d·i·e

Deutsches Institut für Entwicklungspolitik

German Development Institute

Studies

Environmental Tax Reform in Developing, Emerging and Transition Economies

Jacqueline Cottrell
Kai Schlegelmilch
Matthias Runkel
Alexander Mahler

Environmental tax reform in developing, emerging and transition economies

The German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE) is a multidisciplinary research, policy advice and training institute for Germany's bilateral and multilateral development cooperation. On the basis of independent research, it acts as consultant to public institutions in Germany and abroad on current issues of cooperation between developed and developing countries. Through its nine-month training course, the German Development Institute prepares German and European university graduates for careers in the field of development policy.

Jacqueline Cottrell is Senior Policy Adviser at Green Budget Germany (GBG) and Green Budget Europe (GBE), as well as a freelance environmental policy consultant.
Email: Jacqueline.Cottrell@foes.de

Kai Schlegelmilch is co-founder and President of GBG.
Email: Kai.Schlegelmilch@foes.de

Matthias Runkel is a Research Associate of GBG on transport policy.
Email: Matthias.Runkel@foes.de

Alexander Mahler is Director of the GBG Transport Team and is GBG Deputy Director.
Email: Alexander.Mahler@foes.de

Jacqueline Cottrell and Kai Schlegelmilch have worked as consultants for environmental fiscal policies in many developing countries including Chile, China, Indonesia, Lao PDR, Malaysia, Mauritius, Mexico, Vietnam, Thailand, and Tunisia, as well as for a number of Small Island Developing States. The authors would like to thank Benjamin Zenke for his valuable assistance in writing this report**.**

Studies
Deutsches Institut für Entwicklungspolitik
93

Environmental tax reform in developing, emerging and transition economies

Jacqueline Cottrell
Kai Schlegelmilch
Matthias Runkel
Alexander Mahler

Bonn 2016

Studies / Deutsches Institut für Entwicklungspolitik
ISSN 1860-0468

Die deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über http://dnb.d-nb.de abrufbar.

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data is available in the Internet at http://dnb.d-nb.de.

ISBN 978-3-96021-017-7

Printed on eco-friendly, certified paper

Published with financial support from the Federal Ministry for Economic Cooperation and Development (BMZ)

Tulpenfeld 6, 53113 Bonn
☏ +49 (0)228 94927-0
🖷 +49 (0)228 94927-130
E-mail: die@die-gdi.de
http://www.die-gdi.de

Contents

Figure

Tables

Boxes

Abbreviations

BAU	Business-as-usual
CGE	Computer-generated equilibrium
CO_2	Carbon dioxide
EFR	Environmental Fiscal Reform
EPT	Environmental Protection Tax
ETR	Environmental Tax Reform
ETS	Emissions Trading Scheme (of the EU)
EU	European Union
EUR	Euros
GDP	Gross domestic product
GHG	Greenhouse gas
IMF	International Monetary Fund
INDCs	Intended Nationally Determined Contributions
MoF	Ministry of Finance
NDCs	Nationally Determined Contributions
OECD	Organisation for Economic Co-operation and Development
RMB	Renminbi (currency of the People's Republic of China)
THB	Thai Baht
UK	United Kingdom
UNEP	United Nations Environment Programme
USD	United States dollars
VGGS	Vietnam Green Growth Strategy
VND	Viet Nam Dong

Executive summary

This report sets out to achieve two things. First, it highlights **lessons regarding impacts, costs and acceptance learned from environmental tax reform (ETR) in industrialised countries** in theory and in practice. In so doing, it focuses on those lessons which seem most transferable to the developing country context. Second, **this report appraises the experiences of the authors in selected developing countries** (Vietnam, Thailand, Mexico, Chile, China, and Mauritius) in connection with these lessons learned and relates these experiences to the more general developing country context (see Sections 3 and 4).

At the centre of the report are trade-offs that policymakers in developing countries may have to consider between environmental effectiveness, fiscal objectives, private investment, social equity issues, and political economy considerations.

The report makes the following recommendations for policymakers in developing countries as regards the implementation of ETR:

ETR measures in developing countries should be equipped with an escalator, so that tax rates increase year-on-year, as well as being indexed to inflation or gross domestic product (GDP) growth. This way, low initial rates can foster political acceptance and give stakeholders time to adjust to the new tax rates, while increases over time can ensure stable revenues and maintain environmental effectiveness.

ETR should **accurately target the source of pollution** or environmental damage, **maximise coverage**, apply **homogenous tax rates** uniformly to all sources of emissions, and **keep exemptions to a minimum**.

Although ETR sets out to internalise the external cost of pollution, only in the rarest of cases has it thus far created a level playing field between 'green' and 'brown' technologies, that is, between renewable and fossil energy sources. Thus, **incentivising private investment still requires additional measures** to minimise the risk for investors by creating secure investment frameworks, such as low-cost loans for private investors in green technologies, accelerated depreciation, preferential interest rates or, for renewable energy, long-term power purchase agreements (see, for example, Cottrell, Fortier, & Schlegelmilch, 2015).

Fiscal impacts from ETR measures have the potential to be substantial, but have so far tended to be relatively low in the majority of developing countries. However if countries introduce bolder ETR measures, they will have a great deal more revenue to obtain 'buy-in' from a range of stakeholders and thus boost political acceptance. Bolder ETR measures would also provide developing country governments with the opportunity to 'lock in' environmental taxes and secure their implementation in the medium- and long-term by establishing a so-called fiscal driver, or dependence on ETR revenues, to achieve additional policy goals.

In developing countries, **social inequity tends to be high, and measures to protect the vulnerable are crucial**. **Where the poorest cannot be effectively targeted, governments should tend towards overcompensation to ensure sufficient coverage**. As impacts change over time, policymakers must monitor social impacts carefully. **Social compensation mechanisms should aim to drive the green transition,** for instance by funding the acquisition of low-carbon, energy- or resource-efficient technologies such as solar stoves, and take advantage of synergies and co-benefits between social and environmental policies.

Collection mechanisms should be linked to existing administrative structures to keep costs to a minimum. Revenues can be used to improve enforcement and for institutional capacity-building. ETR measures tend to be difficult to evade, which can be an advantage for countries facing institutional difficulties in tax monitoring and collection.

Revenue use is a political question and revenues are a powerful tool for creating political acceptance of ETR measures: Revenue distribution can drive government policy agendas, facilitate coalition-building in favour of ETR, protect the poorest from the impact of price increases, or contribute to investment in the green economy transition. Political earmarking can boost acceptance and reduce opposition to ETR.

Introducing ETR measures within broader fiscal policy reform packages – such as those recently introduced in Chile and Mexico – **can enhance the potential for implementation and reduce opposition.**

Communication and cooperation at all levels is crucial: ETR is a cross-cutting issue and the cooperation of government ministries can result in better policy development and more successful implementation.

Communication with all stakeholders can improve understanding and foster political acceptance of ETR.

This report also highlights a number of trade-offs which may have to be managed to achieve the implementation of ETR measures. Deviations from optimal tax design, for example, are often necessary to prevent negative impacts on international competitiveness – and to bring industry on side to build coalitions supportive of change. Environmental effectiveness suffers as a result. Similarly, while it is preferable to maximise welfare and compensate only the vulnerable and not wealthier households, in practice compensation schemes may have to be designed in a way which approaches the issue with a much broader brush to ensure full coverage for the vulnerable.

The current study has attempted to analyse such trade-offs and has developed a **series of proposals for the best strategies for developing countries going forward**. A well-designed environmental tax reform is the most efficient and cost-effective policy instrument for environmental protection, and one which has the important co-benefit of also raising revenue – a very important advantage in developing countries struggling to increase public resources.

1 Introduction

Governments in developing, emerging and transition economies[1] and international organisations and institutions, such as the Green Fiscal Policy Network[2], are currently engaged in the relatively early stages of investigating the systematic requirements for obstacles to and implementation of environmental tax reform (ETR) in developing countries.

With this in mind, this report sets out to achieve two things. First, this report highlights lessons regarding impacts, costs and acceptance learned from ETR in theory and in practice in industrialised countries. It focuses on those lessons which are most transferable to the developing country context (Section 2 of the report). Second, the report appraises the experience of the authors in selected developing countries (most notably Vietnam, Thailand and Mexico) in relation to these lessons learned and relates these additional lessons to the more general developing country context (see Sections 3 and 4).

The report is structured as follows:

Section 2 introduces definitions of ETR, considers which definitions are most relevant to developing countries and takes a brief look at the different kinds of instruments available to policymakers when implementing environmental taxation. It then focuses on research conducted in European and other OECD (Organisation for Economic Co-operation and Development) countries and extracts lessons learned for developing countries regarding the following topics: environmental impacts and the effectiveness of ETR; impacts of ETR on private investment; the fiscal and social impacts of ETR; the administrative feasibility of ETR; use of ETR revenues; and the political acceptability of ETR.

Section 3 compares and contrasts the main conclusions of the previous section in the context of concrete experiences and best practice in the implementation of ETR measures in developing countries.

Building on this analysis, Section 4 develops a series of recommendations for policymakers regarding the implementation of ETR measures, with a

1 For the sake of brevity, the term 'developing countries' is used as a catch-all in this report to refer to developing, emerging and transition economies. Where a specific economic system is being referred to, this will be made clear in the text.

2 www.greenfiscalpolicy.org

particular focus on political and administrative feasibility, in the context of developing countries.

The report is complemented by an Annex,[3] which provides an overview of ETR measures implemented both in European Union (EU) countries and beyond.

2 Environmental tax reform: impacts, costs and acceptance

This section sets out to review existing literature on environmental taxation and extracts the lessons learned from theory and practice that are most relevant to developing countries. The Annex to this document looks in depth at a range of environmental tax reform measures in practice and provides details on the objectives of these measures, their environmental, economic, fiscal and social impacts. It also touches briefly on aspects of political economy.

2.1 Definitions – what is environmental tax reform?

Environmental taxation

The OECD definition of environmental taxes, also used by the European Commission, is as follows:

> Environmentally related taxation (ERT), which does not entail tax shifting, has been defined as any compulsory, unrequited payment to general government levied on tax bases deemed to be of particular environmental relevance. (OECD [Organisation for Economic Co-operation and Development], 2004)

This definition is significant because the tax base is considered as the only objective basis for identifying environmental taxes: neither the name and purpose of the tax, nor the motivation for implementing it, nor the use of revenues collected, are taken into consideration. Although it is important that readers are aware of this widely-used definition, in this paper we use a more precise term – environmental tax reform – to emphasise the importance

3 www.die-gdi.de/studies/article/environmental-tax-reform-in-developing-emerging-and-transition-economies/

of the use of revenues raised by environmental taxes, for example to fund the achievement of the Sustainable Development Goals. This is explained in more detail in the subsection below.

To give an indication of the broad range of environmental taxes and similar instruments available to policymakers, an inventory of environmental pricing instruments compiled on the basis of the OECD/EU definition is shown in Table 1. It should be noted that this is not a comprehensive list.

Table 1: Inventory of environmental taxes, fees and charges

Sector	Examples
Transport	• Registration taxes based on CO_2 emissions • Annual circulation taxes • Road tolls/vignette systems • Congestion charging • Air pollution charging
Energy	• Taxes on transport fuels • Taxes on heating fuels, e.g. oil, gas, • Taxes on power generation
Carbon	• Taxes on CO_2-content in energy sources • Taxes on CO_2 emissions • Carbon price floor (a minimum carbon price usually enforced by means of a tax)
Air	• Air pollution charges, e.g. on SO_2, as well as VOC, NO_x, PM, NH_2, heavy metals, CO, NH_3, etc. • Fines for failure to meet air quality standards • Ticket tax
Water	• Charges and taxes on water supply • Waste water charges
Biodiversity	• Payment for environmental services • Stump charges • Conservation fees, e.g. national park entry fees • Land tax, e.g. taxes on land use change, high rates of land tax on frontier • Extraction taxes • Fishery management charges • Non-compliance fees

Table 1 (cont.): Inventory of environmental taxes, fees and charges	
Sector	**Examples**
Waste	• Landfill taxes • Incineration taxes • Pay-as-you-throw schemes (PAYT)
Resources	• Taxes on natural resources • Royalties for resource extraction • Rent taxes (e.g. resource rent taxes) • User fees (e.g. signature bonus[4]) • Aggregates tax • Similar arrangements: production sharing agreements, auctions, equity participation, infrastructure provision requirements
Agriculture	• Pesticide and fertiliser taxes • Nitrogen charges
Source: Based on Broadway & Keen (2009); Withana, ten Brink, Illes, Nanni, & Watkins (2014)	

Environmental tax reform

The term 'environmental tax reform' (ETR) emphasises not only the tax base, but also the use of expenditures. The European Environment Agency provides an excellent and broadly accepted definition of environmental tax reform:

> Environmental tax reform (ETR) is a reform of the national tax system where there is a shift of the burden of taxation from conventional taxes, for example on labour, to environmentally damaging activities, such as resource use or pollution. The burden of taxes should fall more on 'bads' than 'goods' so that appropriate signals are given to consumers and producers and the tax burdens across the economy are better distributed from a sustainable development perspective. (EEA [European Environmental Agency], 2005, p. 84)

Thus, in industrialised countries, ETR typically focuses on the **shifting of the tax burden** from conventional taxes to environmental taxes.

4 A signature bonus is a one-off fee for the assignment and securing of a license for commercial entities to conduct exploration activities and extract natural resources such as oil.

In developing countries, however, such a shift is often less relevant, as tax revenues are relatively low as a proportion of GDP. In these countries, as a general rule one of the first priorities of government is to **increase overall tax take for vital investment** in, for instance, education, health care, energy infrastructure, rather than shift taxes between tax bases. Thus, we suggest that the reform element of ETR in these countries consists of the **introduction of new environmental taxes** to increase fiscal space, that is, overall tax revenue, to enhance domestic revenue mobilisation. By using the term 'environmental tax reform' rather than 'environmental taxation', we wish to place emphasis on the **potential role of environmental taxes for boosting state revenues** available for the green economy transition or other investments associated with sustainable development.

