2010
<b>Population [million]</b>	66.02	77.63	86.93
<b>GDP per capita, PPP [constant 2005 international \$]</b>	905	1597	2875
<b>Poverty headcount ratio at \$1.25 a day (PPP) [% of population]</b>	63.7 <sup>*</sup>	40.1 <sup>**</sup>	16.9 <sup>***</sup>
<b>Urban population [% of total]</b>	20.3	24.4	30.4
<b>GINI</b>	35.68 <sup>*</sup>	37.55 <sup>**</sup>	35.57 <sup>**</sup>
<b>Life expectancy [years]</b>	65.5	71.9	74.8
<b>Human Development Index (HDI)</b>	0.439	0.534	0.611
<b>Net ODA received [constant 2010 million US\$]</b>	254	2212	2940

**Table 1: Selected socio-economic and development indicators for Vietnam for the years 1990, 2000 and 2010 (Sources: World Bank 2013, UNDP 2013). Note that for selected data points available data differ from indicated years marked by symbols: <sup>\*</sup> 1993, <sup>\*\*</sup> 2002, <sup>\*\*\*</sup> 2008.**

Table 1 shows selected development indicators for Vietnam for three selected points in time (1990, 2000 and 2010). During this period Vietnam has undergone an outstanding social transformation, and has (partly significantly) improved in numerous important indicators, including poverty, life expectancy and HDI. At the same time the population has grown significantly, of which more and more people live in cities and urban areas. Net official development assistance (ODA) has significantly increased in the last two decades, now

amounting to approximately 3.5 billion USD of which 61% stems from bilateral donors (data for 2011, source OECD 2013).

Social changes shown by Table 1 are mirrored in changes in Vietnam’s economy. Once being dominated by the agricultural sector it is today built on a solid industry base, with the industrial sector having grown at more than 10% per annum in the 2000s. In 2006, it has become the largest sector in Vietnam’s GDP (see Toan et al. 2011 for a detailed description). Even though private entrepreneurship is basically allowed in Vietnam, most key industries (and in particular heavy industry) are controlled by the state. Those State-Owned Enterprises (SOE) generally play an important role in the Vietnamese political process (see e.g. Hayton 2010 for a detailed discussion). Economic growth in Vietnam has recently slowed down. While the global economic crisis has impacted Vietnam’s economy by decreased exports and reduced foreign direct investment (FDI) (World Bank 2012), the country also has to deal with an increasingly inflexible economy (due to the high share of State Owned Enterprises ), and a banking crisis, impeding new investments as reported by several interviewees. Additionally, Vietnam is ranked rather low on institutional quality including relatively high indices for corruption and a low ranking for rule of law (WGI 2012).

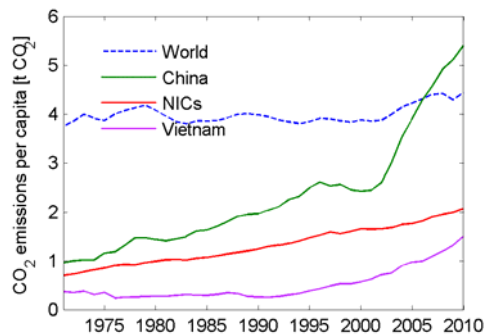


**Figure 1: Development of Kaya indicators (left) and Vietnamese primary energy mix (right). Data Source: IEA (2012).**

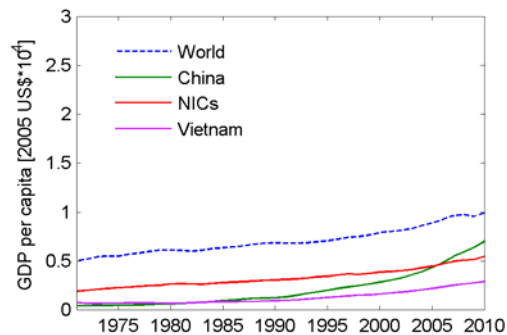
Energy demand, formerly to a large extent covered by renewable sources, mostly traditional biomass and hydropower, is now majorly covered by fossil fuels (particularly oil and coal) and has increased by nearly factor five since 1971. In the electricity sector the state owned utility Electricity Vietnam (EVN) controls the lion’s share of transmission, distribution and generation; in 2010 EVN accounted for about 60% of electricity generation (Do and Sharma 2011, UNDP 2012). Most households (>97% according to World Bank (2013) statistics) have access to electricity, and electricity prices are regulated by the national government at a level below generation costs (with average retail prices being at approximately .07 USD per kWh at the time of the interviews). Electricity prices are hence indirectly subsidized with the total amount of consumption subsidies in the electricity (energy) sector estimated to be USD 2.92 bln or 2% of GDP (USD 4.12 bln, 3.3% of GDP) in 2011 (IEA 2013, World Bank 2013), though a UNDP study suggests that those figures might be even underestimated (see UNDP 2012). Vietnam’s CO<sub>2</sub>

emissions in the energy-related sectors have increased about eight-fold between 1971 and 2010 (see Figure 1), resulting in per capita emissions of 1.5 t (113 Mt CO<sub>2</sub> in absolute terms) in 2010. In order to understand the drivers of Vietnam's emissions we present an analysis along the lines of the Kaya identity (Kaya 1990), which decomposes CO<sub>2</sub> emission changes into population, GDP per capita, energy intensity of GDP, and carbon intensity of energy, building on IEA (2012) data. Following Steckel et al. (2011) and Hübler and Steckel (2012) we also decompose changes in carbon intensity into contributions of different energy carriers (see Appendix for methodological details). It is first useful to look at the development of key Kaya factors in Vietnam compared to other countries. Figure 2 illustrates the development of CO<sub>2</sub> per capita emissions, GDP per capita, energy intensity and carbon intensity for Vietnam in comparison to China, the global average and an aggregate of other newly industrializing countries (NICs), including Brazil, India, Indonesia, Mexico and South Africa.

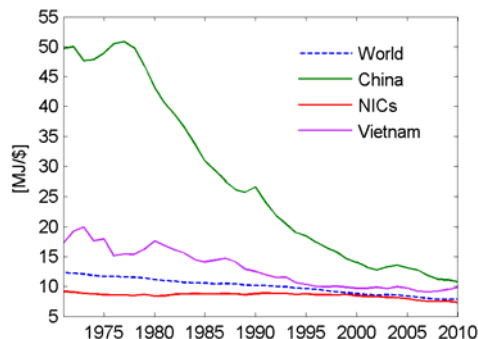
### a) CO<sub>2</sub> emissions per capita



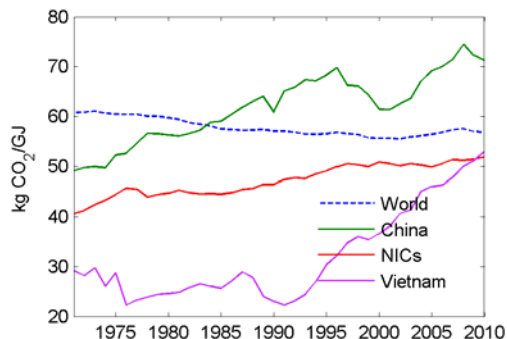
### b) GDP (PPP) per capita



### c) Energy Intensity (PPP)



### d) Carbon Intensity



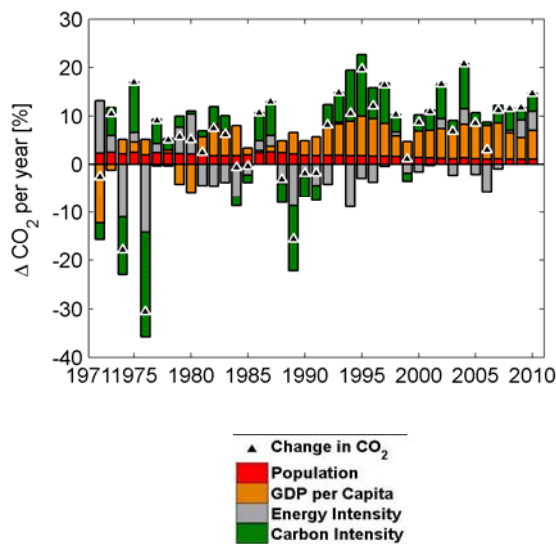
**Figure 2: CO<sub>2</sub> emissions per capita and factors of the Kaya identity over time for Vietnam, China, Newly Industrialized Countries (including Brazil, India, Indonesia, Mexico and South Africa) and the global average. Data source: IEA (2012).**

Per capita emissions in Vietnam, despite their dramatic growth in the last two decades, still remain far below the global average and also below the average value of other NICs (Figure 2a). However, Vietnam's carbon intensity is remarkable, which has increased significantly in the last decades, now having crossed average levels of other NICs. Vietnam's energy system has carbonized even faster than China's, particularly in the last two decades (see Figure 2d). In

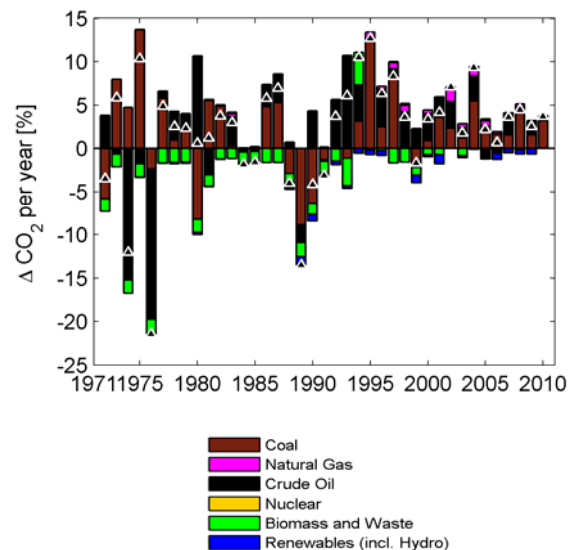
addition to that, Vietnam's energy intensity has increased in the last decade and is - comparable to China's - higher than the global average. Note that we show GDP measured in PPP; when using market exchange rates (not shown) Vietnam's level of energy intensity is nearly twice the global average and significantly higher than values given for China.