This focus on increasing state revenues as a means of achieving sustainable development is reflected in the 2015 **Addis Ababa Action Agenda**. In the document, countries agreed to mobilise and effectively use domestic resources generated by economic growth and supported by additional measures, among other things "sound social, environmental and economic policies, including…adequate fiscal space" (United Nations, 2015, §20). The document also recognised that progressive, more efficient and effective tax systems with a broadened tax base to "enhance domestic revenue as part of national sustainable development strategies" would be crucial to achieve the Sustainable Development Goals (UN, 2015, §22). **Environmental taxes, which tend to be efficient, growth-friendly and hard to evade, fit well within the Action Agenda approach**, as will be discussed below.

This approach to environmental tax reform in developing countries – and the relative importance of revenue raising and expenditure – is also reflected in the OECD-DAC (Development Assistance Committee of the OECD) definition of environmental *fiscal* reform (EFR) in developing countries:

> EFR can contribute to poverty reduction directly by helping address environmental problems […] that impact the poor […] and indirectly, by generating or freeing up resources for anti-poverty programmes […]. (OECD, 2005, p. 12)

Environmental fiscal reform consists not only of tax shifting but also of the reform of environmentally harmful subsidies and wasteful government expenditures. As many developing countries have fossil fuel consumption subsidies in place, subsidy reform is also a key element of fiscal reform. In addition to having environmental benefits, fossil fuel subsidy reductions can

free up substantial revenues for poverty reduction – the subsidies are often meant to protect the poor, but rarely achieve this aim. Indeed, International Monetary Fund (IMF) research has found that the richest 20 % of households capture on average 6 times more fossil fuel subsidies than the poorest 20 % (Coady, Parry, Sears, & Shars, 2015).

The reform of fossil fuel subsidies, however, is often a very political process loaded with diverging interests and is challenging to manage. It merits more than one report of its own, and indeed has been treated in many publications (see, for example, the works of the Global Subsidies Initiative of the International Institute for Sustainable Development (IISD)). In the present report we thus focus solely on environmental tax reform, thereby carving out recommendations for environmental tax policy design especially relevant to developing countries.

ETR in developed and developing countries

The subject of this report is relevant to both developed and developing countries. The United Nations Environment Programme's (UNEP) Green Economy Report, written in preparation for the 2012 United Nations Conference on Sustainable Development (Rio +20), highlights taxes and other market-based instruments as one of six key enabling factors for the realisation of green economy in all countries of the world (UNEP [United Nations Environment Programme], 2011).

Environmentally-related taxes have been in place for many years, in both developed and developing countries. Since the 1990s, a great deal of empirical research documenting the impacts, effectiveness and political economy of ETR instruments has been collated in OECD countries. Scientific analysis in developing countries remains less comprehensive. Few ex post analyses of ETR measures have been conducted and, as a result, fewer clear conclusions have been drawn about the implementation of ETR in the developing country context.

Conclusions drawn on the basis of research conducted in OECD countries need to be tested for their applicability in developing countries. In all cases, the country context is key: Differences in the institutional, social, economic and political implementing conditions, respective stages of development, and economic and fiscal structures are all factors that influence the implementation of ETR. In the sections below, the report highlights those lessons learned in OECD countries most applicable to developing countries.

2.2 Environmental impacts and effectiveness – issues of tax design

This subsection looks at the ways in which tax design and implementation can affect the effectiveness and political feasibility of ETR measures. A broad range of literature already exists on developed countries. Those findings which are most relevant for developing countries are presented below.[5]

2.2.1 The theoretical basis of ETR

Pollution and resource consumption create costs such as health impacts, reduced crop yields, and biodiversity loss. If the economy does not internalise these so-called 'external costs', it will operate inefficiently and market distortions and inefficient economic decision-making will result. ETR measures can internalise these external costs and include some or all of them in the price of pollution, generating welfare gains, improving environmental quality and reducing inefficiencies in the economy.

Thus, ETR measures work by increasing the price of polluting or of using an environmental product, resource, good or service. If set at an appropriate level, the price signal influences the behaviour of economic actors, whether businesses or individuals, and changes in behaviour result in the form of energy efficiency improvements, reduced private car use or reduced resource consumption, to give some examples. The environmental impact of ETR – and thus its environmental effectiveness – is to a great extent governed by the design of the specific tax itself and is not necessarily related to the use of revenues, as will be explained below.

2.2.2 Instrument choice

The starting point for all environmental policy measures is damage done to the environment and how best to reduce it. When deciding whether to implement ETR or alternative policy measures, policymakers should consider which policy measure is most appropriate, taking into account widely used criteria of instrument choice: cost-effectiveness and economic

5 See, for instance, EEA, 2005; European Commission, 2014; IMF [International Monetary Fund], 2012; OECD, 2010a; Withana et al., 2014.

efficiency, distributional equity, minimisation of risk in the presence of uncertainty and political feasibility (Goulder & Parry, 2008).

Thus, there may be many situations where ETR is not the most appropriate instrument. While ETR is in theory cost-effective and economically efficient, concerns about distributional equity – whether well-founded or not (see subsection 2.5.1 below) – and political feasibility may mean that other instruments are preferable. Furthermore, if an environmental problem poses a serious threat, for instance to human health, then an instrument with immediate effect, such as an outright ban, is more appropriate.

On the other hand, if pollution is to be reduced gradually over time and economic actors are to be given flexibility in their responses to legislation, then environmental taxes may be more appropriate. The significant advantage of environmental taxes is that they are cost-effective – achieving the best possible outcome with the resources available, or a specified outcome at the lowest possible cost – and economically efficient – in other words, they achieve a level of pollution which maximises welfare for society (Goulder & Parry, 2008). At the same time, taxes typically create a dynamic incentive for an improved environment, meaning that improvements take place above and beyond the prescribed minimum accepted standards laid down by regulation.

2.2.3 Tax base and coverage

The first consideration for an effective ETR is the choice of **tax base** – namely the subject of a tax such as waste water, or the carbon content of a fuel, **and the point of application**, that is, where the tax is levied – upstream, at the start of the value chain (for instance, an input to power generation) or downstream, at the point of consumption, (such as a tax on electricity). To maximise environmental effectiveness, environmental taxes should target the pollutant or polluting behaviour as accurately as possible (see, for example, EC [European Commission], 2014; OECD, 2010a).

Using CO_2 content as the tax base for energy or fuel taxes, for instance, creates fair relative prices and correct incentives. However, in practice, a consistent carbon price is relatively rare for political economy reasons; many countries in the European Union, for example, tax coal inputs to power generation at a very low rate to protect their mining industries which have become relatively uncompetitive internationally. Such measures

distort price competition in favour of more harmful fuels with higher carbon content, such as coal. Rising emissions from coal globally demonstrate that this is a problem faced by all countries, and not only the European Union.

The tax base should "**maximize the coverage of emissions sources**" (IMF [International Monetary Fund], 2012, p. 29). This usually implies an upstream tax at an early stage in the supply chain. In such cases, secondary products would be uniformly affected and there would be little room for exemptions. This also means minimising collection points for the tax, implying lower administrative costs.

In some developing countries, however, political economy and regulatory considerations may mean that taxes are more effective when levied downstream. In regulated energy markets, for example, an upstream tax on energy inputs might have little or no impact on energy prices for consumers as prices are regulated and pass-through to the consumer is limited. While the better option in such cases is certainly energy market reform so that price effects are felt throughout the economy, an interim measure might be to introduce a downstream tax, for instance, on electricity consumption. For political economy reasons, differentiating between industrial and/or domestic consumers may be necessary. Nonetheless, such a measure will go some way towards ensuring that the incentive effect of an energy tax will be felt, even though it will not differentiate between primary energy sources.

Downstream taxation can also be targeted and effective, but requires more administrative complexity and has a narrower impact. Plastic bag levies in the United Kingdom (see subsection 2.2.9), for example, have significantly reduced plastic bag use but only target a very small fraction of plastic waste, whereas an upstream tax on plastic would cover all plastic products. These kinds of specific levies may meet with greater political acceptance and support if they target a product generally regarded as being environmentally damaging.

A related consideration for effective tax design regards the **breadth of coverage –** in theory, environmental taxes should cover the whole breadth of the environmental damage under consideration, unless pollution is felt locally, when national/sub-national taxes may be preferable (OECD, 2010a). Thus, to address energy-related carbon emissions, in theory a tax should be introduced or harmonised internationally in order to prevent carbon leakage, such as the shifting of production from regions with higher carbon tax rates to lower-taxing countries (see for example EC, 2014; OECD,

2010a). The reality, however, is that coordinating a minimum global carbon price is extremely difficult and often political economy considerations play the more important role in both developed and developing countries.

The theory also suggests that coverage should be consistent, without exemptions or differences between products or industries as this might cause unintended consequences. **Homogeneous tax rates** ensure that abatement takes place at the lowest cost possible and minimise the opportunities for tax evasion (OECD, 2010a). The lack of uniformity in energy tax rates among EU member countries, for instance, causes fuel tourism as well as tax competition.

Clearly, however, in many cases political decision-makers have to accept trade-offs between breadth of coverage and political feasibility (Withana et al., 2014). In the majority of developed and developing countries, policymakers have faced significant challenges when introducing an energy tax without introducing exemptions or reduced tax rates for energy-intensive sectors.

Danish carbon and energy taxes on energy-intensive industry are designed so that trade-offs between breadth of coverage, environmental effectiveness and political economy considerations are minimised. In Denmark, energy-intensive industries pay the full carbon and energy tax rates for energy they consume for heating and cooling processes, while energy-intensive production processes are exempt from the energy tax and subject to a reduced rate of carbon tax. At least in part as a result of such intelligent tax design, Denmark is one of the least energy-intensive economies in the world (Green Budget Europe, s. a.).

2.2.4 Level of tax rate or charge

In theory, tax rates should be commensurate with the environmental damage addressed (OECD, 2010a), or more precisely their **marginal damage costs**. Only if the market price corresponds to the real costs of a resource or an activity, does the market equilibrium yield an efficient result (see, for instance, EEA, 2005; EC, 2014; OECD, 2010a). In reality, though, it is difficult – and in some cases impossible – to calculate these externalities accurately and, as a result, a pragmatic approach to tax rate setting is called for.

In practice, **tax rate setting tends to be a political process** influenced by a number of factors such as lobby groups, vested interests, timing within

the electoral cycle, party political and competitiveness concerns. In both developing and developed countries, taxes are a sensitive issue subject to intense political debate. Experience in developed countries has shown that **the political feasibility of ETR might be enhanced by the introduction of a tax at a relatively low rate, which is gradually increased over time**. Depending on elasticities, that is, the possibilities available to actors to change their behaviour, it might even be politically desirable to set a tax rate beyond marginal damage costs (see Box 1).

Box 1: A high tax rate to ensure environmental effectiveness: the case of the United Kingdom (UK) landfill tax

In 1996, a tax was introduced in the United Kingdom with the initial objective of internalising externalities associated with landfill, within initial tax rates being based on estimated externalities (Herd, Cournede, & Sutherland, 2004). Following a review in 2002, by which time it had become clear that the tax rate was too low to change behaviour, the objective of the tax was redefined to that of encouraging waste producers and the waste management industry to switch to more sustainable alternatives for disposing of waste (United Kingdom Government, 2016a).

The tax rate was substantially raised over time, and subsequently helped to reduce the percentage of waste going to landfill from 86 % in 1996 to 36 % in 2012 (Withana et al., 2014). Today, rates have been described as "several times greater than any reasonable estimate of the external costs associated with landfill" (Mirrlees et al., 2011, Part 2, p. 243). From an economic perspective, setting the tax rate above marginal damage costs does not lead to the optimal outcome and decreases social welfare. From a political economy point of view, however, 'overtaxing' was necessary to achieve the specified objectives.

The United Kingdom experience exemplifies the difficulties policymakers in both developed and developing countries face when setting a tax rate. The tax rate required to bring about behavioural change, particularly in cases where large-scale investment in alternatives is required, might be higher than the optimum.

Source: Authors

2.2.5 Stability of tax rates over time

Most environmental taxes are quantity taxes and therefore depreciate in real terms as a result of inflation, meaning that the price signal weakens over time and the tax loses its effectiveness. For this reason, in countries with stable and low rates of inflation, tax rates should be **indexed** to a consumer price index – or the GDP growth rate[6] – in order to account for price developments (see, for instance, EC, 2014). This ensures that taxes send out a stable price signal to economic actors. There are several successful examples of indexation in Denmark, the Netherlands and Sweden such as those for taxes on transport fuels. Other countries have introduced automatic annual increases to environmental taxes, such as the Fuel Duty Escalator in the United Kingdom or German energy and electricity taxes from 1999 to 2003.

In developing countries, where inflation rates may be less stable, indexation should be carefully considered, depending on the country context. Relatively predictable annual increases in the tax rate create stability for investors. While indexation of tax rates to GDP growth rather than inflation might prevent rapid and unpredictable increases, a more stable option may to be to introduce a fixed annual tax escalator subject to regular review. If indexation is introduced, developing countries could include an annual review as an integral part of budgetary decision-making processes.

2.2.6 Uniformity of tax rates across taxpayers

In theory, tax rates should **apply uniformly** across taxpayers in order to establish cost efficiency, or failing that, across sectors (IMF, 2012). Differentiated tax rates distort competition and thus lead to inefficient market outcomes and reduce incentives in some sectors to reduce environmental damage. In practice, however, uniform tax rates may not be politically feasible in the short or medium term, due to competitiveness concerns, and may also increase the risk of regressive social impacts (for how to address these impacts, see subsection 2.5).

6 Indexation to GDP growth may be preferable, as it is the product of prices and quantities, and thus automatically covers all inflation impacts – but experience with this kind of indicator as a basis for a tax escalator is limited.

2.2.7 Political economy concerns and environmental effectiveness

As noted above, **industry exemptions** are often included to achieve political consensus for the implementation of ETR, particularly energy taxes. Many OECD countries have introduced energy tax exemptions for energy-intensive industries, which has cushioned them from the impact of international competitiveness, but has also compromised the environmental effectiveness of such measures (OECD, 2006).

An important lesson learned from developed countries is that exemptions must be targeted, time-limited, subject to regular review, and accompanied by certain conditions or agreements to give industry time to adjust and adapt to rising prices in the short term and to implement structural responses in the long term, thus ensuring environmental effectiveness. If exemptions are not time-limited, there is a strong risk that benefits become locked-in and that path-dependencies develop which are hard to reverse. Energy tax exemptions for industry in Germany are a case in point, as described in Box 2 below.

Box 2: Special provisions in energy and electricity taxes for energy-intensive industry in Germany

In Germany, energy-intensive companies in the manufacturing sector benefit from a refund of 90% of their already reduced energy and electricity taxes – a 40% reduction already applies to all manufacturing industries, agriculture and forestry – and some energy-intensive processes are completely exempt. The electricity and energy tax refunds are in place to maintain the companies' international competitiveness. According to the German Federal Environment Agency (UBA [Umweltbundesamt], 2014), these revenue losses constituted an implicit subsidy worth almost 2.2 billion euros in 2012 (the 40% reduction totalled 2.5 billion euros) and the 90% refund almost completely removed the tax's intended price incentive to improve energy efficiency for several thousand companies. This distorts consumer decisions and delays structural change, so supporting environmentally harmful behaviour and reducing the environmental effectiveness of the measure (Schlegelmilch & Joas, 2015).

Box 2 (cont.): Special provisions in energy and electricity taxes for energy-intensive industry in Germany

Initially, this tax relief was due to be phased out in 2012, but the provisions have been extended to 2022 under certain conditions: energy management systems have been made compulsory and annual energy savings of 1.3 % (between 2013 and 2015) and 1.35 % in 2016 have to be realised (BMWi [Bundesministerium für Wirtschaft und Energie], 2013; UBA, 2014). Progress will be assessed in 2017 to readjust the current targets for the coming years.

Nonetheless, the German Federal Environment Agency (UBA, 2014) does not consider current goals to be ambitious enough. Yearly energy savings between 1991 and 2009 were well above the planned rates of 1.3 % and 1.35 %. Large potentials in the energy-intensive industries in Germany have thus been left untapped (see Andersen & Ekins, 2009; Roland Berger, 2011) because of costly and environmentally harmful tax exemptions.

Source: Authors

2.2.8 The wider context of additional policy instruments

Taxes and policy instruments operate within a wider context, which influences the effectiveness of the policy mix and the ability of economic actors to adjust their behaviour in response to these conditions. Perhaps the single most important factor is to what extent a particular policy context creates opportunities for consumers and producers to change behaviour. For this reason, often the most environmentally effective taxes are those where alternatives are available and a switching response is easy to undertake. Differentiated tax rates on low-sulphur and standard diesel, or leaded and unleaded petrol, for instance, have proved to be highly effective. Such taxes are especially appealing to developing countries, as they can generate rapid and effective results as easy alternatives are available. In such cases, developing countries can use ETR measures to harvest ‘low-hanging fruits’ to bring about environmental improvements with minimum effort and at a low or even negative cost.

If alternatives do not exist or technological progress is in its early stages, the policy mix should, at the very least, set out to create a level playing field for different technologies and reflect the external costs of fossil fuel

combustion or environmental damage in the price of goods and services by implementing ETR. Particularly in developing countries, however, where fossil fuel subsidies are in principle regarded as a means of distributing oil revenues to the population and as a kind of social security net, creating a level playing field is no easy task. Nonetheless, reforming harmful subsidies is a first step towards internalising the external cost of environmentally harmful behaviour and is thus closely linked to ETR – as noted above in the definitions in subsection 2.1.[7]

Experience in OECD countries has shown that dedicated spending of a portion of ETR revenues to, for instance, energy efficiency improvements or renewable energy can amplify the environmental benefits of a tax and should result in environmental improvements being achieved at a lower cost than would be the case if ETR were implemented as a stand-alone measure. For the EU case, modelling has indicated that, in order to meet emission reduction targets in the EU 2020 strategy, a much lower carbon-energy tax rate would likely be necessary, if approximately 10% of total revenues are invested in low-carbon technologies and renewable energy (Ekins, 2009). Similarly, in developing countries, using a proportion of revenues for low-carbon or green investment can facilitate a cost-effective and economically efficient green economy transition and/or carbon emissions reductions and reduce the tax rate required to achieve these goals.

2.2.9 Measuring environmental effectiveness

Policy monitoring should be regularly carried out so that the actual impact of taxes is known. Is the tax environmentally effective? Do rates need to be adjusted? Are economic actors responding to price signals engendered by the tax? Is there a need for accompanying policy measures?

Yet this is not always a simple matter as external factors such as oil price fluctuations, the state of the economy, disposable incomes, and the availability of substitutes make it difficult to isolate the environmental effectiveness of a particular tax. Many different factors both affect the price and influence consumption of energy and other resources. For this reason,

7 A good starting point for policymakers is the useful and accessible guide to fossil fuel subsidy reform that has been developed by IISD/GSI (Global Subsidies Initiative) – see Beaton et al. (2013).

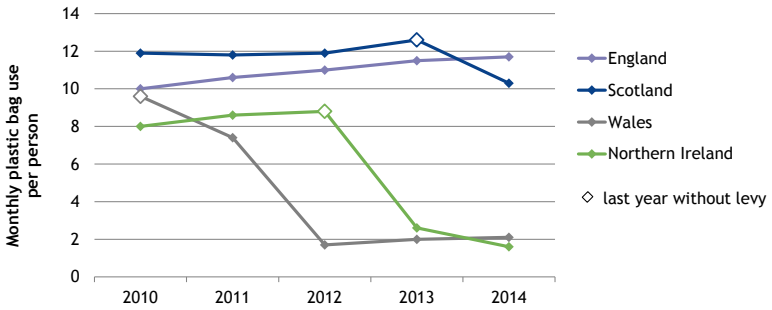
it may be very difficult to quantify the impact of a tax alongside other complementary or competing factors.

The 1999-2003 German ETR which shifted taxation from ancillary wage costs (pension contributions) to energy (transport and heating fuels, electricity) was introduced at a time when oil prices increased substantially within a relatively short timeframe. In this case, it proved difficult to extrapolate which impacts were a result of the ETR, and which were a response to the global oil price increase. There are a number of reasons for this. First, while it is relatively easy to determine how much of the price increase was due to higher oil prices and how much due to higher environmental taxes, higher fuel prices varied substantially over a short timeframe during the period, making any calculations much more difficult. Second, taking public awareness into account renders these calculations even more complex: For some time, the public assumed that the major part of the increase was due to the ETR – although in fact only about one-quarter of the price increase was attributable to the ecotax, while three-quarters were triggered by the world oil price. This begs the question: To which of the two components of the price increase should the impacts be attributed?

On the other hand, the environmental effectiveness of some taxes, where fewer factors influence consumption and use, is relatively simple to measure. Plastic bag taxes are a good example, although in this case awareness-raising and the availability of alternatives clearly also influence the effectiveness of the tax. Figure 1 shows the monthly average plastic bag usage per person for UK-countries between 2010 and 2014. Within that period Wales, Northern Ireland and Scotland introduced a plastic bag levy (a white diamond marks the last year without levy) with immediate impacts on consumer behaviour. In Northern Ireland, usage dropped by 70 % within one year. In comparison, the plastic bag usage in England, where no such levy existed until October 2015, was higher and increased steadily over the whole period.

Economists employ a range of modelling tools in order to estimate and predict the impacts and effectiveness of ETR measures as well as to isolate the impact from other influencing factors like price changes. A well-known example is the EU Commission commissioned COMETR (Competitiveness Effects of Environmental Taxes) report (Andersen et al., 2007). On the basis of indicators from 1999 to 2005, a BAU (business-as-usual, without ETR) scenario was calculated and compared to the de facto development in order

Figure 1: Monthly plastic bag usage, 2010–2014



Source: Based on data from Wrap (2015)

to derive changes resulting from implemented EFR elements. The on-going impact of ETR to 2012 was also modelled. COMETR modelling indicated that the impact of ETR in all six EU countries was a slight increase in GDP of up to 0.5% and a decrease in fuel consumption and greenhouse gas emissions of up to 6%. These changes were as a general rule more significant in those countries with the highest tax rates (Sweden and Finland) (Andersen et al., 2007).

It is important that such monitoring processes take place regularly because the impact of ETR measures changes over time as actors respond to the policy in different ways. In general, the responsiveness of demand to changes in prices, that is, the price-elasticity of demand, is higher in the long run than the short run. In the short term, business and households may adopt less polluting behaviours in response to a tax, while in the medium term, they will make structural changes and investments in response to a stable and predictable tax (OECD, 2010a). These responses have implications for tax policy design: introducing regular tax rate increases ensures that revenues remain stable and that dynamic incentives for behavioural change and continuous environmental improvements are maintained over time.

2.3 Impacts on private investment

2.3.1 Maximising the impact of ETR on private investment

A coherent, stable and predictable taxation system is essential for the promotion of private investment and structural change and can create an economy-wide incentive system in favour of sustainable development, steering investment away from non-sustainable, non-renewable resources. ETR measures foster private investment most effectively if the tax rates are set to remain in the long term. In Scandinavian countries in particular, a cross-party consensus on ETR measures has maintained ETR over many years and has sent an unambiguous signal to all market participants upon which they can base their investment decisions (see, for instance, OECD, 2010a).

Other systems of government, such as one-party states or less established democracies can use other mechanisms to foster a stable investment framework – such as dependency on revenues from an ETR. In Germany, for example, a fiscal driver – namely dependence on the revenues raised by the taxes – ensured that politically unpopular energy and electricity taxes introduced between 1999 and 2003 remain in place in 2016.

In both developed and developing countries, environmental tax structures must be coherent and tax rates sufficiently high to guarantee a return on green investment. If businesses or households anticipate regulatory changes or price instability, their long-term cost calculations may view green or low-carbon investments as too risky, leading to the misallocation of capital discussed in subsection 2.3.2.

A selection of lessons learned from the EU is shown in Box 3.

Introducing carbon taxation to foster low-carbon investment could prove to be a key element in measures taken by emerging and transition economies with rapidly rising CO_2 emissions to meet targets specified in their (Intended) Nationally Determined Contributions (INDCs).[8] In the immediate aftermath of the Paris summit, Price Waterhouse Coopers published a briefing which made clear that business would look to the INDCs for an indication of the commitment of governments to reduce CO_2 emissions (PwC [PricewaterhouseCoopers], 2013).

8 Intended Nationally Determined Contributions (INDCs) were firmed up in Paris and are now referred to as NDCs.

Box 3: The impact of carbon pricing on fossil fuel investment in the United Kingdom

In the EU, the low carbon price within the Emissions Trading Scheme (ETS) has resulted in very few incentives to invest in low-carbon technologies.[9] To address this problem, the UK government has introduced a carbon price floor, to keep the carbon price at a level which guarantees a certain rate of return for investors, explicitly stating that it regards the price floor as necessary to incentivise investment in low-carbon power generation.

The high carbon price has already had a significant impact on the United Kingdom as a result of a carbon price support – a tax on carbon emissions, which ensures that the carbon price is sufficiently high in EU ETS sectors to incentivise investment in low-carbon technologies. Three coal-fired power stations in the UK announced they would close in March 2016 as a result of this price floor and the introduction of strict new European emissions rules in January 2016, both of which left coal-fired electricity unable to compete with low-carbon sources of electricity generation (Sandbag, 2015). The high carbon price, strict emissions rules and the switch from coal to biomass at Drax, previously the UK's largest coal power station, have resulted in the share of coal in electricity generation falling by 71.3 per cent to a record low of just 5.8 per cent in only two years between the second quarter of 2014 and second quarter of 2016 (Department for Business, Energy and Industrial Strategy, 2016, September).

On the back of energy and emissions projections published by the UK's Department for Energy and Climate Change (DECC), which predicted 0 % of power generation from coal by 2026 – a trend attributed at least in part to the high carbon price in the United Kingdom – the UK government announced in November 2015 that it would phase out coal power by 2025 and permit only restricted use from 2023 (BBC News, 2015; DECC [Department of Energy and Climate Change], 2014; Mathiesen, 2015). However, subsequent updates to projections appear to regard a complete coal phase-out to be less certain (DECC, 2016).

Source: Authors

9 The current carbon price in the EU ETS – under EUR 5/tonne at the time of writing – is too low to incentivise the scale of investment required to bring about emissions reductions of 80-95 % in the European Union by 2050.

This is backed up by an analysis of the business case for fossil fuels. For example, in a report published in March 2016, Barclays Bank predicted that coal-fired power generation in Germany would be worthless by 2030, if targets from the Paris Agreement were embraced within the country and a carbon price of about 45 euros/tonne was introduced – although at the present time, such a policy development is not reflected in the country's 2050 Climate Action Plan. The report also predicted that only four coal-power stations, among the most efficient in Germany, would be connected to the grid by 2030 (RenewEconomy, 2016). The inevitability of coal phase-out in Germany at some point in the future has resulted in the break-up of large utilities such as E.ON and RWE into separate divisions for renewables and fossil energy (see subsection 2.3.3 below for details).

Over the next five years, all countries will be required to revise their emissions mitigation targets and submit their next NDC, Nationally Determined Contribution, to ratchet up ambitions towards closing the gap between pledged emissions reductions and the reductions needed to remain below 2°C global warming. This process has considerable potential to send a strong signal to private investors.

Developing countries in particular have the chance to lay the foundations early on and avoid path dependencies that are difficult to abandon at a later stage. This is not only the case for carbon reductions but for other measures as well, such as large-scale investment projects, for instance in sustainable urban planning, energy-efficient construction, and public urban transportation systems.

Evidence that developing countries are already leapfrogging onto a more sustainable investment path can be seen in UNEP's Global Trends in Renewable Energy Investment 2016 report, which revealed that developing world investments in renewables (up 19% in 2015) topped those of developed nations for the first time in 2015 (down 8%) (UNEP, 2016).

2.3.2 Poor investment decision-making: an era of gross capital misallocation

The cost disadvantage of higher prices is one of the main political economy arguments against ETR. In particular, industry sectors with highly inelastic demand for energy and/or resources are concerned about their competitiveness and put up strong opposition to the introduction of ETR

(EC, 2015). However, the distortive costs of low prices outweigh the benefits. Low prices send a distorted signal to consumers and producers which lead to misallocations of capital and resources, poor investment decisions and reduced incentives for energy efficiency. Insufficient monetary incentives to avoid polluting behaviour, by adopting new technology or investing in innovation to reduce pollution, result in **pollution oversupply and innovation undersupply** (OECD, 2010a). This creates an inappropriate competitive advantage for ecologically harmful products or industries.