Vietnam's carbon emissions have grown by more than 10% in most years after 1990 (Figure 3a). While before 1990 a clear singular driver of emissions cannot be identified, after 1990 economic growth and carbon intensity have driven the increase of emissions to approximately equal extents. Energy intensity and population growth have not played a continuous role for emissions growth (with energy intensity however remaining at high levels, see Figure 3).

### a) Decomposition along Kaya factors



### b) Decomposition of Carbon intensity



**Figure 3: Decomposition of changes in CO<sub>2</sub> emissions in the energy system along a) Kaya factors (left) and b) a decomposition of the carbon intensity (right).**  
**Data source: IEA (2012). See appendix for methodological details.**

Large increases of carbon intensity after 1990 (see Figure 3b), can majorly be attributed to an increased use of oil, but coal also plays a significant role. In the last decade (2000 – 2010) coal is the main driver of a carbonizing Vietnamese energy system, with annual increases ranging from two to five per cent per year. Even though carbonization of the energy system has slowed down, it is still very high compared to other NICs (see e.g. Steckel et al. 2011).

Available scenario analyses for Vietnam (e.g. Toan et al. 2011, Do 2011) predict a continuation of the observed trend in the future, with energy demand increasing substantially in the upcoming decades. In its national energy plan, Vietnam expects energy demand to increase by factor four until the year 2025 (compared to 2005 levels) in a business as usual (BAU) scenario (World Bank 2011), mainly driven by industrialization and rising household incomes. All studies expect a huge part of the demand to be covered by (carbon-intensive) coal. Even though Vietnam aims to cover some of its future electricity demand by nuclear power, emissions from its energy sector are expected to more than double until 2020 (251 mio t CO<sub>2</sub>e) and quadruple by 2030

(471 mio t CO<sub>2</sub>e) as stated in its Second Communication to the UNFCCC (Socialist Republic of Vietnam – MoNRE 2010, p.56).

### **3 Energy and climate policies in Vietnam**

Single environmental policies in Vietnam could already be observed with the beginning of the *Doi Moi* process in the 1980s. Inspired by the 1992 Earth Summit on sustainability, the Vietnamese government initiated the Vietnam Agenda 21 “Strategic Orientation for Sustainable Development” in 2001, which was finalized in 2004 (see Nguyen 2012). Vietnam ratified the UNFCCC in 1994 and the Kyoto Protocol in 2002. As a Non-Annex-B country Vietnam does not have any emission reduction obligations, and has highlighted developed countries responsibility for financing mitigation projects - e.g via the *Clean Development Mechanism* (CDM) (see UNFCCC 2013, UNEP Risoe 2013) - in its two communications to the UNFCCC Secretariat (2003, 2010) (Socialist Republic of Vietnam – MoNRE 2003 and 2010).

This section first provides a detailed overview of domestic climate related policies in Vietnam, focusing on policies that either (directly or indirectly) put a price on CO<sub>2</sub> or support new and renewable energy policies, as these policies are generally regarded to be essential in order to achieve significant emission reductions in the long term. Second, we shortly sketch Vietnam’s position in the international context, especially its positions in the UNFCCC process. On both levels – domestic and international - we can identify a shift in how climate and energy policy is perceived and framed by Vietnam’s policy makers.

#### **3.1 Domestic policies**

Even though Vietnam has already been involved in international climate negotiations since the 1990s and climate change issues have been discussed nationally since the beginning of the 2000s, climate change only explicitly entered the national policy making agenda with the *National Target Program to Respond to Climate Change* (NTP-RCC) approved in 2008 (see Zink 2013 for more details). Despite containing a long term component that identifies the need to develop towards a low carbon economy (NTP-RCC 2008), the allocation of funds granted for the NTP-RCC clearly reflects its focus on adaptation by attributing only about 2% of the overall resources to mitigation activities (see Fortier 2010). Moreover, the NTP-RCC (2008) emphasizes that mitigation actions will need to be financed externally by industrialized countries or international funds (see also Zink 2013).

In December 2011, the Prime Minister approved the *National Climate Change Strategy* (NCCS). In contrast to the NTP-RCC, which defined climate change response mostly in terms of adaptation measures, the NCCS states that climate change adaptation and mitigation actions should be carried out in parallel. The NCCS defines ten strategic tasks, inter alia outlining approaches for emission reduction, in particular renewable energy and energy efficiency improvements, though not yet defining emission reduction targets for the energy and industry sector. Additionally, a National Climate Change Committee has been established. In the NCCS, Vietnam (for the first time) signals its willingness to take responsibility for climate change caused by its own development pathway indicated by formulations such as “*the global trend [...]*”



*demands every country, developed or developing, to reduce greenhouse gas emissions”* (NCCS 2011, p.2). Though not the focus of this study it should be mentioned that in parallel the Ministry of Agriculture and Rural Development (MARD) decided on a reduction target of 20% of total GHG emissions from the agriculture and rural development sector by 2020 (18.87 mio t CO<sub>2</sub>e, see MARD 2011), which was also confirmed in the NCCS (NCCS 2011, p.11).

Early 2012, soon after the approval of the NCCS, the *Vietnam National Green Growth Strategy* (VGGS) was drafted and approved by the Prime Minister in September 2012 (Nguyen 2012). The VGGS - combining energy-, economic-, and climate policy (compare Table 2 ) - aims to “achieve a low carbon economy” (VGGS 2012, p.2) by restructuring the economy and reducing GHG emissions. In contrast to the NCCS, the VGGS defines explicit emission reduction targets for the energy sector. While in the NTP-RCC Vietnam had conditioned any mitigation action on the financial support from abroad, it now unconditionally commits itself to reduce its GHG intensity per unit of GDP by 8 to 10% until 2020 compared to 2010 levels and to reduce GHG emissions from energy activities by 10% (additional 10% conditional on international support) below business as usual until 2020 and 20% (additional 10% with international support) in 2030 (VGGS 2012, p.2). Importantly, “adequate funding from the state and local budgets” (VGGS 2012, p.12) to finance the VGGS’ implementation is promised. Finally, all line ministries, state agencies and regional authorities are requested to revise their strategies according to the VGGS and to develop Action Plans for its effective implementation.

Policy documents	Year of approval	Ministry in charge	Fiscal Policy	Environ Policy	Climate Policy		Energy Policy	Econ Policy
					Adap-tation	Miti-gation		
National Target Program to Respond to CC	Dec 2008	MoNRE (Nat.Res.& Environ)			●			
Law on econ. & efficient use of energy	June 2010	MOIT (Industry & Trade)					●	●
Environmental Protection Tax Law	Nov 2010 (tax: Jan 2012)	MOF (Finance)	●	●				
Master Plan for Power Develop. (VII)	July 2011	MOIT (Industry & Trade)					●	●
National CC Strategy	Dec 2011	MoNRE (Nat. Res. & Environ)		●	●	●	●	
Vietnam Green Growth Strategy	Sept 2012	MPI (Planning & Investm.)	●	●	●	●	●	●

**Table 2: Overview on selected recent climate and energy related policies in Vietnam indicating addressed policy fields. Note that dark-blue dots mark laws, lighter dots mark strategies and plans that require further implementation.**

Before the NCCS was approved Vietnam had already launched several ‘indirect’ climate policies dealing with energy use and natural resources, though not mentioning climate change mitigation explicitly as an objective. By the end of the year 2010, the *Environmental Protection Tax Law* (discussed below) was passed (EPT 2010). Simultaneously, the Vietnamese government made efforts to reform the power sector by launching the *Law on Economical and Efficient Use of Energy* in June 2010 and the *National Master Plan for Power Development* (Power Master Plan VII) in July 2011. Table 2 gives an overview of the different climate-related policies that have been passed from 2008 to 2012, indicating the ministries in charge and sketching the policy fields they mainly address. For a more detailed overview on energy policies in Vietnam see Do and Sharma (2011).

More specifically, Vietnam has announced several particular *policies targeting new and renewable energies* as well as *policies concerning the pricing of energy, fossil fuels or carbon* that will be discussed in the following. Table 3: Overview on new and renewable energy policies as well as fossil fuel and emission pricing policies in Vietnam.

at the end of this section summarizes existing and announced policies, defined targets, measures already implemented, the current state of the policy as well as envisaged measures and objectives.

#### *Policies targeting new and renewable energies*

The *National Energy Development Strategy* of 2007 aims to achieve a share of new and renewable energy (excluding large hydro > 30 MW) in total commercial primary energy of about 5% in 2020 (NEDS 2007), confirmed by the NCCS (2011) setting targets of 5% in 2020 and 11% in 2050. The Master Plan for Power Development of 2011 adds explicit targets for electricity production by envisaging a share of renewable energy sources (excluding large hydro) in total electricity production of 4.5% in 2020 and 6% in 2030, and several specific targets of capacity increases for different types of renewable energy technologies and large hydro (Power Master Plan VII 2011).

Despite the implementation of economic incentives such as a feed-in tariff for wind energy of one US cent/kWh additional to the standard electricity price for households<sup>2</sup> (Socialist Republic of Vietnam 2011b) as well as tax exemptions and preferential loans, private investment in renewable energy has remained low as stated by several interviewees. RE lacks competitiveness inter alia due to very low prices for conventional energy and market power of SOEs. Reforms in energy pricing and steps towards market liberalization are envisaged, which might facilitate private investments and the diffusion of renewable energy technologies (see also Nguyen and Ha-Duong 2009 for the case of wind energy).

Finally, the first nuclear power plant in Vietnam is supposed to enter into operation in 2020. In 2030, 10% of electricity production is planned to be covered by nuclear power (Power Master Plan VII 2011). The construction of two nuclear power plants is currently prepared in cooperation with Japan and Russia.