Reflecting the severity of this issue, the United Nations Environment Programme (UNEP, 2011, p. 14) has labelled the last decades **"an era of gross capital misallocation"**. According to the authors, current crises, among them climate change, the fuel price shock, food prices, and the financial crisis, have one feature in common: the misallocation of capital of the last two decades. While much capital was invested in property, financial assets and fossil fuels for instance, "relatively little was invested in renewable energy, energy efficiency, public transportation, sustainable agriculture, ecosystem and biodiversity protection, and land and water conservation" (ibid.). While investment in renewable energy reached a new high of USD 266 billion in 2015, substantial capital misallocation continues with new investment in coal and gas generation, although at lower levels. Capital already 'locked in' to conventional power production meant that in 2015 only 10% of electricity worldwide was generated by renewable energy sources (Frankfurt School-UNEP [United Nations Environment Programme] Centre & BNEF [Bloomberg New Energy Finance], 2016).

This threatens a sustainable growth path and lays ground for further crises. However, particularly in the context of the Paris Agreement, it seems that this misallocation of investment may be redirected as it becomes increasingly apparent that fossil fuel assets are at risk of being stranded, as discussed in subsection 2.3.3 below.

2.3.3 Excursion: stranded assets in developing countries

Closely related to the misallocation of capital is the risk of stranded assets – investments whose value is prematurely reduced as a result of external factors. In the December 2015 Paris Agreement (UNFCC [United Nations Framework Convention on Climate Change], 2015a), governments around the world agreed to hold the increase in global average temperature to well below two degrees Celsius and to pursue efforts to limit the temperature

increase to 1.5 degrees. If this objective is met, then a large number of investments – especially in fossil fuels – will suffer from severe devaluation.

A shift towards devaluation of fossil fuel assets began even before a climate change agreement was reached, with prominent energy industry companies like E.ON and RWE (both in Germany) launching large restructuring processes, separating their traditional business units (fossil and nuclear energy) from renewables. Allianz SE, one of the largest insurance companies worldwide, also reacted and started to divest from coal-based business models (Allianz, 2015). In December 2015, institutions had pulled a total of USD 3.4 trillion of investment out of fossil fuels (DivestInvest, 2015). If – or when – the so-called 'carbon-bubble' bursts, that is, if it becomes clear that known reserves of fossil fuels will not be extracted and burnt and fossil fuel assets devalue substantially within a short timeframe, this will mean significant losses for all investors. The financial stakes are so high that Mark Carney (2015), governor of the Bank of England, has warned that physical, liability and transition risks of climate change could imperil financial stability. Such systemic failures are amplified by the neglect of externalities and the underpricing of natural assets described above.

The problem of stranded assets has important implications for developing countries. In 2012, for example, extractive fossil fuel industries generated resource rents worth five times more than total aid flows in 2012 (Oxfam, 2016a). Such reserves in developing countries – excluding China – have been estimated to be worth about USD 21 trillion – or about USD 627 billion per year up to 2050 (Oxfam, 2016b). The implications of not extracting these assets for sustainable development in developing countries are significant. Thus, the issue of stranded assets is clearly also closely linked to equity issues, as countries which can least afford it are facing the loss of a very significant amount of revenue, should fossil fuels become stranded assets in the coming decades.

One possible solution to the problem of stranded assets might be for developed countries to pay developing countries to not extract fossil fuels, along similar lines to the REDD programme (Reducing Emissions from Deforestation and Forest Degradation), which pays those who would otherwise harvest timber to protect forest (for more details, see Carney, 2016).

It should be noted in this context that the actual impact of rents from fossil fuel extraction in developing countries is not necessarily positive nor clear cut (see Carney, 2016). Some developing country governments

tend to over-rely on receipts from hydrocarbons and minerals and the resulting complacency linked to the easy rents generated from such taxes is one element in the so-called 'resource curse' – the negative relationship between natural resource wealth and economic growth. Reliance on such revenues has been associated with reduced incentives for economic reform or diversification (World Bank, 2006).

2.4 Fiscal impacts

Environmental taxation is not only beneficial for the environment. Environmental taxes are also highly relevant for fiscal policy. They can generate significant, stable revenues, if well designed. At the same time, in many instances, an environmental or resource tax base is a more efficient and less distortive tax base than labour or capital, as environmental taxes correct market distortions (the underpricing of pollution or resource use) while taxes on labour or capital tend to increase them. Environmental taxes, which tend to be collected from relatively few emitters (for instance, energy taxes on large installations or upstream on petrol refineries), or from well-established tax collection systems, are also harder to evade (Fay et al., 2015).

ETR thus offers several benefits which support sound fiscal policy. Vice versa, fiscal policy objectives may act as a fiscal driver that facilitates ETR implementation. The interdependencies of ETR and fiscal policy are discussed in the following subsections.

2.4.1 Revenue raising using environmental taxation

Alongside its environmental goal, ETR often has a fiscal goal – to raise revenue. In most instances, the two goals can be aligned or at least overlap while an environmental tax can reduce environmentally harmful behaviour and raise revenue at the same time (Schlegelmilch & Joas, 2015). However, trade-offs may be required between these two goals, because the environmental goal is to reduce consumption and production of the taxed good, which negatively affects revenues (the fiscal goal). If the environmentally optimal tax rate is higher than the fiscally optimal rate, there is a risk that policymakers are tempted to set a tax rate that is too low to change behaviour and thereby reduce pollution.

In practice, however, this relationship usually remains unproblematic as long as policymakers are clear about whether they wish to prioritise

environmental effectiveness or fiscal policy objectives. For example, some taxes which have an environmental tax base, such as taxes on plastic bags, prioritise environmental objectives and cannot be expected to raise significant or stable revenues in the medium term. Here, governments must plan for this trade-off between environmental tax revenue and environmental improvement.

Conversely, many ETR measures are of greater fiscal relevance, for instance energy taxes – and can be designed in an intelligent way to ensure that revenues remain stable in the medium term (Schlegelmilch & Joas, 2015). This can take the form of a tax escalator, which should ideally include step-wise increases of the tax rate year by year and indexation to inflation which can keep revenues stable in the face of a diminishing tax base and positive environmental effects (see Fay et al., 2015). In the case of an energy tax, for example, the tax base will not necessarily be eroded, as even energy taxes can also apply to renewable energies – to incentivise energy-efficiency and energy savings.[10]

In some cases, tax bases may be eroded to a certain extent and then stabilise, as additional reductions in pollution may be more difficult or costly to achieve. In the Netherlands, for example, the introduction of a water pollution tax in the 1970s brought about a rapid reduction in pollutants in waste water, but over time it proved difficult to further reduce residual emissions and the tax base of the water pollution tax became relatively stable, with few additional environmental gains (Volleberg, 2015). At the same time, keeping the tax in place may drive innovation, which leads to further environmental improvements in the future. Thus, the fiscal and environmental goals of an ETR measure may change over time.

As discussed in subsection 2.1, in developing countries environmental tax revenues are generally not used to reduce other distortionary taxes – as has been the case in many EU countries – but to raise additional revenues to increase public financial resources. For this reason, it may be even more important in developing countries to implement mechanisms to keep revenues relatively stable. These may include indexation to inflation, if inflation rates within the country are relatively stable, or to GDP growth, if they are not (see subsections 2.2.5 and 4.2.2 for more details).

10 Energy efficiency and energy savings are essential pillars o f energy transition – see, among others, Cottrell et al. (2015).

Generally, environmental taxes (as a share of total government revenues) have a tendency to decline over time for several reasons (see Box 4), so that tax rates have to be assessed and readjusted frequently.

Box 4: Environmentally-related tax revenues in the EU

In the EU, the fiscal potential of environmental taxation is rarely fully utilised. Currently, the Environmental tax revenues finance a relatively small, but not negligible part of the EU member states' (EU MS) budgets. However, between 2003 and 2013, the share of environmental taxes in total revenues from taxes and social contributions fell from 6.9% to 6.3% – although this weighted EU average masks substantial differences between EU MS as the share of environmental tax revenues has increased in some countries, and fallen in others (Eurostat, 2015a).

Where revenues have fallen, this is due to a number of factors. Environmental taxes in the EU – energy taxes in particular – tend to be levied per unit of physical consumption (unit taxes) and be fixed in nominal terms. Hence, unlike ad valorem taxes, their real value in relation to GDP tends to fall unless they are adjusted for inflation or otherwise increased regularly. Policymakers have proven reluctant to introduce either indexation to inflation or tax escalators. At the same time, environmental taxes may have had a steering effect, provoking behavioural change that results in falling energy use and corresponding drops in environmental damage and fiscal revenues (for an in-depth analysis of this topic, see EC & Eurostat, 2011, pp. 143).

The trend in falling revenues may be reversed through the EU's Flagship Initiative for a Resource-Efficient Europe, which has a target of increasing the share of environmental taxes in total revenues from taxes and social contributions to at least 10% by 2020. However, as a framework for policy actions in numerous policy areas rather than a binding agreement, it is difficult to predict the influence the Initiative will have on the tax policies in EU member states.

Source: EC and Eurostat (2011); Eurostat (2015a)

It is notable that energy tax revenues accounted for 77% of total environmental tax revenues in 2013 in the EU and that 77% of these energy tax revenues were raised on transport fuel (Eurostat 2015a). Taxes on transport (for example, motor vehicle taxes) accounted for a further 20%, while taxes

on pollution and resources (such as on water consumption or the extraction of minerals) generated on average only 3 % of all environmental tax revenue. The high proportion of energy tax revenues is not due to especially high tax rates, but rather to high levels of final energy consumption, a long tradition of levying excise on transport fuels, the existence of easy, cheap tax collection mechanisms, relatively high acceptance of transport fuels being seen as a necessary evil to fund infrastructure, and the relative inelasticity of energy demand.

The potential of energy taxes as revenue-raising instruments will be returned to in the conclusions section of this report (Section 4).

2.4.2 Reducing distortions in the wider economy through environmental taxation

In general, environmental taxes are less distortive for the broader economy than other taxes such as those on labour or capital. According to Vivid Economics (2012), income taxes, for instance, have a twice as damaging impact on GDP as energy taxes, while value-added-taxes tend to be especially detrimental to employment, as they strongly affect the retail sector. Energy taxes, in contrast, usually lead to reduced energy imports and thus the impact on employment or GDP tends to be transferred abroad. For such reasons, economic theory proposes that green tax shifting (that is, away from more distortive taxes) should result in significant efficiency gains in the tax system. For this reason, the IMF (2012, p. 27) suggests, among other things, that "carbon tax revenues should be used to alleviate distortions created by the broader fiscal system […]".

However, as noted above in subsection 2.1, in the majority of developing countries, reducing other distortive taxes is usually not a first priority as tax revenues are relatively low in general. It is more important to raise additional funds and create a stable stream of revenues to finance vital government investments such as those in infrastructure, health, education, or climate change mitigation and adaptation. This is not only relevant for ETR measures: **All tax revenue should be used to maximise welfare**.

2.4.3 Fiscal drivers

A fiscal driver – either in the form of an urgent requirement to raise additional revenues, fiscal consolidation pressures, or a degree of dependence on revenues raised from existing environmental taxes – can help 'lock in' tax measures and secure reform in the medium and possibly even the long term. The fiscal potential of ETR can act as an important source of political support from governments. Especially in times of crises, countries such as Ireland, Greece, Denmark and Sweden have introduced elements of ETR in order to consolidate their budgets.

Box 5: Emergency budget recovery in Ireland

In response to deteriorating public finances – a result of the banking crisis of 2007 – Ireland introduced a national recovery plan comprising large spending cuts (EUR 10 billion) and tax increases (EUR 5 billion) for the years between 2011 and 2014 (Government of Ireland, 2010). The recovery plan included, among many other things, several ETR elements. The government established a carbon tax with progressively increasing rates. At that time, it was forecasted to contribute EUR 330 million, or 6% of the planned tax revenue increases up to 2014. In fact, the tax generated more than EUR 356 million per year on average (2011-2014) and receipts are expected to have grown to EUR 415 million in 2015 (Tax Strategy Group, 2015). Additionally, a water charge was introduced to cover local authorities' operational costs for providing water services (approximately EUR 590 million in 2008). The Government of Ireland (2010, p. 99) recognised that "[a]t a time when national Budgets are under pressure, it makes sense to choose tax options that can have external benefits such as reducing import dependency, reducing emissions and driving innovation." According to data from Eurostat (2015b), Ireland was able to reduce its budget deficit (as a percentage of GDP) from 32.3% in 2010 to 3.9% in 2014; the trend of rising debt-to-GDP ratios was also reversed.

Source: Authors

Such cases demonstrate that fiscal drivers often constitute a necessary impulse for reform and that, once implemented, environmental taxes usually stay in place. After the banking crisis of 1990-1992, the Swedish government introduced several ETR elements, including a carbon tax as

well as indexation of (among other things) energy and carbon tax rates that still exist more than two decades later (EC, 2012; Statens Offentliga Utredningar, 2013). Similarly, Denmark introduced a carbon tax in 1991 as a way to generate new public revenues despite high unemployment following the 1980s recession (Klok, Larsen, Dahl, & Hansen, 2006). In Germany, high labour costs and high unemployment rates in the 1990s were conducive to tax shifting from desirable to undesirable activities (that is, from income derived from productive work – labour – to polluting behaviours damaging to the environment) and about 90 % of total revenues were used to finance a proportion of workers' pensions. The ETR in 1999-2003 increased the share of environmental taxes (as a percentage of total revenues and charges) from 5.1 % to 6.5 % (FÖS [Forum Ökologisch-Soziale Marktwirtschaft], 2015). In all these cases, the fiscal driver has helped to create a stable environmental tax framework in the medium and long term. This lesson can be transferred directly to developing countries: a fiscal driver can help secure ETR measures in the long-term.

2.5 Social impacts

2.5.1 The impact of environmental taxes on equity

The distributional impact of environmental taxes varies widely between different countries and between environmental taxes (EEA, 2011; Kosonen, European Commission, Directorate-General for Taxation and the Customs Union, 2012; Sterner, 2012). Nevertheless, equity issues are one of the main barriers to the implementation of ETR (European Commission, 2015), not least because environmental taxes are often assumed to be regressive, that is, to impact disproportionately on low-income households in comparison to households with higher incomes. To counteract such objections it is important to understand the distributional impact of individual taxes and to develop accompanying measures to protect the vulnerable from the impact of relative price changes (for instance, by using EFR revenues for impact mitigation, see subsection 2.5.2).

This current subsection looks first at the different impacts of differing kinds of environmental taxes and then goes on to examine ways in which these impacts can be mitigated.

Transport taxes

As a general rule, transport taxes can be regarded as progressive or neutral. Sterner (2012) does not find that there has been a regressive impact of fuel taxes in seven European countries. Instead, the tax burden is distributed proportionally. For Africa and the large Asian countries, Morris and Sterner (2013) even find that fuel taxes are strongly progressive, and neutral in many other regions. A study of 21 OECD-countries (Flues & Thomas, 2015) supports these findings and notes that fuel taxes are progressive in most countries.

Transport fuel taxes are particularly likely to be progressive in poorer countries with lower degrees of motorisation, because low-income households are less likely to own a car, and thus spend less on transport fuel as a proportion of their income. Often in these countries, transport fuel taxation acts as a 'luxury tax' (Morris & Sterner, 2013). Nonetheless, policymakers should be cautious about transferring these results to their own country context without an impact assessment. Taxation of diesel, for example, may have an impact on the costs of public transport, thus impacting negatively on social equity.

In India, for example, transport fuel tax expenditure as a percentage of total income amounts to less than 2% for the lowest income decile (Morris & Sterner, 2013). This value gradually increases up to the seventh decile (approximately 4%), before it starts to rise more quickly for high-income households. The top 10% of Indian households spend almost 8% of their total income on fuel taxes. The distributional effect of transport fuel taxes is clearly progressive in this country.

Similarly, flying tends to be a privilege for wealthier households. A tax on kerosene for air travel would most likely be highly progressive (especially in an international context).[11] However, kerosene remains largely exempt from taxation on a global scale due to clauses in the Convention on International Civil Aviation. Such fuel subsidies in the form of undertaxation often benefit high-income households disproportionally – particularly in developing countries (del Granado, Coady, & Gillingham, 2010).

11 In some developing countries, kerosene is also used as a cooking fuel and in such cases increasing kerosene taxation could have a regressive impact.

Taxes on electricity, heating and cooling

Taxes on heating, cooling and electricity are more likely to be regressive, as all households require a certain level of energy to light, heat and cool their homes. Indeed, a 2015 analysis revealed that in most of the 21 OECD-countries, such taxes are indeed regressive (Flues & Thomas, 2015). Again, the actual impact is dependent on the country context and developing countries considering the implementation of ETR in the energy sector would need to assess carefully possible impacts on vulnerable households.

It is also the case, however, that such studies on the distributional impact of taxes often use a static approach and do not take behavioural changes into account (Kosonen et al., 2012). As the environmental imperative for introducing ETR measures is to bring about behavioural change, it is critical that these changes are borne in mind, however – particularly because the price elasticity of demand for energy products tends to be much higher in the short run than in the long run (see subsection 2.2.9). This means that households can and do adjust to price changes and are hence able to influence their own tax burden (Kosonen et al., 2012).

The possibility of poor households being negatively impacted by increases in energy or electricity prices cannot be disregarded in either developed or developing countries. In the United Kingdom, for example, fuel poverty (that is, households with fuel costs which leave them with a residual income below the official poverty line) is a problem that affected more than 2.4 million households in 2013 (DECC, 2015). A reduced VAT rate of 5% (regular rate is 17.5%) for households mitigates the problem to some extent, but results in foregone tax revenues of around 0.25% of GDP (OECD, 2010b). In this as in many other cases, the problem would be better addressed with targeted support to low-income households rather than across-the-board tax reductions for all (Webb, 2008, p. 13).

Taxes on natural resources

Taxes on the extraction or use of natural resources, such as timber, minerals, wild flora and fauna and so on have a huge revenue potential in developing countries since their economies are often dominated by these industries. Such taxes are typically not paid by households, so that there is usually no direct effect on the distribution of income and wealth among households. However, resource taxes are likely to increase prices of final products, possibly affecting households disproportionately. The impact is dependent

among other things on the extent to which the final products are consumed domestically. In poorer countries, natural resources are often extracted and exported. In such cases resource taxes leave households unaffected, but the population might benefit from additional government revenues. A general statement about the regressivity of resource taxes cannot be made.

Taxes on water and waste water

In the case of water, social impacts are more pronounced. In an effort to stimulate the more efficient use of water and in order to fund investments in the water network, the Irish government introduced a charge on water supply in 2014. The costs per household for water supply and wastewater services can add up to EUR 260 per year or EUR 160 in a single household (Irish Water, s. a.). The introduction resulted in widespread protests demanding partial relief from the charges (McDonald, 2014) and at the time of writing they remain politically controversial. Willingness to pay is extremely low among the Irish population (Edwards, 2016), although a prison sentence may be imposed for non-payment. Since the potential to save or substitute water is limited, the burden on low-income households is particularly high relative to households with higher incomes. In 2015 a water conservation grant (EUR 100) was introduced, which all households registered with Irish water services are entitled to (Citizens Information Centre, 2016).

In developing countries, while it is desirable that water charges cover the cost of water services in the medium term, taxes on water supply and sanitation may in many cases have a significant impact on social equity and, if introduced, should be carefully designed to ensure access to water services is maintained and prevent any negative impacts.

Knock-on effects in the economy/pass-through of energy price increases

When examining regressive impacts of ETR measures, the ways in which taxes directly and indirectly affect consumer prices should be considered, as well as variations in impacts over time and behavioural change, as noted above.

While direct impacts are relatively easy to estimate in advance, indirect price changes as a result of pass-through of tax increases are hard to predict. In the case of developing countries, special attention should be given to potential impacts resulting from increases in transport fuel and energy taxes which affect almost all commodities via higher production

and transportation costs, including food prices. In India, researchers have found that agriculture is not very sensitive to fuel taxation increases and that few fuel-sensitive sectors affect the poor more than the rich (Morris & Sterner, 2013). Nonetheless, because a high proportion of income of poor households is spent on food, clearly this is an issue which policymakers should monitor carefully during the implementation of ETR measures.

In this context it is also important to note that the impact of ETR increases tend to be rather limited, since any tax increase typically only represents a small proportion of total energy or transport fuel costs, which in turn only represent a small proportion of total production costs. Hence, typical fluctuations in energy prices on the global energy markets tend to be much more significant. At the same time, the producers' ability to pass through their costs depends on their market power, price elasticities and government policies, which for instance fix the price of basic commodities.

The progressive impacts of environmental and other benefits

The physical impact of environmental improvements is generally progressive, since it is often the poorest households that live next to large and highly polluted thoroughfares, open sewers, or other areas where pollution and health impacts are at their worst. In developing countries, the poorest and most vulnerable tend to be most dependent on natural resources for their livelihoods, for example in small-scale agriculture, fisheries or forestry. This is an often underestimated positive impact in the distribution debate.

Summarising the impact of environmental taxes on social equity

In summary, to determine the distributional impact of an ETR – or taxation in general (since all taxes redistribute wealth) – many aspects have to be considered. Taxes on electricity and other fuels for heating, cooling and cooking tend to be regressive, while transport taxes appear to be progressive in most countries. The effect of taxes on natural resources critically depends on the resource being taxed. In all cases, a general statement about the regressivity or progressivity of a particular tax cannot be made. A careful analysis of the country context and the possible impacts of any ETR are essential to ensure that social equity impacts are carefully and effectively dealt with.

Whatever their impact as stand-alone measures, whether environmental taxes are regressive or not is ultimately dependent on their policy context

and there are many examples in developed countries of progressive ETR measures – not least because most developed countries have implemented ETR within a broader package of fiscal reform, or as one element in a policy package which includes measures to reduce labour taxes, facilitate behavioural change, fund energy efficiency measures or other investments, or introduce compensation measures to protect the vulnerable. Indeed, the use of additional revenues is crucial for the effectiveness of measures to mitigate negative impacts. Possible measures to achieve this are described below.

2.5.2 Addressing social impacts

Where there is a risk that environmental taxes have a direct regressive impact, appropriate compensation measures should be implemented alongside ETR measures to address equity issues and protect the vulnerable. As a rule of thumb in developed countries, it has been suggested that usually a maximum of 10 % of additional revenues from new energy tax packages are required to compensate the poorest 20 % (Vivid Economics, 2012), leaving governments with substantial revenues for other purposes. However, this is clearly largely dependent on the country context and the nature of relief or compensation required.

The feasibility and administrative costs of compensation schemes depend on the country context. In developing countries, experience has shown that targeted measures are the most effective and that measures to address social impacts, if poorly designed, can be associated with high administrative costs. In the United Kingdom, for example, a reduced VAT rate applies to the energy use of households. This effectively reduces the cost burden for all households but, according to the OECD (2010b) costs the state around 0.25 % of GDP in foregone tax revenue. If administrative structures allow, more targeted compensation schemes focussing on low-income households are generally preferable.

In developed countries, the OECD has argued that the structure of compensation mechanisms should not undermine the incentive effect of a particular tax, but should compensate by other means (OECD, 2006). However, it is often an administrative challenge to target all those negatively affected by a particular measure, and it is not always straightforward to determine whom to compensate and to what extent.

In many developed countries the regressive impact of energy and carbon taxes is neutralised, among other things, by means of income tax cuts or reductions in ancillary wage costs. In this way, the price signal of the environmental taxes is retained and low-income households are relieved at the same time. Such a tax shift away from taxation of labour (income taxes, social security payments, pensions) and towards environmental factors may serve to neutralise the distributional impact of taxes on energy and carbon dioxide, as was the case in the Netherlands and Sweden, for example (Peter et al., 2007). At the same time, such a tax shift does not undermine the incentive effect of the tax itself, as there are no exemptions from the tax.

Compensation or protection in some form is all the more important in developing countries, where vulnerabilities tend to be higher, and particularly in those countries with a significant proportion of their population living in poverty and vulnerable even to relatively small changes in prices such as energy. At the same time, in developing countries compensation schemes are more challenging in terms of design and coverage, as much of the population, and certainly the most vulnerable, are economically active in the informal sector. This means that compensation schemes which recycle revenues to employers and/or employees are largely irrelevant in developing countries, because such mechanisms do not target the most vulnerable.

Instead, developing countries should look to additional targeted measures in OECD countries which have been introduced to protect the vulnerable and facilitate adaptation to new environmental taxes, such as the installation of energy-efficiency measures at low cost or investment in public transport systems. We will explore the kind of schemes most relevant to developing countries and highlight some lessons learned for policymakers in subsection 4.5.

2.6 Administrative feasibility and costs

2.6.1 Administrative feasibility

Clearly wherever an environmental tax is introduced, it must be administratively feasible to collect it, and costs should be kept to a minimum wherever possible. Often compromises have to be made between economic efficiency and administrative and political feasibility (IMF, 2012).

Particularly in developing countries, feasibility plays an important role, as administrative capacity is often limited and tax collection mechanisms less advanced. While high-income economies are able to generate tax revenues in the magnitude of 30% to 40% of GDP, this number usually lies between 10% and 20% in low-income economies (see, for instance, Besley & Persson, 2014; Fuest, Hebous, & Riedel, 2011). One important observation by Besley and Persson (2013) is that high-income countries have been continuously investing in their fiscal capacities over many years – the power to tax cannot be taken for granted. Several additional explaining factors relating to economic structure, political factors (political will, culture, norms, and identity) for this discrepancy are discussed in subsection 4.4.

Next to the generally low tax revenues, low-income countries, in contrast to high-income countries, rely much more on taxation of trade than income, because taxes on trade – largely import and export duties, but also profits of export or import monopolies, exchange profits, and exchange taxes[12] – require less fiscal capacity (Besley & Persson 2013). They are easier to control and to collect. Thus, Besley and Persson have suggested that a higher share of tax revenues from trade can be seen as an indication of weaker fiscal capacity.

Underdeveloped fiscal capacities must be taken into account when thinking about ETR in a developing countries context. A focus on quick wins, trade-offs between administrative feasibility and other factors by identifying measures that are easy to implement is therefore appropriate. A number of tax design considerations (see also subsections 4.2.2 and 4.6.1) can reduce complexity as well as administrative costs and hence increase feasibility, for example by reducing the number of taxpayers. A smaller number of taxpayers implies less complexity and better control. Choosing a sensible tax base, a smart point of collection along the supply chain and a focus on the most important taxpayers can significantly increase feasibility.

- Tax base: Choosing the right tax base influences the complexity of the tax. For example, carbon taxes and emissions trading systems often focus on energy-related CO_2 for administrative ease, although it would be ideal to include all greenhouse gases from all sources (IMF, 2012). Taxing CO_2 only reduces the number of taxpayers substantially – and

12 Definition from the World Bank website: http://data.worldbank.org/indicator/GC.TAX.INTT.RV.ZS (accessed 13.06.2016).

hence complexity – but still captures a large proportion of greenhouse gas emissions.

- Point of collection: Taxes can be implemented at several points along the supply chain. Upstream taxation usually implies fewer suppliers and hence fewer taxpayers. It has to be examined though, where exactly the optimal point is. In the United States, for example, there are fewer petroleum refineries than oil wells (IMF, 2012). Taxation is thus easiest to collect at the second stage of the supply chain. Similarly, there are 450,000 gas wells in the United States, but only 500 operators (IMF, 2012). Although taxing the former would maximise emission coverage, the trade-off with administrative costs favours the latter.
- Focus on most relevant taxpayers: A focus on large taxpayers usually maximises revenues and coverage at lower administrative costs (Pereira, Hoekstra, & Queijo, 2013). Some sectors are often diverse and complex (for example, households and small businesses), which implies more difficult collection and monitoring processes despite relatively little revenue potential.

Besides smart tax design, synergy potentials with available tax infrastructure may exist in some instances. Minimising the need for additional capacities, for example by adding a new tax to already existing taxation infrastructure, increases administrative feasibility and reduces administrative costs. Fossil fuel-related pollution (such as emissions of carbon dioxide or sulphur) can be taxed via the same channels, using already established energy taxation regimes.

Fast-moving markets in developing countries create many opportunities for tax evasion (Pereira et al., 2013). According to the authors (2013, p. 3), adoption of control measures in parallel to or soon after the implementation of tax measures is necessary to prevent a "culture of noncompliance" and to signal resolute enforcement. A substantial argument in favour of environmental taxes is that they are in many instances more difficult to evade than taxes on capital or income. For example, sources of carbon are concentrated and hence easier to control and monitor (see Fay et al., 2015). According to Fay et al., evasion of environmental taxes in Sweden (carbon tax) and the United Kingdom (energy tax) is less than 1% and 2% respectively. In contrast, tax evasion for income taxes in the United Kingdom is said to be around 17% and is possibly much higher in many developing countries. Additionally, many environmental tax bases, such as those on

energy consumption, water, agricultural inputs or waste, are fairly immobile, in contrast to capital in particular, which makes tax evasion less likely.