#### *Policies concerning the pricing of energy, fossil fuels or carbon*

The energy sector is characterized by market dominating SOEs as well as by significant subsidies for fossil fuels. Several policy documents and strategies envisage to gradually restructure the power market, which includes equitizing SOEs and to eventually adapt electricity prices to long-term marginal costs (Power Master Plan VII 2011, NCCS 2011). That is confirmed by announcements of a gradual phase out of (indirect) fossil fuel subsidies – mainly via government compensations to SOEs for losses due to regulated energy prices – in the Green Growth Strategy (VGGS 2012). As a first step, EVN has been granted the government’s permission since 2011 to adjust electricity prices quarter-annually by a maximum of 20% per year (see also UNDP 2012). However, first price increases realized by EVN have been only 17% on average in 2011 remaining below inflation rates and leading to decreasing real prices (see UNDP 2012), and amounted to only about 10% in 2012. Although rates for poor households protected by a block tariff (VND 993 per kWh for the first 50kWh) have not been raised those price hikes have evoked public resentment (see e.g. Ngan Anh 2013, Tuoi Tre News 2013, Van Nam 2013) also due to impacts of electricity price increases on inflation (see Nguyen 2008).

Discussed for the first time in 2004 (Nguyen 2012), the *Environmental Protection Tax* (EPT) came into effect in January 2012 levying a tax on a broad range of fossil fuels including oil products and coal (EPT 2010). Though the EPT is also levied on some other environmentally harmful substances such as plastic bags and pesticides it can be considered as a comprehensive energy tax (see Rodi et al. 2012). Currently, the EPT cannot be called a climate policy instrument as tax rates disregard carbon content of taxable objects, thus possibly leading to a shift to more carbon-intensive fuels like coal (see e.g. Willenbockel 2011). Moreover, tax rates are currently set very low and partially substitute preexisting fees, such that the EPT is not likely to have resulted in additional incentives to reduce emissions.

In its Green Growth Strategy Vietnam announced to move towards “trading of certified greenhouse gas emissions, carbon tax and fees and levies” (VGGS 2012, p.12). In a World Bank project (“Partnership for Market-Readiness”) the feasibility of several pricing instruments such as a carbon tax, sectoral crediting or an emissions trading scheme are assessed. Vietnam’s interest in market-based instruments is underlined by Prime Minister Nguyen Tan Dung’s approval of a plan to implement an emissions trading scheme by the year 2020 (see e.g., Cheeseman 2012).

An important prerequisite for pricing emissions is a functioning monitoring, verifying and reporting (MRV) scheme, which Vietnam is currently lacking. In cooperation with the Japan International Cooperation Agency (JICA) Vietnam is currently working on establishing a regular GHG emission inventory, which had already been announced in the NCCS in 2011.

Table 3 provides an overview on the status of measures with regard to renewable energy and pricing of emissions or fossil fuels.

	<b>New and Renewable Energy (RE) Policy</b>	<b>Fossil Fuel and Carbon Pricing Policy</b>
<b>Targets defined</b>	<ul style="list-style-type: none"> <li>• Increase share of RE from 3.5% of total <i>electricity</i> production in 2010 up to 4.5% in 2020 and 6.0% in 2030 (total power plant capacity RE share of 9.4% in 2030)</li> <li>• Specific targets for different technologies</li> </ul>	<ul style="list-style-type: none"> <li>• Decrease GHG intensity by 8 – 10% (compared to 2010)</li> <li>• Reduce GHG emissions from energy activities (VGGs 2012) : <ul style="list-style-type: none"> <li>- 2020: 10% below BAU (20% with international cooperation)</li> <li>- 2030: 20% below BAU (30% with international cooperation)</li> </ul> </li> </ul>
<b>Measures already implemented</b>	<ul style="list-style-type: none"> <li>• Feed-in tariff for wind energy of one UScent/kWh financed by an Environmental Protection Fund</li> <li>• Economic incentives (e.g. tax exemptions, preferential loans)</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Protection Tax on several fossil fuels (among other substances)</li> </ul>
	<ul style="list-style-type: none"> <li>• First steps concerning phase out of fossil fuel subsidies: government permission to adjust electricity prices in quarterly steps by a maximum of 20% per year</li> </ul>	
<b>Work “in progress”</b>	<ul style="list-style-type: none"> <li>• 2 nuclear power plants in preparation</li> </ul>	<ul style="list-style-type: none"> <li>• Partnership for Market-Readiness with World Bank to assesses the feasibility of several policy instruments</li> <li>• Establishing a regular GHG emission inventory</li> </ul>
	<ul style="list-style-type: none"> <li>• Gradual phase out of indirect fossil fuel subsidies</li> <li>• State Owned Enterprises (SOE) Reform</li> </ul>	
<b>Envisaged measures/objectives</b>	<ul style="list-style-type: none"> <li>• Competitive power sector</li> <li>• Equitization of SOEs (i.e. transformation of state-owned enterprises into shareholding companies, see Do and Sharma 2011 on details)</li> <li>• Establishment of an ‘appropriate’ pricing system of energy by the year 2015 (prices equal marginal costs of production)</li> </ul>	
	<ul style="list-style-type: none"> <li>• technology transfer for particularly advanced technologies</li> </ul>	<ul style="list-style-type: none"> <li>• “trading of certified greenhouse gas emissions, carbon tax and fees and levies” (VGGs 2012, p.12)</li> <li>• Domestic Emission Trading scheme plans for 2020 announced</li> </ul>

**Table 3: Overview on new and renewable energy policies as well as fossil fuel and emission pricing policies in Vietnam.**

### **3.2 International positioning**

Vietnam has traditionally insisted on its status as a developing country opposing any internationally binding obligations and emphasizing the UNFCCC’s principle of ‘common but differentiated responsibilities’. In this respect, at COP 16 (2010, Cancún) the Vietnamese Delegation urged industrialized countries to make more ambitious commitments and support developing countries with climate finance and technology transfer, particularly highlighting Vietnam’s high vulnerability to climate change (Socialist Republic of Vietnam 2010).

A year after in Durban, the head of the Vietnamese delegation, Dr. Tran Hong Ha, decided to revise his speech in short notice; while still stressing the ‘principle of common but differentiated responsibilities’, Dr. Ha stated that “*Vietnam [...] believes that both developed and developing countries must take further actions*” (Socialist Republic of Vietnam, 2011a, p.1). Furthermore, he announced that Vietnam takes it as its responsibility to develop a low carbon economy and has started to do so with own national resources (pointing at the NCCS approved shortly before), though hoping for further support by developed countries. This shift in discourse towards a stronger focus on emission reductions on the international level of climate policy making came as a surprise to many international donors according to several interviewees.

Vietnam’s domestic policies are thus reflected in the international arena, with the National Climate Change Strategy obviously marking a turning point in the discussion. In the following section, we aim to analyze the underlying motivations for Vietnam to formulate climate policies dealing with mitigation

## **4 Motivations for Vietnam to voluntarily adopt climate change mitigation measures**

This section outlines motivations for Vietnamese policy makers to introduce policies discussed in the previous section on the basis of the conducted interviews. The identified drivers can be differentiated in ‘domestic factors’ occurring *inside* Vietnam and falling into the responsibility of domestic policy, and ‘external factors’ being determined outside the country but relevant for Vietnam. Domestic factors include Vietnam’s vulnerability to climate change, promoting economic growth and restructuring the economy, energy security issues and local air pollution. External factors include the role of other countries and donors as well as the international policy environment, i.e. international climate negotiations. Finally, using Kingdon’s (1995) ‘Multiple Streams Framework’, we explain how a combination of changes occurring for each of these underlying motivational factors resulted in the observed policy shift towards measures to mitigate GHG emissions.

### **4.1 Domestic factors**

#### *Vulnerability*

Characterized by a long coastline where the majority of the population is located, Vietnam is particularly sensitive to climate changes that lead to intensified tropical storms and sea-level rise endangering agricultural production, particularly in the Mekong delta, which is the heart of Vietnam’s rice production (MoNRE 2009, Wassmann et al. 2004). A widely cited report by the World Bank identified Vietnam as one of the most adversely affected countries for different scenarios of sea-level rise for all indicators considered (Dasgupta et al. 2007, 2009) for a

sample of 84 developing countries.<sup>3</sup> Additionally, climate-change induced droughts already constitute a recognizable impact for Vietnam (Cruz et al. 2007).

It is thus not surprising that climate change has received considerable attention in the media and has resulted in the formulation of policies to respond to it. However, it is less clear why vulnerability to climate change should provide an incentive for Vietnam to reduce emissions. As the country's emissions only accounted for about 0.4% of global emissions in 2011 (EDGAR 2013), any reduction would have a rather small effect on the change in global temperature and hence on the impacts of climate change borne by Vietnam. Yet, in the interviews conducted, the majority of respondents mentioned Vietnam's vulnerability as one of the main reasons for adopting policies targeted at climate change mitigation, such as the Green Growth Strategy discussed in Section 3.

One possible explanation – which eludes empirical testing – is that policy makers have adopted mitigation measures as a kind of 'symbolic policy', in order to convey the impression that public concerns are being addressed, even if resulting policies might remain ineffective with respect to reduction of emissions and climate change impacts. In any case it seems plausible that the country's vulnerability has played an important role in raising awareness and putting climate change on the political agenda.

#### *Promoting economic growth and restructuring the economy*

After years of spectacular economic growth resulting in Vietnam's ascension to lower middle income country status (according to World Bank classifications), growth rates have decreased markedly in recent years (see World Bank 2012). Consequently, policy makers fear that the country could run into a 'middle-income trap' marked by economic stagnation after an extensive period of rapid growth, obstructing the official goal of becoming a modern industrialized country by 2020 (SEDS 2011). In our interviews, we found a broad agreement among respondents that maintaining economic growth is the prime objective of the Communist Party. Some interviewees also indicated that failure to achieve this aim might create public unrest, which could eventually jeopardize the Party's rule.