There are several practical issues which should be mentioned in the context of administrative feasibility of the tax base and prevention of tax evasion. Fay et al. (2015) point to carbon as a good tax base for three main reasons, which may also serve as criteria for other environmental tax bases:

Measurement and monitoring: Carbon emissions are generally easy to measure and monitor at the supplier level, so that relatively few subjects have to be taxed and monitored (the same holds for instance for many natural resources and energy). In comparison, income taxes and value-added taxes have a much more diverse tax base, and compliance is therefore harder to enforce.

Existing infrastructure: Since systems for the application and collection of energy taxes are already in place in most countries, much of the required infrastructure for a carbon tax already exists and governments can benefit from the various synergies. The same is true for a tax on sulphur emissions.

Price transparency: Energy and carbon are traded in open marketplaces and prices are thus transparent. The possibility to report incorrect prices or quantities in order to evade taxes is more difficult (Liu, 2013). Thus, a shift to environmental taxation also benefits welfare due to reduced tax evasion and controlling costs (Liu, 2013).

2.6.2 Administrative costs

In general, there is only limited information on the costs incurred in administrating ETR by public administration and companies, but anecdotal evidence suggests that they are not substantial (Withana et al., 2014).

Ian Parry has suggested (IMF, 2012) that as a rule of thumb, approximately 5 % of revenues might be required to administrate a typical carbon tax. The actual amount of administrative costs is dependent on the instrument design and pre-existing mechanisms for tax collection, monitoring and enforcement. Selected examples of the administrative costs of environmental taxes are given below:

- The administrative costs of the Swedish taxation system for energy and carbon, for example, are very low and account for only 0.1 % of total revenue from these taxes (Hammar & Åkerfeldt, 2011). One reason,

according to the authors, is the very limited amount of authorised producers of energy products (approximately 300 companies) that are taxed and hence have to be monitored and controlled. The taxation of carbon was introduced in 1991 and complemented the already existing energy taxation system. It was built on the same tax regime and thus benefited from synergies.

- Administrative costs of the pesticide tax system in Norway account for approximately 1% of its revenues (Vatn, Kvakkestad, & Rorstad, 2002).
- Administrative costs of the plastic bag levy in Ireland account for approximately 3% of its revenues (Convery, McDonnell, & Ferreira, 2007).
- Administrative costs of ETR in Germany are estimated to account for just 0.13% of the total tax revenue generated, due to synergies with existing collection mechanisms, making the ETR one of cheapest taxes to administrate in Germany (OECD, 2006).
- To run its truck toll, Germany pays more than EUR 500 million per year to its operating company (Toll Collect GmbH), representing approximately 12% of its annual revenues of roughly EUR 4.5 billion (BMF [Bundesministerium der Finanzen], 2015). The costs are comparatively high, because of the high complexity of the tolling system. The remaining revenues of around EUR 4 billion provide significant funding for the German road infrastructure.

In general, as shown by the cases above, where a functioning collection system is already in place, the introduction of environmental taxes is easier and less costly. ETR measures can benefit from synergies with existing taxes and be designed in a way so that an established tax regime as well as collection and control structures can be used.

On the other hand, however, it is true that the examples above comprise industrialised countries with high fiscal capacities. Implementation in less developed economies is certainly more difficult and may be more expensive, as fewer potential synergies might exist. However, developing countries can certainly learn from these experiences, for instance by linking ETR measures to existing tax collection mechanisms or by implementing upstream environmental taxes which can be collected from relatively few taxpayers towards the start of the value chain. As stated above, environmental taxes are generally easier and cheaper to implement – and more difficult to evade –

than capital and income taxes and are thus a good first step for developing countries looking for routes to boost overall tax revenue. If developing countries implement good financial governance for the monitoring and enforcement of environmental tax collection, this will have many benefits in the medium term, and not only for the collection of environmental taxes. In some developing countries, a proportion of environmental tax revenues has been set aside to improve revenue collection mechanisms – for more details see subsection 4.6.1.

2.7 Revenue use: political acceptance and political economy

This subsection looks at how environmental tax revenues, and other methods, can be used to enhance political acceptance and address political economy issues – particularly how to address competitiveness concerns. While taking trade-offs between effectiveness, equity and other concerns into account, it is essential that ETR revenues are used to maximise welfare.

2.7.1 Earmarking of revenues in theory

Tax revenues from environmentally-related taxation are by definition no different from any other form of tax revenue (OECD, s. a.).[13] Thus, it is possible to contend that the question of how to allocate environmental tax revenue is equivalent to asking how to allocate government revenues generally (Schlegelmilch & Joas, 2015). In principle and by definition, all tax revenues should be appropriated to the general budget without hypothecation of revenue – usually referred to as earmarking – as this gives governments and parliaments the freedom to prioritise their goals and spend tax money accordingly and in a transparent way. This flexibility is especially valuable, for instance in times of unforeseen events or crises, when a sudden change of spending policy might be necessary. The alternative, of earmarking revenues for specific purposes, could be prejudicial in this regard and restrict the government's ability to act and react freely to changing circumstances.

13 The OECD's widely accepted working definition of taxation in its online glossary of tax terms at the Centre for Tax Policy and Administration is "a compulsory unrequited payment to the government" (see http://www.oecd.org/ctp/glossaryoftaxterms.htm#T) .

Another strong theoretical objection to earmarking is that the amount of revenue raised by a particular environmental tax instrument is not an indication of how much spending in other environmental programmes is socially desirable or indeed economically necessary: both are not known in advance. Hence, earmarking carries with it an inherent risk that projects may end up over- or underfinanced, or that circumstances change in such a way that other projects are more beneficial to invest in. A misallocation of resources is a possible result. Economists and fiscal experts therefore usually oppose legal earmarking (see, in this context, World Bank, 2005) and suggest instead that revenues should be allocated in a productive and efficient way to harvest additional economic benefits comparable to those of other economic uses, hence minimising the cost of the policy to the economy (IMF, 2012).

2.7.2 Earmarking to enhance political acceptance

The allocation of tax revenues has an impact on households, companies and the economy as a whole, and the purpose of revenues raised matters for the public acceptance of EFR (World Bank, 2005). For example, dedicating a proportion of tax revenues to a specific project (green investments, for example) can be expected to gain more public acceptance than general budget appropriation, because it makes the link between environmental taxes and environmental improvement more clear (Cottrell et al., 2015).[14]

Earmarking revenues in this way can increase public trust in policy, enhance transparency of expenditure and might even "mitigate the baggage associated with the t-word" (Kallbekken, Rorstad, & Vatn, 2011). In addition, linking revenue recycling to policy priorities can ensure policy stability and, as mentioned above, a combination of both is environmentally most effective (Ekins, 2009).

A legally binding earmark is unconstitutional in many countries and, in any case, inadvisable. Nevertheless, the revenue from a certain environmental tax can still be politically connected to a certain spending programme. Such 'soft earmarking' can be understood by electorates as a declaration of intention. Linking EFR to a government's spending policies can change the public perception of the reform's benefits without compromising budgetary

14 Linking ETR to the 'polluter pays' principle can also be helpful in this regard, as support for the principle is widespread (Cottrell, 2015).

authority. The UK government, for example, politically earmarked revenues from the Climate Change Levy for reductions in National Insurance Contributions and the Carbon Trust, a publicly-owned company set up by government to provide advisory services and information on low-carbon development. Revenues raised by the Levy ultimately did not correspond to the transfers made. In this case, earmarking was communicated for political economy reasons, to boost support for the Levy itself (Cottrell et al., 2013).

In developing countries, confidence in the fulfilment of political promises made for example to earmark revenues for a particular environmental improvement tends to be lower than in developed countries. This may be due to higher rates of corruption and a lack of trust in government. In developed countries too, research has indicated that these factors influence support for economic environmental policy instruments (Harring, 2013). Therefore, in developing countries it may be that legal earmarking is helpful to boost political acceptance, as well as rendering communication about ETR measures more straightforward, as earmarking makes the linkages between an ETR and environmental improvements more salient.

2.7.3 Revenue allocation and competitiveness impacts

The design of ETR measures should include a phase of broad-based consultation with all stakeholders potentially affected by the measure, to understand their perspectives on how adjustment can be facilitated and how to reduce the costs of compliance (OECD, 2005). Many stakeholders are resistant to increasing prices resulting from the introduction of ETR measures, and the most organised – typically industry – can constitute a significant obstacle to ETR implementation. In terms of revenue allocation, issues are rather complex and several factors influence the way revenues are allocated and spent – often also in this case depending on the relative power of the stakeholders involved in the political decision-making process. A number of trade-offs need to be made to find a balance between economic efficiency, environmental effectiveness, political feasibility, and social equity. These trade-offs will be discussed below.

Fear of reduced international competitiveness is extremely important in terms of the political economy of energy taxation and poses one of the most significant obstacles to ETR implementation in developed countries (OECD, 2006). In response, firms in trade-exposed sectors are often compensated through targeted measures, such as adjustments to the broader tax/benefit

system, reduced tax rates or exemptions linked to voluntary agreements to improve environmental performance, transitory production subsidies, or tax exemptions. Tax exemptions are the least desirable option as they create inefficiencies in pollution abatement and undermine the notion of the 'polluter pays' principle, representing an undesirable trade-off between environmental effectiveness and political feasibility (OECD, 2006).

In developed countries, the full potential sectoral competitiveness implications of the environmental taxes applied to most of the economy have rarely been revealed, because those industrial sectors perceived to be most vulnerable – in general, energy-intensive sectors – have always been granted special treatment in the form of reduced tax rates, or even complete exemption from such taxes (OECD, 2006). While such measures have been necessary for the ETR to gain adequate political support to be implemented, such tax provisions can have serious implications for the efficiency and effectiveness of environmental taxes (Green Fiscal Commission, 2010).

At the same time, competitiveness concerns linked to energy tax increases relate to a few energy-intensive sectors and are often exaggerated, for several reasons. Firstly, fluctuations in energy prices on global markets tend to be far more significant than the impact of a tax on energy. Secondly, by no means all energy-intensive goods are highly traded internationally and, where this is not the case, increased costs can be passed on to the consumer. Thirdly, an increase in energy prices will incentivise both energy efficiency measures and innovation, which may result in stable or even falling energy costs for firms over time. Finally, revenues can be used to mitigate negative impacts and support investment in reduced energy use or installation of appropriate technologies (Green Fiscal Commission, 2010).

In developed countries, for the vast majority of sectors, impacts on competitiveness have been minimal and for most businesses, other factors are considerably more important (Science for Environment Policy, 2016). Nonetheless, for political economy reasons, it is clear that special conditions for industry will often be necessary, also in developing countries, to build the consensus necessary to implement ETR. Revenues raised by ETR measures can be used to support industry to adapt by implementing new processes to reduce energy or resource use and by installing new technologies. As noted in subsection 2.2.7, such programmes should be targeted, time-limited, subject to regular review, and accompanied by certain conditions or agreements.

Sweden's nitrogen oxide charge, introduced in 1992, is an innovative example of how revenue allocation can influence environmental effectiveness, while also gaining the support of industry for a particular ETR measure and maintaining international competitiveness at the same time. It is described in Box 6.

Box 6: Sweden's refunded nitrogen oxide charge

In 1992, Sweden introduced a charge on NO_X-emissions with the goal to reduce acidification and nitrogen oxide emissions below the regulatory limits (Bragadóttir et al., 2014). The case illustrates the trade-off between breadth of coverage and feasibility and how to cope with unintended consequences. In contrast to carbon and sulphur emissions, nitrogen oxide emissions do not increase proportionally with fuel consumption and thus cannot be derived from the nitrogen content of the fuel but have to be measured physically (Millock, Nauges, & Sterner, 2004). Therefore only large stationary combustion plants (>25 gigawatt hour (GWh) per year) are taxed – the coverage is rather narrow – but including smaller plants in the tax system has increased administrative costs substantially and might have encouraged the operation of smaller plants (Millock et al. 2004), leading to inefficiencies and leakage of emissions.

Revenue-recycling is dependent on the amount of useful energy generated, that is, the most efficient plants receive a higher refund, while less efficient plants receive less – thus both reducing NO_x-emissions whilst increasing electricity generation and thus efficiency. Awareness of this relationship appears to be high: in some utilities, like Vattenfall in Stockholm, both values of emissions and electricity generated are displayed on the same screen, showing positive and negative amounts of charge payments.

The tax was extremely successful, and between 1990 and 1995, NO_X-emissions fell by 60 %, which can be largely attributed to the nitrogen charge (Johansson, 2000). Currently, the rate is set at EUR 5.8 per kilogramme of NO_X (Bragadóttir et al., 2014).

Source: Authors

2.7.4 Fostering a consensus to boost political acceptance

Ideally, a broad consensus in favour of ETR measures should be fostered between diverse agencies and ministries (such as energy, environment, finance, health, economics and trade, transport), interest groups (such as manufacturers, refineries), and civil society.

Creating such a consensus requires both **scientific evidence** and **awareness-raising** about the environmental and health impacts of pollution to create **political acceptance** for the introduction of ETR instruments. It is important that the public understands the rationale of ETR instruments, as well as being made aware of opportunities to change behaviour (see Cottrell, 2015). For example, in the case of phasing out lead, a broad consensus about the detrimental effects of lead was necessary to successfully implement the programmes, considering the various political actors as well as diverse stakeholder and interest groups (Lovei, 1998, p. 26).

Political credibility is also necessary to convince the public of the government's intentions. In the mid-1990s, several European countries introduced ETR measures but faced serious opposition. Assessments of these reform efforts revealed several commonalities, including insufficient knowledge among citizens about the implemented instruments and their interaction, as well as public scepticism regarding the purpose and use of the additionally raised revenues (OECD, 2010a). If governments fail to communicate credibly and transparently, they will not obtain public support. This is all the more important in developing countries, where trust in the benevolence and capabilities of governments is often low.