We also encountered a wide-spread perception that the green policies under study could actually be an important ingredient of a new 'development model' that fosters economic growth by increasing productivity through more efficient use of natural resources and the adoption of modern technologies (see Hallegatte et al. 2012). Given the considerable inefficiencies that prevail throughout the economy – with sizable energy subsidies handed out through state-owned enterprises via prices for electricity and fossil fuels set by the government being probably the most salient examples (UNDP 2012) – it seems plausible that a range of 'no-regret' mitigation options exist that pay off financially (at least in the long term) even if environmental benefits are not included in the calculation. This is confirmed by a recent World Bank study, which identifies a theoretical potential of reducing national GHG emissions in 2015 by up to 133Mt CO<sub>2</sub>-eq. below the business-as-usual projection<sup>4</sup> at negative or zero costs, mostly in the power sector (World Bank 2011).

From these considerations the question emerges why no steps to exploit these efficiency gains have been undertaken previously. Our interview partners repeatedly emphasized important obstacles hindering the implementation of policies to tackle no-regret options (see e.g. Staub-Kaminski et al. in press for an overview of obstacles to climate policy). According to our interviews, important obstacles are: first, appropriate information on saving potentials and the required technologies and volumes of investment; second, institutional and political obstacles, such as resistance by powerful interest groups; third, lack of up-front finance to meet initial investments that would pay off over a longer time-horizon (which is especially pronounced in the current situation of high budget deficits and a looming banking crisis); fourth, a lack of capacity to draft the required legal documents and administer their implementation.

### *Energy security*

Until today, Vietnam has covered its fossil energy demand majorly by domestic sources. However, in recent years export rates have decreased (for coal and oil) or have ceased entirely (for natural gas) (see IEA 2012). Depletion of domestic resources in combination with the projected rapid increase in energy demand is expected to turn the country into a net importer of both in the near future (Toan et al. 2011, Nguyen and Ha-Duong 2009) and a net energy importer by around 2015 (Do and Sharma 2011). This anticipated development raises significant concerns with regard to energy security (see IPCC 2011 for different dimensions of energy security). First, several interview partners mentioned that policy makers see import dependence as exposing the country to volatility of world market prices and make it prone to disruptions of energy supply. Second, as the domestic price for fossil fuels is set below the world market price, for imports this price difference would have to be met by public sources, putting pressure on an already strained government budget (in 2012, the budget deficit amounted to 3.9% of GDP, and public debt to 48.2% of GDP, CIA Factbook 2013) and – in addition to the distortionary effects of subsidies – redistributing money away from the Vietnamese economy to fossil fuel exporters. Hence, as repeatedly stated by our interview partners, a shift of economic activity towards less intensive energy use or substitution of fossil fuels with alternative sources of energy – such as renewables – is regarded as highly desirable from the perspective of increased energy security.

### *Local air pollution*

The co-benefits of improved ambient air quality resulting from climate change mitigation measures have received considerable attention (GEA 2012) and it is sometimes argued that these benefits could be important for the decision whether to reduce the use of fossil fuels (Nemet et al. 2010). On the Environmental Performance Index, which provides a comparison of environmental quality across countries, Vietnam ranks among the lowest ten nations in the world with regard to health-related air quality (EPI 2012) and indeed, local air pollution was seen as a major public health problem by practically all our interview partners. Against this background, it is quite surprising that according to our interviews it did not have a major

influence on the formulation and adoption of emission reduction policies outlined in Section 3 (Interviews), and we did not encounter a convincing explanation why reduction of local air pollution has not received more emphasis as a reason in favor of adoption measures to abate GHG emissions.

## **4.2 External drivers**

### *The role of other countries and donors*

Arguably, policy formulation in one country can be influenced by policies that have previously been adopted in other countries by what Steinberg (2003) describes as policy transmission or translation. Several interviewees highlighted South Korea, a country pursuing sustainable socio-economic development within its National Strategy for Green Growth (see e.g. OECD 2010), to serve as a role model for Vietnam with respect to becoming an industrialized country by 2020 (SEDS 2011). Yet, it should be noted that at the time of adopting its Green Growth Strategy, South Korea had already achieved high-income status. Even though these experiences cannot be directly transferred to Vietnam and might not even have been decisive for Vietnam's decision to pursue unilateral climate measures, our interview partners repeatedly mentioned that policies in other countries had an influence on the choice of specific policy instruments (e.g. a pollution tax, or feed-in tariffs for renewable energy). This is corroborated by the fact that prior to implementation, Vietnamese officials embarked on extensive fact-finding missions to learn from other countries' experiences (Interviews). According to one high-ranking official, "Vietnam tries to learn from other countries but does not copy anyone".

Further, as mentioned in most interviews, Vietnam's economy is to a certain degree dependent on official development assistance (ODA) from bi- and multilateral donors. In recent years, ODA accounted for up to 15% of the government budget (Interviews) and about 3% of GDP (World Bank 2013). With Vietnam having achieved low-middle income status, some donors have announced to reduce their activities in or completely withdraw from Vietnam in all but few selected areas (e.g. the UK's Department for International Development (DFID) will exit Vietnam in 2016; see DFID, undated). In parallel, several interview partners emphasized that donors' aid portfolios have increasingly focused on sustainable development and green growth, such that new funding opportunities for international support might arise for Vietnam in these areas.

Cooperation with donors seems to be perceived as a means to tackle some of the obstacles to reaping negative-cost options. That is, by carrying out workshops and background studies, donors helped to put climate change on the political agenda and assisted in building capacities required for formulating strategies and objectives as well as designing policy instruments. For instance, the United Nations Development Program (UNDP) has supported Vietnam with detailed studies identifying the structure and amount of fossil fuel subsidies as well as potentials to reduce them and also provided advice in drafting the VGGs. Further, Germany's "Gesellschaft für Internationale Zusammenarbeit" (GIZ) provided advice on the Environmental



Protection Tax as well as on feed-in tariffs for renewable energy (see GIZ, undated). Finally, cooperation with donors is also regarded as a potential means to spur technology transfer and thus to help modernizing the economy (Interviews). As a consequence, cooperation with donors on Green Growth policies is often evaluated to provide significant benefits with little or no associated costs or risks. Several interviewees saw an important role for development assistance in further identifying co-benefits and removing barriers for specific policies.

### *The international policy environment*

Regarding global climate negotiations, several Vietnamese policy makers interviewed mentioned “to take responsibility” and “to contribute to global efforts against climate change” as enshrined in the VGGS and the NCCS as a motivation for climate policy. Some interviewees pointed out that by being a front-runner Vietnam might also motivate other countries to follow its example and pledge to reduce emissions. However, they also stated that this was not a major motivation for Vietnam to put forth green policies as it perceives itself as a too small player to influence others’ behavior.

It seems more plausible that, as stated by several of our interlocutors, a strong impression of a ‘first mover advantage’ in attracting climate finance prevails among Vietnamese policy makers. That is, it is widely presumed that countries that are first to bring climate policies on the table will attract a more than proportional share of the financial resources available for climate change mitigation. In particular, Indonesia, the Philippines, and Thailand were frequently mentioned to compete with Vietnam for climate finance. Not surprisingly, climate finance plays a central role and policy makers are exploring means to mobilize resources via several avenues, or, as one official put it: “Vietnam is trying to keep all options open”. The Green Climate Fund seems to be regarded as the most promising source, and first steps to develop frameworks for ‘nationally appropriate mitigation actions’ (NAMAs) have been undertaken, which require the government of the recipient country to assess financing needs, possible barriers, and policy measures towards a low-carbon growth strategy that is in line with overall development objectives (see UNFCCC 2009). The Prime Minister’s announcement to implement an emissions trading scheme by 2020 suggests that Vietnam takes preparatory steps to obtain finance from selling emission permits on either a global carbon market or by linking its emission trading system to other countries’ domestic markets. The fact that climate finance from international sources is predominantly geared towards mitigation yields some explanatory power for the recent shift from adaptation to a strategy including mitigation and adaptation mentioned above.

Finally, some interviewees highlighted that constructive engagement in the arena of international climate change mitigation is seen to contribute towards establishing a good international reputation for Vietnam as a ‘reliable partner’ in the region, which could then have positive spillovers to other policy arenas, such as trade negotiations or investment treaties (See Rose and Spiegel 2009 for a theoretical model). According to Koos Neefjes (UNDP), this is in line with Vietnam’s aim to be perceived as showing commitment and contributing to global efforts to tackle climate change. From this perspective, it also seems likely that efforts to

address energy subsidies in Vietnam (see Section 3) have been strengthened by the renewed interest on energy subsidy reform on the international level (e.g. G20 2010, IEA 2011)

### **4.3 Understanding the policy change**

Many of the motivational factors identified above are routed in policy objectives other than climate change mitigation, such as energy security, economic restructuring and access to finance. That is, climate change mitigation arises mainly as a co-benefit rather than the main goal of the associated policies and there seem to be numerous possibilities to benefit from 'no-regret' options to reduce emissions. As these benefits had already been present before Vietnam announced or implemented the policies discussed in Section 3, the observed policy shift towards voluntary emission reductions has to be explained by either an increase of their benefits or a decrease of their costs (or of obstacles to their implementation). This sub-section analyzes such changes in underlying motivational factors along the lines of Kingdon's (1995) 'Multiple Streams Framework'.

Kingdon (1995) identifies three streams - 'problems', 'policies', and 'politics' - that in combination determine policy formation. Problems are conditions identified by policy makers or the public as issues that need to be addressed. Policies are political ideas that could serve as potential solutions that need to be tested for feasibility in the national context. Politics describe factors as party ideology or the national mood. To explain policy change one needs to understand developments in each single stream as well as their interplay.