In view of this problem, political acceptance in developing countries might benefit from approaches which emphasise the choices involved in policy making. Concretely, this means emphasising for example that if well-designed and implemented effectively, ETR measures are the most cost-effective option available – and that introducing a regulation to achieve the same objectives would come at a higher cost (Cottrell, 2015). On the other hand, such approaches are complicated by the question of who pays such costs: in the case of ETR, a sceptical population possibly concerned about corruption or lack of accountability; in the case of regulation, industry.

A further possible approach to address lack of confidence in political institutions and government agencies can be addressed by setting up new, independent entities to manage ETR revenues, such as the United Kingdom's

Carbon Trust or Denmark's Energienet.dk. Energienet.dk is an independent, non-profit enterprise, 100 %-owned by the Danish Ministry of Climate, Energy and Building, which manages revenues from the Public Services Obligation tariff (PSO – a levy on electricity consumption). Funds from the PSO reach a state-owned company, but not the state itself – and thus are not included in the state budget, although their magnitude is politically decided in accordance with the requirements of the overall energy policy.

As noted in subsection 2.5, some kinds of environmental taxation are regressive and have negative social impacts. Revenues from ETR can be used to address equity issues and may include mechanisms which undermine the environmental effectiveness of a particular ETR measure, but these trade-offs are essential for social equity reasons to protect the most vulnerable.

3 Practical experience in developing countries

This section focuses on the personal experience of the authors of this report in developing, emerging and transition economies and summarises the lessons learned.

3.1 Vietnam

According to Vietnamese Prime Minister, Nguyễn Tấn Dũng, "[a] price on carbon would catalyze green investment and give companies the certainty they need to green their industries and supply chains" (Carbon Pricing Leadership, 2015).

3.1.1 Environmental policy planning in Vietnam

In 2007, the Environmental Protection Tax (EPT) in Vietnam was included in the seventh legislative programme of the National Assembly (2007-2011). The EPT Law 57/2010 / QH12 was ultimately implemented in 2012, and is often hailed as an example of international best practice[15] of ETR in a developing country (see Green Fiscal Policy Network, 2011).

Vietnam passed resolution no. 24-NQ / TW in 2013, which committed the country to "an active response to climate change, improvement of natural

15 To what extent this is justified is discussed in this subsection of the paper.

resource management and environmental protection" (London School of Economics, Grantham Research Institute, 2016, website on climate change legislation). Subsequently, the government has committed to the implementation of an ambitious transition to a greener economy – the Vietnam Green Growth Strategy. Targets for the strategy are shown in Table 2.

Table 2: Headline targets of the Vietnam Green Growth Strategy by 2020
Double GDP per capita on 2010 levels
Reduced energy consumption per unit of GDP by 2.5-3 % annually
Reduced greenhouse gas (GHG) emissions intensity 10-15 % on BAU scenario from 2010
Improved efficiency of natural resource consumption
Reduce or halt environmental degradation
Shift growth trajectories towards a green economy to support sustainable development
Source: Government of Vietnam (2012)

In Vietnam, some policymakers are highly committed to environmental protection and improvement, while others prioritise economic growth, leading to increased welfare as a priority. Some policymakers are relatively sceptical about the feasibility of uniting the goals of environmental, economic and social sustainability. In general, the Communist Party's priority has been its own survival and thus the need to contain the potential for social unrest by spreading the benefits of economic growth has resulted in a fine balance between economic growth, poverty reduction and political stability (Hayton, 2010).

The concerns of the government in Vietnam not to introduce measures which adversely affect the poor should be seen against the context of a relatively ineffective social welfare/transfer system. In Vietnam, the poorest quintile receives on average 9 cents per day in government transfers and the richest quintile USD 1.6 (World Bank, 2016a).

In 2012, the Vietnam Green Growth Strategy (VGGS) was signed by the above-mentioned Prime Minister, Nguyễn Tấn Dũng. The strategy focuses on the three tasks of greening production, reducing CO_2 emissions, and greening lifestyles. Within the strategy, there is considerable potential to implement environmental taxation to price carbon or incentivise higher

levels of resource efficiency. The VGGS is a framework for concrete policy implementation, delineated in the form of institutional Action Plans. Thus, there are several directions in which broad environmental taxation could be developed in Vietnam in the coming years: energy/carbon taxation could be strengthened; or other environmental taxes, charges and fees could be introduced and broadly applied.

In 2015, Vietnam submitted its INDC (Intended Nationally Determined Contribution) to the United Nations Framework Convention on Climate Change (UNFCCC) in the run-up to the 2015 Paris climate conference, the COP21 (UNFCCC, 2015b). This commits the country to reducing CO_2 emissions by 8 % compared to business-as-usual from 2021 to 2030 – which would still mean an increase of 58 % or 288 million tonnes of CO_2e in absolute terms – in that period. The document also notes that emissions reductions of up to 25 % on BAU are possible, subject to receiving international support. The agreed 5-year cycle to regularly review and update NDCs on the back of the 2015 Paris Agreement will give countries, including Vietnam, the opportunity to ratchet up their ambitions in the years ahead.

These documents indicate a degree of commitment within the country to start to integrate environmental policies with other measures to boost growth, restructure the economy, address energy security concerns, and access international finance. Environmental improvements have thus been integrated into many aspects of policy making as a co-benefit of policies aiming to promote other goals (Zimmer, Jakob, & Steckel, 2015).

In 2016, Vietnam is also currently considering the reform of the EPT, and of natural resource taxation.

3.1.2 Environmental impacts and effectiveness

Even before the introduction of the 2012 EPT, Vietnam had a range of taxes and levies with environmental relevance, including natural resource taxes and fees on oil refining, coal, land use, waste water discharge, forests and mineral extraction. In general, however, these taxes lack a coherent legal basis and in most cases, environmental benefits arise as unintentional side effects (Sieber, 2013). While these levies do yield state revenues – see Table 4 – they failed in the past to influence the behaviour of economic actors to a significant extent, due to too low rates, too many exemptions, and poor monitoring and enforcement (Mehling, 2008).

A more comprehensive raft of environmental taxes was introduced with the 2012 EPT, with the explicit aim of introducing an environmental tax and all that entails. The EPT Law 57/2010 / QH12 is often hailed as an example of international best practice in ETR in industrialising countries (Green Fiscal Policy Network, 2011). The EPT introduced taxation on a wide range of tax bases, mostly energy, but also hydrochlorofluorocarbon (HCFC) and a range of chemical pollutants like pesticides, and in principle has considerable potential to reduce environmental damage. For each tax base, a range of tax rates were proposed (see Table 3). In the first

Table 3: Environmental Protection Tax – tax bases and rates

Goods	**Tax rate in Viet Nam Dong (VND / unit)**
All kinds of gasoline	1,000 – 4,000 / litre
Jet fuel	1,000 – 3,000 / litre
Diesel	500 – 2,000 / litre
Paraffin	300 – 2,000 / litre
Mazut	300 – 2,000 / litre
Lubricating oil	300 – 2,000/ litre
Grease	300 – 2,000 / kg
Brown coal	10,000-30,000 / tonne
Black coal	10,000-30,000 / tonne
Anthracite	10,000-30,000 / tonne
Fat coal	10,000-30,000 / tonne
HCFC substance	1,000 – 5,000 / kg
Taxable soft plastic bags	30,000 – 50,000 / kg
Restricted-use weedkiller	500 – 2,000 / kg
Restricted-use anti-termite chemicals	1,000 – 3,000 / kg
Restricted-use preservatives for forest products	1,000 – 3,000 / kg
Restricted-use disinfect chemical used for warehouses	1,000 – 3,000 / kg
Source: Ministry of Finance, Vietnam; authors	

instance, the lower end of each tax band was implemented. The advantage of introducing a range of possible tax rates is that it gives policymakers flexibility to increase the tax in response to changing circumstances, such as falling oil prices or evidence of lack of behavioural response. The National Assembly Standing Committee, the body responsible for setting tax rates and subsequently agreeing changes, is able to raise the tax without a repeated legislative process.

Econometric modelling prior to the introduction of the EPT suggested that the measures proposed could potentially reduce GHG emissions by between 3 million and 9 million tonnes of CO_2 in the year 2012, depending on the tax rates applied (see Green Fiscal Policy Network, 2011). As the growth in Vietnam's GHG emissions is quite rapid, this would not lead to a reduction in overall emissions but could contribute to a slowing of emissions growth.

Computer-generated equilibrium (CGE) modelling of the impact of the EPT compared to a business-as-usual scenario suggests that CO_2 emissions were reduced by about 2 million tonnes in 2012 and 2013, or a decrease of about 1.7% (Huong, 2014). This discrepancy can be explained by the tax increases on energy products in the EPT being introduced at the same time as falling oil prices, as well as the abolition of an energy charge of the same amount (Sieber, 2013). Thus, the impact of the EPT on prices was less than had been predicted and resulted in less change than suggested by modelling.

The authors have heard some anecdotal evidence that challenges were encountered once the EPT was implemented in relation to its environmental impact. Concerns have been expressed that the tax created false incentives for substitution effects away from refined oil fuels and towards (low-taxed) coal in the electricity sector – a switch towards the dirtiest fossil fuel. Clearly, an improved tax design could address these problems.

As the EPT is not indexed to inflation, tax rates have been falling in real terms since it was introduced in 2012. Thus, in spite of increases to tax rates, it is reasonable to assume that the impact of the EPT on behavioural change has been minimal.

3.1.3 Impacts on private investments

Modelling prior to the implementation of the EPT suggested there would be an increase in production prices as a result of energy price increases, which could in turn lead to reduced competitiveness of exports and so

negatively impact GDP growth (Willenboeckel, 2010). This finding was corroborated by CGE modelling conducted in 2014, which indicated a small drop in investment in comparison to business-as-usual as a result of the EPT of about -0.7% in 2012 and 2013 (Huong, 2014). This was presumably attributable to higher production costs as a result of higher energy prices, resulting in lower rates of return on investment.

On the other hand, a review of investor sentiment conducted by the International Institute for Sustainable Development in 2015 revealed that the investment decisions of those looking to make Foreign Direct Investments would not be negatively affected by increased energy prices, but by a lack of skilled human resources and an unreliable electricity supply (Garg, Bridle, & Clarke, 2015). In general, private investment is affected far more by regulatory conditions and the political situation in the country, with the so-called '6 Nos' in policy implementation acting as a major barrier to investment, according to representatives of government interviewed in the Vietnam Economic Times. They identified no transparency, no consistency, no synchronisation, no stability, no possibility (a comment which is presumably related to a lack of policy reform in the country, for instance in relation to energy market development), and no predictability as major investment barriers in the country (Vietnam Economic Times, 2016).

3.1.4 Fiscal impacts

In total, environmental taxes make up a considerable proportion of total tax revenues in Vietnam – particularly when seen in the context of a middle-income country.

As shown in the table, EPT revenues are quite significant, generating about 2-3% of the total government budget in Vietnam. As a result of the introduction of the EPT, government revenues increased by 1.6% in 2012 and 1.2% in 2013 (Huong, 2014).

Moreover, EPT revenues doubled in 2015 as a result of rate increases to VND 3,000 per litre of gasoline and jet fuel, VND 1,500 per litre for diesel and VND 900 per litre of kerosene. This should result in increased government revenues in the future – particularly as the main source of additional revenue in the EPT are transport fuel taxes. However, once again these adjustments took place in parallel to import tax rate reductions on fuel products imported from ASEAN countries – accounting for 64% of

total fuel imports – in accordance with trade agreements, so the impact on domestic fuel prices was minimal (Son, 2015).

Nevertheless, the government claimed that smuggling activities will be reduced as a result of the new tax changes – and that fuel prices of gasoline grade 92-octane remained lower than in other countries in the region, such as Cambodia, China, Laos and Thailand.

Table 4: Environmental tax receipts in Vietnam, 2011-2015, plan 2016

Tax in billion VND	**2010**	**2011**	**2012**	**2013**	**2014**	**Plan 2015**	**Actual 2015**	**Plan 2016**
Natural resources	26,306	38,123	42,278	36,368	39,886	38,020	27,651	30,058
EPT	0	11,201	12,680	11,654	12,034	12,939	26,404	38,472
Land rents	3,791	5,869	7,762	5,103	7,231	6,422	13,066	11,855
Land and property	49,368	54,225	45,109	39,200	39,000	39,000	57,920	50,407
TOTAL	**79,233**	**99,418**	**107,829**	**92,325**	**98,151**	**96,381**	**125,041**	**130,792**
Per cent of total budget	13.4%	13.8%	14.5%	11.7%	11.6%	10.6%	11.4%	10.8%

Source: Ministry of Finance, Vietnam (unpublished report)

It is not legally permissible to hypothecate (or earmark) tax revenues in Vietnam to a specific policy goal in budgetary law and thus, environmental tax revenues flow into the general budget. It seems however that some political earmarking did take place in the country: indeed, it was also predicted that the EPT would strengthen fiscal decentralisation by allocating funds to state and provincial budgets. However, these revenues appear not to have been earmarked in any way or used for environmental expenditures as initially intended and discussed.

3.1.5 Social impacts

Modelling conducted prior to the introduction of the EPT indicated that household welfare would decline across all groups – more so, if high tax rates were implemented. Concerns about these possible social impacts had a significant influence on the ultimate design of the EPT. Thus, at the time the EPT was introduced, other taxes were reduced to ensure that the initial impact on prices would be minimal – although increasing environmental expenditures was also seriously discussed.

The social impact of the EPT was expected to be regionally differentiated, affecting largely poor populations in rural villages, known to local government. Thus, the Vice-Finance Minister at the time stated that those who would be affected would receive increased payments from local government – and that there would thus be no social/monetary impact on the population.

However, CGE modelling conducted in 2014 indicated a small drop in household consumption of just under -0.6% in comparison to business-as-usual as a result of the EPT in 2012 and 2013 (Huong, 2014). This was presumably due to higher prices of fossil fuels, which reduced household real income and shifted demand from coal and other refined fuels to other goods (Huong, 2014). The poverty rate in Vietnam declined from 11.1% to 9.8% between 2012 and 2013, representing a deviation of -0.2% from the BAU scenario in 2012 and -0.1% from that in 2013. On the other hand, income distribution improved slightly during the same period (Huong, 2014).