The problem stream predominantly contains factors that according to our definition are labeled as domestic. In response to a number of international reports (Stern 2007, IPCC 2007, Dasgupta et al. 2007), climate change impacts, in particular sea-level rise, have been lifted high on the Vietnamese political agenda. The adoption of the NTP-RCC (2008) as well as a MoNRE (2009) report on vulnerability to sea-level rise can be seen as a direct reaction to them. In parallel, economic growth slowed down significantly as a result to the global economic crisis (from around 8% per pre 2007 to 5% in 2009, World Bank 2013) and structural deficits of the Vietnamese economy (including inefficiencies of domestic industrial production, price controls, and a high share of SOEs) were increasingly recognized as obstacles to economic development, however difficult to overcome due to political economy reasons. With domestic fossil energy resources becoming increasingly scarce and estimates predicting that Vietnam will turn into a net-importer of fossil energy carriers in the near future, additional concerns arose with respect to energy security especially in view of the expected increase in energy demand. At the same time, increasing budget deficits of up to 8% of Vietnam's GDP in 2010 (see ADB 2011) put additional pressure on the high subsidies on fossil fuels and decreased the tolerance for loss-making SOEs. Furthermore, environmental degradation and air pollution have eventually been recognized as serious health concerns. Finally, with Vietnam achieving lower middle income status in 2009 while still being highly dependent on ODA, policy makers needed to deal with a gradual phase out of 'conventional' ODA.

Given these pressing problems, Vietnamese policy makers were searching the policy stream for potential solutions, which are mainly related to factors that we label as external. Donors supporting the policy process in Vietnam have proposed different ideas, which were then examined for their feasibility in the national context. Furthermore, Vietnamese policy makers have observed Green Growth implemented in some neighboring countries (particularly South Korea) as a reaction to the global economic crisis. So-called 'policy entrepreneurs' from important donors like UNDP and World Bank revealing existing 'no-regret' mitigation potentials while offering support to overcome barriers have potentially stimulated the adoption of the Green Growth Strategy in Vietnam (interviews). Against this background, the Vietnamese government identified Green Growth as a new potential policy to address several problems at once while – at least at first glance - dissolving the trade-off between economic development and environmental protection. As some important donors had furthermore announced to restructure their aid portfolios towards mainstreaming environmental and climate change issues, the available choice set has further shifted towards greener solutions. Finally, realizing that focusing on adaptation in international negotiations has not attracted significant funding from international sources, Vietnamese policy makers seem to perceive mitigation actions to be more promising in that respect, i.e. "the money does not lie in adaptation but in mitigation", as one interviewee put it. Arguably, this shift has been accelerated by a perceived first mover advantage for potential recipients of climate finance.

The adoption of climate change mitigation policies was furthermore supported by favorable conditions in the politics stream. Policy makers (including the government and the CPV) seem to have become apprehensive of people becoming increasingly discontent due to the economic situation but also to increasing environmental degradation and exposure to climate change impacts. Interviewees also mentioned an increasingly negative attitude of the people towards badly managed state-owned enterprises and corruption.

The considerations above suggest that Vietnam's policy change cannot be explained by a change of any single motivational factor; rather, it seems likely that their interaction has opened a 'window of opportunity' - a 'problem-window' in the words of Kingdon - for policy change. Being increasingly concerned of being stuck in a middle-income trap, a high budget deficit, fundamental structural problems of its economy, its high dependence on ODA as well as increased awareness of climate issues, Vietnamese policy makers seem to have been exposed to increasing pressure to find policies as potential solutions. Therefore, it seems likely that they have perceived green growth and climate change mitigation policies as a way to modernize the economy and to gain access to funding, technology and capacity building from donors. That is, the impression conveyed in the interviews strongly points in the direction that the main benefit expected to result from green policies is not seen in improved environmental quality, but rather in an improved growth performance; thus, emission reductions are seen to be a co-benefit of these policies. Given the sizable potential for efficiency improvements in the industry and power sector, it seems plausible that at least some negative-cost mitigation options exist that would indeed decrease emissions while at the same time raising economic output.

## 5 Discussion and Conclusions

Vietnam has recently announced and partially implemented a variety of policies relevant to climate change mitigation. From the perspective of standard economic theory, this comes as a surprise. Though Vietnam's stake in mitigating climate change is high due to its considerable vulnerability, standard collective action theory predicts that without a globally binding and externally enforced regulation Vietnam has few incentives to engage in climate policy, as unilateral emission reductions would have only little effect in reducing climate change impacts due to its relatively small share in current global emissions.

Yet, as pointed out by Ostrom (2010), unilateral climate policies, such as those recently adopted or announced in Vietnam, can be understood by taking multiple levels of policy making and additional benefits of emission reductions into account. From this perspective Green Growth is regarded as a means to address issues such as declining rates of economic growth, restructuring the economy, addressing energy security concerns and accessing international finance at the same time, while emission reductions *per se* do not seem to be a major goal of the policies but rather a co-benefit of policies aiming to promote other goals in the first place, as it has also been done by some industrialized countries before (see Rabe et al.2006).

From a pure climate perspective the important question is not only *why* emission reductions are decided on by policy makers, but also *whether* they will be realized. First, targets for energy sector emissions are either formulated in relative terms in the form of emission intensity targets or in absolute terms compared to a business-as-usual scenario based on emission projections. Second, the majority of the policies under consideration are so far only strategies or envisaged measures whose realization yet remains to be seen. The few policy instruments that are already implemented, like the environmental protection tax and the feed-in tariff for wind power, can currently be expected to result in relatively small emission reductions. Therefore, the question whether Vietnam has serious ambitions to engage in climate policy is highly relevant.

Given that emissions from energy activities are expected to more than double by 2020 and quadruple by 2030 compared to 2010 levels (see Socialist Republic of Vietnam – MoNRE 2010) it is obvious that even if higher-bound reduction targets of 20% in 2020 and 30% in 2030 compared to BAU will be achieved, the result will still be a substantial increase in overall emissions compared to today's level. Yet, even though they may be considered to be of a limited extent, they very likely represent real reductions that contribute towards climate change mitigation and that would not be realized without the corresponding policies in place. Especially in view of the considerable negative-cost or low-cost mitigation options identified by the World Bank (2011), the potential for emission reductions seems to be significant. However, as Vietnam's main motivation seems to be reaping ancillary benefits not directly related to climate change mitigation, it is unlikely to go beyond those 'low hanging fruits' in its emission reduction efforts. Additionally, while most measures have been formulated as abstract strategies whose translation in concrete policies is still underway, they have established legal and institutional

structures such as the Committee on Climate Change that can serve as foundations for further efforts. The same holds for the EPT that had originally been formulated to mainly address the waste of resources and local environmental degradation. Resistance from industry and general concerns that the tax would further burden the already ailing economy and spur inflation led Vietnamese policy makers to finally decide on low tax rates when the tax entered into effect in January 2012. Yet, the EPT and Power Sector Reform plans can be seen as a basis for the future implementation of the VGGS.

However, there are numerous factors that will be crucial for the success of these policies. First, reforms announced in the electricity market, particularly with respect to pricing structures, are at the heart of a potential success. It is difficult to judge from the outside how different forces in Vietnam and its Communist Party will react on electricity prices to increase and subsidies to be cut. The fact that EVN does not take full advantage of the maximum price increases for electricity permitted by the government may be regarded as an indicator for increasing internal debates and fear of spurring inflation. Second, the reform of SOEs might raise distributional conflicts. Whether party cadres that profit from the current system will follow the party leadership, which seems to be committed, remains to be seen, but has been possible in the past (cp. Hayton, 2010). However, the pressure on Vietnamese policy makers facing the high budget deficit, a banking crisis and stagnating growth rates could be sufficient to push through the necessary reforms despite the resistance of powerful interest groups.

Given the opportunity to exploit negative cost options, address multiple goals, and realize potential co-benefits, Vietnam seems to have a serious interest in putting its announced climate policies successfully into practice. This is for example indicated by the regular meetings of the newly established Committee for Climate Change, which consists of high ranking representatives of all involved ministries. Furthermore, the party resolution on climate change (Central Committee of CPV 2013) approved in April 2013 signals that the Communist Party has codified the importance of climate change and environmental policy. In a newspaper interview the Director General of ISPONRE, Nguyen Van Tai, states that the “resolution is among the highest-level political documents in Viet Nam in the way that it sets out the direction that all the relevant laws and policies have to abide” (Viet Nam News 2013).

There are reasons to believe that there is a serious interest by Vietnam's policy makers to transform their announced strategies into binding national laws. Even though we argue in this paper that it has been the combination of country specific conditions leading to the adoption of climate change mitigation policies in Vietnam, some general insights could still be applicable to other developing countries facing similar issues. Taking multiple objectives and potential co-benefits into account could increase the willingness of other developing countries to voluntarily engage in mitigation actions even without a global agreement to be in place. As a consequence, a major task for international climate policy will be to identify how climate policies would affect different countries' objectives and their motivations to adopt climate measures. In particular, international donors could strengthen voluntary climate policies in developing countries by supporting them to overcome barriers for exploiting negative cost options and raising awareness for potential co-benefits. Such measures could in the short- and medium-term help to dampen the expected steep increase in these countries' emissions, while in the long-term they could

provide a basis to establish more wide-ranging global cooperation in order to achieve a comprehensive climate agreement.

## 6 References

- ADB (2011): Basic Statistics 2011. Economics and Research Department, Asian Development Bank. <http://www.adb.org/publications/basic-statistics-2011> [accessed 20/10/2013].
- Ang, B.W. (2004): Decomposition analysis for policymaking in energy: which is the preferred method? *Energy Policy* 32, 1131–1139.
- Atteridge, A., M.K. Shrivastava, N. Pahuja and H. Upadyay (2012): Climate policy in India : What shapes international, national and state policy? *Ambio* 41: 68-77.
- Barrett, S. (1994): Self-enforcing international environmental agreements. *Oxford Economic Papers* 46, 878-894.
- Brennan, G. (2009): Climate Change: A rational choice politics view. *The Australian Journal of Agriculture and Resource Economics* 53, 309-326.
- Carraro, C., and D. Siniscalco (1993): Strategies for the international protection of the environment. *Journal of Public Economics*, 52(3): 309-328.
- Central Committee of Communist Party Vietnam (2013): Resolution on "Active response to climate change, strengthening resource management and environmental protection" adopted by the 7<sup>th</sup> session of the Central Committee of the CPV.
- Cheeseman, G.M. (2012): Vietnam to launch National Emissions Trading Scheme by 2020, published on Triplepundit, <http://www.triplepundit.com/2012/12/vietnam-launch-national-emissions-trading-scheme-2020/> [accessed 08/08/2013].
- CIA Factbook (2013): The World Factbook, Country Vietnam, Central Intelligence Agency, <https://www.cia.gov/library/publications/the-world-factbook/geos/vm.html> [accessed 10/10/2013].
- Coxhead, I. and N. V. Chan (2011): Vietnam's new environmental tax law: What will it cost? Who will pay?, University of Wisconsin-Madison, Department of Agricultural and Applied Economics, Staff Paper No. 561.
- Cruz, R.V., H. Harasawa, M. Lal, S. Wu, Y. Anokhin, B. Punsalmaa, Y. Honda, M. Jafari, C. Li and N. Huu Ninh (2007): Asia. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 469-506.
- Dasgupta, S., B. Laplante, C. Meisner, D. Wheeler and J. Yan (2007): The impact of sea level rise on developing countries: A comparative analysis. World Bank Policy Research Working Paper 4136, World Bank, Washington, DC.
- Dasgupta, S., B. Laplante, C. Meisner, D. Wheeler and J. Yan (2009) The impact of sea level rise on developing countries: A comparative analysis. *Climatic Change* 93(3): 379–388.

- DFID (undated): <https://www.gov.uk/government/world/organisations/dfid-vietnam> [accessed 31/05/2013].
- Do, T. M. (2011): Analysis of future energy pathways for Vietnam. Dissertation. Sydney: Faculty of Engineering and Information Technology. University of Technology, Sydney. Available online at: <http://epress.lib.uts.edu.au/research/bitstream/handle/10453/20319/02Whole.pdf?sequence=2> [accessed 24/05/2013].
- Do, T. M. and D. Sharma (2011): Vietnam's energy sector: a review of current energy policies and strategies. *Energy Policy* 39, 5770-5777.
- Dubash, N.K. (2013): The politics of climate change in India: narratives of equity and cobenefits. Wiley Interdisciplinary Reviews, *Climate Change* 4(3): 191–201.
- EDGAR (2013): Emission Database for Global Research. Available Online: <http://edgar.jrc.ec.europa.eu/overview.php?v=CO2ts1990-2011>. [Accessed 03/06/2013].
- EPI (2012): Environmental Performance Index. Yale University. Available online at <http://epi.yale.edu/epi2012/countryprofiles>. [accessed 24/05/ 2013].
- EPT (2010): Law Environmental Protection Tax, National Assembly, Socialist Republic of Vietnam, No: 57/2010/QH12, Hanoi, Vietnam. Available online at: [http://vbqppl.moj.gov.vn/vbqpq/en/Lists/Vn%20bn%20php%20lut/View\\_Detail.aspx?ItemID=10487](http://vbqppl.moj.gov.vn/vbqpq/en/Lists/Vn%20bn%20php%20lut/View_Detail.aspx?ItemID=10487) [accessed 31/05/2013]
- Escribano, G. (2013): Ecuador's energy policy mix: Development versus conservation and nationalism with Chinese loans. *Energy Policy* 57, 152-159.
- Fortier, F. (2010): Taking a climate chance: A procedural critique of Vietnam's climate change strategy. *Asia Pacific Viewpoint* 51 (33), 229-247.
- G20 (2010): Toronto Summit Declaration. <http://epe.lac-bac.gc.ca/100/206/301/faitc-aecic/g20/2013-08-14/summit-sommet/2010/toronto-declaration-toronto1b0e.html?lang=eng> [accessed 10/10/2013].
- Garibaldi, J. A., H. Winkler, E. Lebre la Rovere, A. Cadena, R. Palma, J.E. Sanhueza, E. Tyler and M. Torres Gunfaus (in press): Comparative analysis of five case studies: commonalities and differences in approaches to mitigation action in five developing countries. *Climate and Development*, July 2013, DOI: <http://dx.doi.org/10.1080/17565529.2013.812031>.
- GEA (2012): Global Energy Assessment - Toward a Sustainable Future. Cambridge University Press, Cambridge, UK and New York, NY, USA and the International Institute for Applied Systems Analysis, Laxenburg, Austria.
- GIZ (undated): Development of Renewable Energy Project in Vietnam, Deutsche Gesellschaft für Internationale Zusammenarbeit, project homepage: <http://www.renewableenergy.org.vn/> [accessed 31/07/2013].
- Hallegatte, S., Heal, G. Fay, M., Treguer, D. (2012): From Growth to Green Growth - a Framework. NBER Working Papers 17841.
- Hayton, B. (2010): *Vietnam Rising Dragon*. New Haven and London: Yale University Press.



- Hübler, M., & Steckel, J. C. (2012). Economic growth, decarbonization and international transfers. *Climate and Development*, 4(2): 88-103.
- IEA (2011), World Energy Outlook, Chapter 14: Developments in Energy Subsidies, Paris: International Energy Agency.
- IEA (2012): World Energy Balances 2012. Paris: International Energy Agency [CD-ROM]
- IEA (2013): IEA fossil fuel subsidy data, Paris: International Energy Agency. Available online at: [www.oecd.org/dataoecd/41/46/48802785.pdf](http://www.oecd.org/dataoecd/41/46/48802785.pdf) [Accessed 24/05/2013]
- IPCC (2007): Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.
- IPCC (2011): IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation. Prepared by Working Group III of the Intergovernmental Panel on Climate Change [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, C. von Stechow (eds)]. Cambridge and New York: Cambridge University Press.
- Jaffe, A., Newell, R.G., Stavins, R.N. (2005): A tale of two market failures: Technology and environmental policy, *Ecological Economics* 54(2-3): 164-174.
- Jakob, M., Haller, M., & Marschinski, R. (2012): Will history repeat itself? Economic convergence and convergence in energy use patterns. *Energy Economics*, 34(1): 95-104.
- Jakob, M. and JC Steckel (in press): How climate change mitigation could harm development in poor countries. *WIREs Climate Change* 2013, doi: 10.1002/wcc.260
- Kaya, Y. (1990): Impact of Carbon Dioxide Emission Control on GNP Growth: Interpretation of Proposed Scenarios. Paper presented to the IPCC Energy and Industry subgroup, Responses strategies working group, Paris: mimeo.
- Kingdon, J. W. (1995): Agenda, alternatives, and public policies. New York: HarperCollins.
- MARD (2011): "DECISION on approving programme of Green House Gas (GHG) emissions reduction in the Agriculture and Rural Development sector up to 2020", No: 3119 /QĐ-BNN-KHCN , Ministry of Agriculture and Rural Development, Dec 2011, Hanoi.
- MoNRE (2009): Climate Change, Sea Level Rise Scenarios for Vietnam, Ministry of Natural Resources and Environment, Hanoi.
- NCCS (2011): Decision on approval of the National Climate Change Strategy. Prime Minister, Socialist Republic of Vietnam, No: 2139/QĐ-TTg, Hanoi.
- Nemet, G.F., Holloway, T. and Meier, P. (2010): Implications of incorporating air-quality co-benefits into climate change policymaking. *Environmental Research Letters* (5)1: 1-10, [doi:10.1088/1748-9326/5/1/014007](https://doi.org/10.1088/1748-9326/5/1/014007).
- NEDS (2007): Decision approving Vietnam's National Energy development Strategy up to 2020, with 2050 vision. Prime Minister, Socialist Republic of Vietnam, No. 1855/QĐ-TTg, Hanoi, Vietnam.

- Ngan Anh (2013): “EVN monopoly evokes resentment over price hike”, Thanh Nien News ,15 August 2013, <http://www.thanhniennews.com/index/pages/20130815160257-vietnam-evn-monopoly-evokes-resentment-over-price-hike.aspx> [accessed 14/10/2013].
- Nguyen, K.Q. (2007): Wind energy in Vietnam: Resource assessment, development status and future implications. *Energy Policy* 35:1405-1413.
- Nguyen, K. Q. (2008): Impacts of a rise in electricity tariff on prices of other products in Vietnam. *Energy Policy* 36, 3145– 3149.
- Nguyen, N. T. and M. Ha-Duong (2009): Economic potential of renewable energy in Vietnam’s power sector. *Energy Policy* 37:1601-1613.
- Nguyen, C.Q. (2012): Greening Đổi Mới: An Outlook on the Potential of Green Jobs in Vietnam. Friedrich-Ebert-Stiftung, Hanoi. Accessible under <http://www.fesvietnam.org/en/publications/16-economy-and-finance> [accessed 31/05/2013].
- NTP-RCC (2008): Decision on the approval of the National Target programme to respond to climate change, Prime Minister, Socialist Republic of Vietnam, No: 158/2008/QĐ-TTg, Hanoi, Vietnam.
- OECD (2010): Economic Survey of Korea. Paris: Organization for Economic Co-operation and Development (OECD). Summary available online at <http://www.oecd.org/korea/economicsurveyofkorea2010.htm> [accessed 12/06/ 2013]
- OECD (2013): Statistics on resource flows to developing countries. Paris: Organization for Economic Co-operation and Development (OECD). Available online at: <http://www.oecd.org/dac/stats/statisticsonresourceflowstodevelopingcountries.htm> [Accessed 12/05/2013]
- Ostrom, E. (2010): Polycentric systems for coping with collective action and global environmental change. *Global Environmental Change*, 20: 550 - 557
- Power Master Plan VII (2011): Decision on the approval of the national master plan for power development for the 2011-2020 period with a vision to 2030, Prime Minister, Socialist Republic of Vietnam, No. 1208/QĐ-TTg, Hanoi, Vietnam.
- Quitow, R., H. Bär and K. Jacob (2011): Asia at a Crossroads: New Trends in Environmental Governance in India, China, Vietnam and Indonesia. Environmental Policy Research Centre (FFU), Freie Universität Berlin.
- Rabe, B.G., M. Roman and A.N. Dubelis (2006): State Competition as a Source driving Climate Change Mitigation. <http://heinonline.org/HOL/LandingPage?collection=&handle=hein.journals/nyuev14&div=7&id=&page=>.
- Raupach, MR, G Marland, P Ciais, C. Le Quéré, JG Canadell, G Klepper, C. Field (2007): Global and regional drivers of accelerating CO2 emissions. *Proceedings of the National Academy of Sciences*, 104 (24): 10288 – 10293
- Rodi, M., K. Schlegelmilch and M. Mehling (2012): Designing environmental taxes in countries in transition: a case study of Vietnam. Published in: Handbook of Research on

- Environmental Taxation, Edited by Jane E. Milne and Mikael Skou Andersen, Edward Elgar Publishing.
- Rose, A.K. and Spiegel, M.M. (2009): Noneconomic Engagement and International Exchange: The Case of Environmental Treaties. *Journal of Money, Credit and Banking* 41(2-3), 337-363.
- SEDS (2011): Vietnam's Socio-Economic Development Strategy for the Period of 2011-2020, Socialist Republic of Vietnam, Hanoi.
- Socialist Republic of Vietnam – MoNRE (2003): Vietnam Initial National Communication under the UNFCCC, Hanoi.
- Socialist Republic of Vietnam – MoNRE (2010): Vietnam's Second National Communication to the UNFCCC, Hanoi.
- Socialist Republic of Vietnam (2010): Speech by H.E. Mr. Cao Duc Phat, Head of the Vietnam Delegation at the Joint High-Level Segment of the UNFCCC Conference, 9 December 2010, Cancún, Mexico.
- Socialist Republic of Vietnam (2011a): Speech by H.E. Dr. Tran Hong Ha, Head of the Vietnam Delegation at the High-Level Segment of the UNFCCC Conference, revised version, 8 December 2011, Durban, South Africa.
- Socialist Republic of Vietnam (2011b): Decision on the mechanism supporting the development of Wind power projects in Vietnam. Decision No.37/2011/QĐ-TTg, 29 June 2011, Hanoi.
- Staub-Kaminski, I., A. Zimmer, M. Jakob and R. Marschinski (in press): Putting Climate Policy into Practice: A Typology of Obstacles and Implications for Integrated Assessment Modeling. *Climate Change Economics*.
- Steckel, JC, M. Jakob, R. Marschinski, G. Luderer (2011): From carbonization to decarbonization? – Past trends and future scenarios for China's CO<sub>2</sub> emissions. *Energy Policy*, 39 (6): 3443 – 3455
- Steinberg, P.F. (2003): Understanding policy change in developing countries: The spheres of influence framework. *Global Environmental Politics* 3 (1),11-32.
- Stern, N. (2007): *The Economics of Climate Change: The Stern Review*. Cambridge, UK and New York, NY: Cambridge University Press.
- Sun, J. and Ang, B. (2000): Some properties of an exact energy decomposition model. *Energy* 25 (12), 1177 – 1188.
- Toan, PK, Nguyen M.B., Nguyen H.D. (2011): Energy supply, demand, and policy in Viet Nam, with future projections. *Energy Policy* 39 (11): 6814 – 6826.
- Townshend, T., Fankhauser, S., Aybar, S., Collins, M., Landesman, T., Nachmany, M. and Pavese, C. (2013): *The GLOBE Climate Legislation Study. THIRD EDITION. A Review of Climate Change Legislation in 33 Countries*.
- Tuoi Tre News (2013): "Vietnam's power price goes up by 5%", 1.Augsut 2013, <http://tuoitrenews.vn/business/11807/vietnams-power-price-to-hike-5pct-from-august-1>, [accessed 14/10/2013].

- UNEP Risoe (2013): UNEP Risoe Center, Energy, Climate and Sustainable Development. CDM project database, <http://cdmpipeline.org/> [accessed 31/07/2013].
- UNDP (2012): Fossil Fuel Fiscal Policies and Greenhouse Gas emissions in Viet Nam. Subsidies and taxes in Viet Nam's energy sector, and their effects on economic development and income distribution in the context of responding to climate change. Hanoi: United Nations Development Program Viet Nam.
- UNDP (2013): International Human Development Indicators, United Nations Development Program available at: <http://hdrstats.undp.org/en/indicators/103106.html>, [accessed 14/10/2013].
- UNFCCC (2009): Decision 2/CP.15, Copenhagen Accord, December 7-19 2009, United National Framework Convention on Climate Change, <http://unfccc.int/resource/docs/2009/cop15/eng/l07.pdf> [accessed 24/05/2013].
- UNFCCC (2011): Decision 1/CP.17, Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action, United National Framework Convention on Climate Change, <http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf#page=2> [accessed 24/05/ 2013].
- UNFCCC (2013): CDM Registry of the United Nations Framework Convention on Climate Change, <http://cdm.unfccc.int/Registry/index.html> [accessed 31/07{2013}].
- Van Nam (2013): "EVN hikes power prices 5% today", The Saigon Times Daily, 2 August 2013, <http://english.thesaigontimes.vn/Home/society/nation/30388/>, [accessed 14/10/2013].
- VGGS (2012): Decision on the approval of the National Green Growth Strategy. Prime Minister, Socialist Republic of Vietnam, No. 1393/QĐ-TTg, Hanoi, Vietnam.
- Viet Nam News 2013: "Party gets serious about climate change" of February 18 2013, <http://vietnamnews.vn/opinion/238125/party-gets-serious-about-climate-change.html>, [accessed 19/09/2013].
- Wassmann, R., NX Hien, CT Hoanh and TP Tuong (2004): Sea level rise affecting the Vietnamese Mekong delta: water elevation in the flood season and implications for rice production. *Climatic Change*, 66: 89 – 107 [as cited by Cruz et al. 2007].
- WGI 2012: World Governance Indicators. Washington, D.C.: The World Bank.
- Willenbockel, D. (2011): Environmental tax reform in Vietnam: An ex ante general equilibrium assessment. Available online at: [http://download.ecomod.net/system/files/EcoMod2011\\_VietnamEcoTax\\_0.pdf](http://download.ecomod.net/system/files/EcoMod2011_VietnamEcoTax_0.pdf) [Accessed 12/05/2013].
- World Bank (2011): Climate-Resilient Development in Vietnam: Strategic Directions for the World Bank. Hanoi: Sustainable Development Department. World Bank Vietnam Country Office.
- World Bank (2012): Taking Stock: An Update on Vietnam's Recent Economic Developments.
- World Bank (2013): World Development Indicators. Available Online at: [data.worldbank.org](http://data.worldbank.org) [Accessed 24/05/2013]

Zink, Eren (2013): *Hot Science, High Water – Assembling Nature, Society and Environmental Policy in contemporary Vietnam*. Nordic Institute of Asian Studies, Monograph series, no. 124, Copenhagen: NIAS Press.

# Appendix

## A. List of Abbreviations

ADB	Asian Development Bank
BAU	business-as-usual - scenario
CDM	Clean Development Mechanism
CIA	Central Intelligence Agency
CIEM	Central Institute for Economic Management
CO <sub>2</sub> eq	CO <sub>2</sub> equivalents
COP	Conference of the Parties
CPV	Communist Party of Vietnam
DFID	UK's Department for International Development
EDGAR	Emission Database for Global Research
EPI	Environmental Performance Index
EPT	Environmental Protection Tax (see EPT 2010)
Eq.	equation
ESMAP	Energy Sector Management Assistance Program
EVN	Electricity Viet Nam
FDI	Foreign direct investment
GDP	Gross Domestic Product
GEA	Global Energy Assessment
GHG	greenhouse gas(es)
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German

	International Co-operation Agency)
IEA	International Energy Agency
IMHEN	Vietnam Institute of Meteorology, Hydrology and Environment
IPCC	Intergovernmental Panel on Climate Change
ISPONRE	Institute of Strategy and Policy on Natural Resources and Environment
JICA	Japan International Cooperation Agency
KOICA	Korean International Cooperation Agency
MARD	Ministry of Agriculture and Rural Development
MCC	Mercator Research Institute on Global Commons and Climate Change
MER	market exchange rates
MOF	Ministry of Finance
MOIT	Ministry of Industry and Trade
MoNRE	Ministry of Natural Resources and Environment
MPI	Ministry of Planning and Investment
MRV	monitoring, verifying and reporting
MtOe	million tonnes of oil equivalent
NAMA	nationally appropriate mitigation actions
NCCS	National Climate Change Strategy (see NCCS 2011)
NEDS	National Energy Development Strategy (see NEDS 2007)
NIC	newly industrializing countries
NTP-RCC	National Target Program to Respond to Climate Change
ODA	official development assistance
OECD	Organization for Economic Co-operation and Development

PIK	Potsdam-Institut für Klimafolgenforschung (Potsdam Institute for Climate Impact Research)
Power Master Plan VII	Master Plan for Power Development VII (see Power Master Plan VII 2011)
PPP	Purchasing Power Parity
RE	Renewable energy
SD	Sustainable Development
SEDS	Vietnam's Socio-Economic Development Strategy for the Period of 2011-2020 (see SEDS 2011)
SOE	State-owned enterprises
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar
VGGS	Vietnam National Green Growth Strategy (see VGGS 2012)
WGI	World Governance Indicators



## B. List of interview partners

<b>Name of Interviewee</b>	<b>Institution and Position</b>	<b>Date of Interview</b>
Koos Neefjes	UNDP, Policy Advisor Climate Change, UNDP Viet Nam	26/02/2013 and 12/03/2013
Nguyen Chi Quoc	Friedrich-Ebert-Stiftung in Vietnam, Advisor Sustainability Program	27/02/2013
Vu Xuan Nguyet Hong	Central Institute for Economic Management (CIEM), associated with MPI, Vice-President	28/02/2013
Pham Ngoc Thach	Ministry of Finance, Director of Environment Tax and Charge, Fee Policy Division	04/03/2013
Vu Trung Kien	Climate Change Resilience Center, Director	04/03/2013
Michael Krakowski	Gesellschaft für Internationale Zusammenarbeit (GIZ) [German International Cooperation], Chief Technical Advisor of Macroeconomic Reform Programme	04/03/2013
Min Jong Kim	Korean International Cooperation Agency (KOICA) Deputy Resident Representative	05/03/2013
Pham Hoang Mai	Ministry of Planning and Investment (MPI), Director General, Department of Science, Education, Natural Resources and Environment	06/03/2013
Johan Kieft	UNDP, Technical Specialist on Climate Change and Sustainable Development, MPI/UNDP SD and CC project	06/03/2013
Annette Frick	Embassy of the Federal Republic of Germany, Hanoi, First Secretary, German Development Cooperation	06/03/2013
Nguyen The Chinh	Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE) / Ministry of Natural resources and Environment (MoNRE) Deputy General Director	07/03/2013

Kim Thi Thuy Ngoc	Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE) / Ministry of Natural resources and Environment (MoNRE) Head International Cooperation Division	07/03/2013
Nguyen Thi Hien Thuan	Vietnam Institute of Meteorology, Hydrology and Environment (IHMEN)/ Ministry of Natural resources and Environment (MoNRE)	07/03/2013
Jochem Lange	Gesellschaft für Internationale Zusammenarbeit (GIZ) [German International Cooperation], Country Director, GIZ Office Hanoi	07/03/2013
Pham Trong Thuc	Ministry of Industry and Trade (MOIT), General Directorate of Energy, Director of Department for new and renewable energy	08/03/2013
Werner Kossmann,	Gesellschaft für Internationale Zusammenarbeit (GIZ) [German International Cooperation], Chief Technical Advisor of Wind Energy Project	08/03/2013
Nguyen Van Kien,	Department for International Development (DFID), UK aid Environment and Climate Change Advisor,	11/03/2013
Lauren Sorkin	Asian Development Bank (ADB) Environment and Climate Change Specialist, Vietnam Resident Mission, South East Asia Department	11/03/2013
Dao Xuan Hoc	Former MARD Vice-Minister and Vice-Chairman of National Committee on Climate Change	12/03/2013
Juergen Hess	Gesellschaft für Internationale Zusammenarbeit (GIZ) [German International Cooperation], Priority Area Coordinator, Environmental Policy, Protection and Sustainable Use of Natural Resources Management of Natural Resources, Program Director	12/03/2013
Laura Altinger	World Bank Senior Environmental Economist (Climate Change), Sustainable Development Program in Vietnam	13/03/2013
Anjali Acharya	World Bank, Environment Cluster Leader	13/03/2013
Pierre Audinet	World Bank, Energy Sector Management Assistance Program (ESMAP), Clean Energy Program Team Leader	13/03/2013

Michiyo Kakegawa and Egashira Eiji	Japan International Cooperation Agency (JICA), Viet Nam Office Both Senior Project Formulation Advisors	13/03/2013
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Michael Parsons	Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE), associated with MoNRE Institutional Strengthening Advisor	14/03/2013
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### C. Kaya Decomposition

This appendix aims to explain the underlying calculations that lead to results presented in Figure 3. The text is heavily based on Steckel et al. (2011, pp. 3446). In order to come up with a detailed analysis of Vietnam’s energy related carbon emissions, we break up emissions-growth along the factors of the Kaya identity (Kaya 1990), which expresses carbon emissions  $F$  as a product of the underlying factors GDP  $G$ , primary energy  $E$ , and population  $P$ :

$$F = P \left( \frac{G}{P} \right) \left( \frac{E}{G} \right) \left( \frac{F}{E} \right) =: P a e k, \quad (C.1)$$

The right-hand-side refers to the relative variables per-capita GDP (affluence)  $a = G/P$ , energy intensity  $e = E/G$ , and carbon intensity of energy  $k = F/E$ . Using the Laspeyres index method<sup>5</sup> (Sun and Ang 2000), a change over time in emissions  $\Delta F$  can be expressed as the joint contribution of the four underlying effects (indicated by subscript  $f$ ),

$$F(t + \Delta t) - F(t) = \Delta F = P_f + a_f + e_f + k_f, \quad (C.2)$$

where each effect can be derived from multiplication, as done here exemplarily for population,

$$P_f = \Delta P \cdot a_t \cdot e_t \cdot c_t + \Delta P \cdot \left[ + \frac{1}{2} \cdot [(\Delta a) \cdot e_t \cdot c_t + a_t \cdot (\Delta e) \cdot c_t + a_t \cdot e_t \cdot (\Delta c)] + \frac{1}{3} \cdot [(\Delta a) \cdot (\Delta e) \cdot c_t + (\Delta a) \cdot e_t \cdot (\Delta c) + a_t \cdot (\Delta e) \cdot (\Delta c)] + \frac{1}{4} \cdot (\Delta a) \cdot (\Delta e) \cdot (\Delta c) \right]. \quad (C.3)$$

The first part of Eq (C.3) ( $\Delta P \cdot a_t \cdot e_t \cdot c_t$ ) can be interpreted as the partial effect of the population component on the change of CO<sub>2</sub> emissions between time step  $t'$  and the preceding step  $t$ . The following parts capture interactions between the remaining variables and form the so called residual term.

In order to get a better understanding of the specific dynamics of the carbon intensity, we subject its time-series to an extended decomposition that allows expressing the change in carbon-intensity as a sum of changes in the supply from specific energy carriers. Namely, carbon intensity  $k_{t'}$  at time  $t'$  can be expressed relative to a preceding time step  $t$  as

$$k_{t'} = k_t \frac{E_t}{E_{t'}} + \sum_j \left( \frac{k_{jt'} E_{jt'} - k_{jt} E_{jt}}{E_{t'}} \right), \quad (\text{C.4})$$

where  $j$  indexes the different energy carriers, e.g. natural gas, coal etc., and  $k_{jt}$  represents the specific carbon intensity of energy carrier  $j$  at time  $t$ , which supplies carrier-specific energy  $E_{jt}$ . Changing specific carbon intensity over time might be confusing at first sight. However, the composition of energy carriers, e.g. coal, changes over time, as for example lignite is replaced by hard coal or vice-versa. Given that by definition we have

$$E_t = E_{t'} - \sum_j (\Delta E_j), \quad (\text{C.5})$$

where  $\Delta E_j$  denotes the change between  $t$  and  $t'$  in energy supply  $E_j$ , one can write

$$k_{t'} = k_t \frac{E_t - \sum_j (\Delta E_j)}{E_{t'}} + \sum_j \left( \frac{k_{jt'} E_{jt'} - k_{jt} E_{jt}}{E_{t'}} \right) .. \quad (\text{C.6})$$

The first part of the expression can be interpreted as the energy carrier's changing contribution to the overall energy mix, while the second term of the expression indicates the change of the energy carriers' specific carbon intensity. This can be reformulated to express the change  $\Delta k$  in carbon intensity between  $t$  and  $t'$  as a sum over contributions from all energy carriers:

$$\Delta k = \frac{1}{E_{t'}} \sum_j (k_{jt'} \cdot E_{jt'} - k_{jt} \cdot E_{jt} - \Delta E_j k_t) \quad (\text{C.7})$$

$\Delta k$  so far only captures the partial effect. In a complete Laspeyres decomposition, all residuals are taken into account, implying that the effect of carbon intensity  $k_f$  can be written as  $k_f = \Delta k \cdot R$ , where  $R$  represents the residual (compare also Eq C.3).  $R$  can then be written as:

$$\begin{aligned} R = & (P_t \cdot a_t \cdot e_t) + \frac{1}{2} \cdot (\Delta P \cdot a_t \cdot e_t + \Delta a \cdot P_t \cdot e_t + \Delta e \cdot P_t \cdot a_t) \\ & + \frac{1}{3} (\Delta P \cdot \Delta a \cdot e_t + \Delta P \cdot \Delta e \cdot a_t + \Delta e \cdot \Delta a \cdot P_t) + \frac{1}{4} \cdot \Delta P \cdot \Delta a \cdot \Delta e \end{aligned} \quad (\text{C.8}).$$

In order to adapt the decomposition of carbon intensity, i.e. the effect  $k_f$  of carbon intensity on the change of emissions, we need to multiply  $\Delta k$  (Eq. C.7) by  $R$  on both sides. This leads to the graphs shown in Figure 5, which allow to directly observe the influence of specific changes in the energy mix on emissions.

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<sup>1</sup> According to the UNFCCC's principle of 'common but differentiated responsibilities', which acknowledges that industrialized countries are responsible for the largest share of past GHG emissions, while developing countries are expected to be affected the most by the impacts of climate change (IPCC 2007) and have the least capabilities to adapt to them, binding emission reduction targets under the Kyoto Protocol only apply for industrialized countries and economies in transition (listed in the Protocol's Annex B).

<sup>2</sup> Technically, Vietnam's feed-in tariff is in fact a feed-in premium. It is paid from the Environmental Protection Fund, financed by fees on waste water and fines for non-compliance with environmental regulations (Interviews).

<sup>3</sup> Indicators include the percentage of land area, population, GDP, urban area, agricultural area, and wetlands affected. Note that this sample excludes most small island states, which would arguably be most severely affected by sea-level rise.

<sup>4</sup> Note that this number includes CO<sub>2</sub> emissions unrelated to energy use (such as industrial processes and land use) and other GHGs (such as methane and NO<sub>2</sub>). Nevertheless, as it corresponds to about 50% of Vietnam's emission projected for 2015 (compare Fig.2 *ibid.*), this estimate should be regarded as rather optimistic.

<sup>5</sup> Different methods can be used to decompose the Kaya identity into additive effects, see, e.g. Ang (2004) for a review of different approaches.