On the whole, the social impacts reported above are insignificant. This is reiterated by anecdotal evidence collected from interviews in March 2016 with policy experts from the Central Institute of Economic Management (CIEM), a governmental policy think tank linked to the Ministry of Planning and Investment, who suggested that the negative social impacts of the EPT had been minimal, due to falling oil prices since the introduction of the tax in 2012. Moreover, the economic and social impacts identified as a result of CGE modelling do not take into account future welfare gains resulting from positive environmental impacts.

3.1.6 Administrative feasibility and costs

In the case of energy taxes, the EPT could tag on to existing collection systems, thus ensuring administrative feasibility and keeping costs to a minimum, as is generally the case for energy taxes in EU and OECD countries.

3.1.7 Use of revenues, acceptance, political economy

Due to concerns about public opposition to the tax, and a lack of an effective social security system to recycle revenue effectively to the most vulnerable, the National Assembly opted to allocate revenues to the general budget – as is generally the case in Vietnam's budgetary law and in spite of an informal proposal in Clause 12 of the EPT law to allocate revenues to environmental projects.

In Vietnam steps are often taken to minimise opposition from public opinion and civil society – the so-called 'motorbike constitutionalism' and opposition, particularly to energy taxes which affect farmers or traffic, can have a significant influence on government policy (Hayton, 2010; Rodi, Schlegelmilch, & Mehling, 2012). Thus, when the EPT was implemented in 2012, the gasoline surcharge regulation was abolished at the same time, which prevented an overall increase in transport fuel prices. This served to keep opposition to a minimum and protected vulnerable households (and businesses) from the impact of energy price rises. While such measures facilitated the implementation of the EPT, trade-offs are certainly evident between environmental effectiveness and thus also revenue-raising potential on the one hand – both were substantially reduced as a result – and political feasibility on the other. Vietnam's single-party state implemented a broad ETR in the form of the EPT within just a few years, in part as a result of not having a democratic government, but nonetheless, it can be seen that the process of designing and implementing the tax were strongly influenced by public acceptance concerns and political feasibility.

At the time of writing in early 2016, there appears to be a sense amongst some Finance Ministry staff that environmental tax rates in Vietnam are high already, and should not be increased. However, a broader review and reform of the tax structure is planned, which may enable policymakers to integrate environmental tax elements into the new policies.

At the same time, expenditures should be scanned regarding their environmental impacts and transformed according to the objectives of the VGGS.

3.2 Thailand

3.2.1 Environmental policy planning

Over the past thirty years, the Thai government has also shown interest in environmental fiscal reform and has implemented several environmental taxes. A Draft Framework Law on Economic Instruments for Environmental Management (henceforth: Framework Law) similar to the EPT in Vietnam was principally approved by the cabinet in 2010, but it did not get past the Council of State. Currently, various elements from the Framework Law are in the process of being implemented, for instance, carbon-based vehicle taxation, water charging, and carbon taxes on transport fuels.

As is the case in Vietnam, Thailand's 5-year planning cycles are strongly influenced by the international development agenda, which may result in planning being tailored less to the needs and perceived requirements of the domestic populations, such as income inequality or educational system failure, and more to the expectations of donors (Israngkura, 2014). As a result, buy-in of policymakers and local populations to environmental policies is sometimes limited.

On the other hand, because climate change poses an 'extreme risk' for Thailand according to the Intergovernmental Panel on Climate Change (IPCC), awareness of the need to tackle climate change is high. Severe flooding in 2011 reduced growth to just 0.1% (Macroeconomic Strategy and Planning Office, 2012) and a 2015 drought led to substantial GDP losses of 0.52% (Office of Natural Resources and Environmental Policy and Planning, 2015). As a result, policymakers are acutely aware of the need to invest in adaptation in the country and to stabilise GHG emissions in the country in the medium term; they submitted a relatively ambitious INDC in 2015, committing to GHG reductions of 20% on business-as-usual from 2021-2030 (projection year 2005). In addition, several 5-year plans, including the 2015 Transport Master Plan, directly refer to economic instruments and propose measures which could be realised by the implementation of environmental taxation.

Following the military coup in May 2014, the new government had a great deal of momentum and was open to pushing through somewhat controversial measures. Steps were taken to phase out fossil fuel subsidies for oil, gas and liquefied petroleum gas (LPG) (LPG) soon afterwards. Ongoing political

momentum may offer a window of opportunity for the implementation of environmental taxes on GHG emissions.

In 2010, as noted above, the Framework Law was principally approved by the Cabinet under the former ruling government. The Framework Law proposed an umbrella framework for economic instruments for environmental policy, to be utilised by different government ministries for environmental purposes, for relatively comprehensive environmental management. The framework law covered the following areas and proposed a range of tax rates for each tax base:

a. Environmental tax
b. User fees or charges for pollution management
c. Product tax and product surcharge
d. Performance bonds
e. Tradable permits
f. Subsidies and other support mechanisms
g. Other economic instruments as determined by the Economic Instruments Committee

To implement a particular instrument from within the toolkit, a Royal Decree would have been passed. However, the Council of State rejected the notion of using a framework law for setting taxation, as it felt the proposal went against legal norms in enacting tax-related legislation in Thailand, in which mechanisms for tax collection and tax rates must be set out in a specific Act.

The Council therefore recommended that the government reconsider the Framework Law and implement each proposed economic instrument as a separate piece of legislation. Since this time, the Ministry of Finance (MoF) has developed a proposal for a carbon tax on transport fuels and the annual circulation tax for vehicles has been reformed (details below) while the original concept of introducing a broad Framework Law appears to have been put on hold.

3.2.2 Environmental impacts and effectiveness

The carbon tax on transport fuels drawn up by the Fiscal Policy Office proposes to restructure fuel excise without significantly increasing transport

fuel prices. Thus, it is predicted to have only a relatively small impact on emissions, due to reduced distortions and clearer price signals in favour of low-emissions transport.

A new excise tax based on CO_2 emissions, engine size and fuel used, introduced on 1 January 2016, is predicted to reduce CO_2 emissions by 40,000 tonnes of CO_2 annually. However, these predictions are based on modelling, rather than empirical evidence.[16]

Taxes on leaded/unleaded petrol in the 1990s have been very effective in terms of environmental impact. A tax differentiation was introduced in 1991 to reduce air pollution from lead, particularly in the capital city, Bangkok. The tax was one element in a package of measures which also increased awareness of the damage caused by leaded petrol and moves to liberalise fuel markets and support oil companies to produce unleaded fuels. Consumers responded rapidly to the introduced price differential between unleaded petrol (THB (Thai baht) 14/litre) and leaded petrol (THB 15/litre) and within 30 days, the share of unleaded fuel had already risen to 30 % (APEIS [Asia-Pacific Environmental Innovation Strategies] and RISPO [Research on Innovative and Strategic Policy Options], 2004, May).

Within two years of a price differential being introduced, lead concentrations in key monitoring stations had dropped by as much as 93 %, and typically by about 70 % in comparison with 1990 levels (Israngkura, 2014). By 1995, leaded petrol had been phased out altogether. The Pollution Control Department (PCD) in Thailand has estimated that health benefits of the measure were worth THB 7 billion (Institute for Global Environmental Strategies, 2004), giving a cost-benefit ratio of 32:1 for the policy.[17]

3.2.3 Impacts on private investment

Impacts of recent changes to car registration taxes on private investment will be seen over time. Modelling of possible impacts is not available in the public domain, but it seems likely that the new structure will influence new vehicle purchases, as similar measures have done in other countries.

16 Modelling results were presented to the authors in an inter-ministerial working group on economic instruments for the reduction of greenhouse gas emissions, led by the Office of National Environmental Planning and Policy, ONEP, in Bangkok in November 2015.

17 The costs included in the PCD's calculations refer to the cost of converting refineries to produce unleaded fuels.

In relation to leaded/unleaded petrol, local investment in new refinery technology necessary to produce unleaded fuels had relatively rapid amortisation rates and was boosted by low oil prices, parallel efforts to liberalise the energy market, and reduced import duties on relevant technologies (World Bank, 1998). It is difficult to say with any degree of certainty whether the differentiated tax rates themselves influenced investor decision-making – it is more likely that the Thai government's clear intention and raft of measures to phase out leaded petrol influenced investment decisions.

3.2.4 Fiscal impacts

Revenues from the environmental taxation in the Thai context have been rather limited. Thus far, reforming environmentally harmful subsidies seems to have more potential to free up revenue for the government budget.

Tax differentiation between leaded and unleaded petrol did not result in a significant change in tax revenues because it quickly brought about changes in consumer behaviour. As a result, fiscal impacts were limited. Clearly in this case, tax design had an impact on revenues raised – introducing a lower tax rate for unleaded petrol rather than a higher tax rate for leaded fuel resulted in foregone revenues for the Thai government.

Similarly, the current draft of the proposed new carbon tax on fuels will not result in significant increased revenues, as taxation of transport fuels will be restructured in a broadly revenue-neutral way. However, it will reduce market distortions resulting from the under-taxation of carbon in diesel fuel.

Carbon-based vehicle registration taxes are expected to raise THB 10 billion, or EUR 258 million, in 2016.[18]

3.2.5 Social impacts

In Thailand, concerns regarding social impacts have had a significant influence on tax implementation and design. Thus, a tax reduction was introduced for unleaded petrol, rather than an increase for leaded fuel. Similar influences were at work when the carbon tax on transport fuels was designed and which will not raise fuel prices when it is introduced.

18 Figure from interviews with Thai officials in 2015.

In terms of impacts, poorer households may have been affected more than the wealthier households by the leaded/unleaded price differentiation, because the poor were not in a position to switch to unleaded fuels for their older and less technologically advanced vehicles and had no choice but to buy fuel at the higher rate.

3.2.6 Administrative feasibility and costs

In Thailand, environmental taxes have not necessarily required additional legislation, but have been implemented within the existing excise tax structure. Import duties and corporate income tax can be amended in much the same way. This means in some cases that policymakers can avoid prolonged legal wrangling, while nevertheless restructuring taxes to take the external costs of environmental damage into account. Such approaches also minimise administrative costs, as environmental taxes are implemented as amendments to existing measures, meaning collection mechanisms are already in place.

Wastewater charges, in place since 1992, have proven to be extremely difficult to administrate in Thailand, largely because local governments responsible for operating wastewater treatment plants have refrained from levying fees for the service. This has started a vicious cycle of high costs, low revenue, restricted services and reduced willingness to pay. The lack of enforcement on the part of local government is largely attributable to lack of political will to impose higher costs on own local businesses and lack of resources for collection and enforcement.

The ultimate failure of the Framework Law exemplifies the challenges faced by policymakers when attempting to implement a broader process of tax reform, not only in Thailand, but in many other countries. Narrowing this approach and focussing on elements within the initial proposal has had some, albeit limited, success – and this more specific and narrow approach is likely to be the most effective for the introduction of new environmental taxes on emissions in the future.

3.2.7 Use of revenues, acceptance, political economy

Much can be learned from negotiations leading up to the failure of the Framework Law and discussions between government agencies since then. International best practice envisages revenues being raised and distributed

by the Ministry of Finance, with few exceptions. Furthermore, stakeholders involved in the drafting process of the Framework Law claimed that the National Environmental Fund administrated by the Ministry of Natural Resources and Environment (MONRE) was very difficult to access. Rights and responsibilities relating to revenue collection and disbursement plagued negotiations and remain an obstacle to environmental taxation in Thailand today.

On the other hand, in a developing country with limited resources, failing to earmark funds for environmental protection deprives environment ministries of urgently needed resources and keeps these ministries weak and lacking in influence. In turn, this feeds ongoing resistance in MONRE to environmental taxes if the Ministry of Finance fulfils a role as collector and distributor of revenue.

Revenues raised by the price differentiation between unleaded and leaded petrol in the 1990s flowed into the general budget in the country, as changes were to existing excise taxes on fuels where collection mechanisms were already established. Thus, opposition to the tax differentiation from within government seems to have been low. However, the political economy of reform prevented tax increases being introduced and so resulted in foregone revenues for the Thai government (although the reduced tax rate did achieve the desired environmental result and proved to be an effective way of changing behaviour).

Public acceptance in Thailand often seems to hinge on tax design: measures which entail carrots rather than sticks, namely tax reductions for green behaviour rather than tax increases for polluters, tend to be more appreciated and accepted than measures which are regarded as punitive. Of course, this is the case in many countries – and is one of the reasons for low rates of implementation of environmental taxes in both industrialised and industrialising countries. Clearly the disadvantage of such measures is that there is a trade-off which policymakers must accept between political acceptance and the revenue-raising potential of a particular tax.

Powerful industries and other stakeholder groups have a significant influence on environmental tax policy in Thailand and have in the past succeeded in putting considerable pressure on policymakers not to increase energy prices.

As in most countries, environmental taxation faces strong resistance from entrenched interests in regional and national government – regional governments being as a rule rather reluctant to collect environmental taxes – as well as from industry.

3.3 Carbon taxes in Mexico – and successes and failures elsewhere

The introduction of carbon taxes in Mexico and Chile represent an important step forward, as they are amongst the first developing countries to have introduced carbon taxes in the run-up to the UNFCCC COP21 in Paris. This subsection also looks at fossil fuel taxation in Costa Rica, which was introduced in 1997 and extracts lessons learned from the ongoing reluctance to introduce carbon taxes in China.

In terms of climate change mitigation, the advantage of a carbon tax, as opposed to more general fossil fuel taxes, is that it meets the OECD recommendation to target the pollutant or polluting behaviour as accurately as possible from an environmental perspective. However, as we will see below, political economy issues have influenced the structure of carbon taxes in both countries.

3.3.1 Carbon taxes in Mexico

Until recently in Mexico, there was a negative excise tax on products and services for gasoline and diesel. This measure provided for a price-setting mechanism that considered differences in the domestic price for petroleum products and an international reference price. While the price for gasoline and diesel varied almost daily in the international market, retail prices in Mexico were set by the federal government on a monthly basis. When the benchmark price was high, and greater than the domestic price, the rate for the country's excise tax became negative. Pemex, the national oil company, then obtained a compensatory tax credit equivalent to the price difference, which the company can credit against other taxes such as its own value-added tax or the ordinary duty on hydrocarbons production.

Between 2014 and 2016, a huge energy-sector reform, including environmental tax reform elements, has been implemented in the country. This was a consequence of the General Law on Climate Change which was

approved in 2012 as a consequence of the commitments made voluntarily by Mexico in 2010 during the UNFCCC negotiations in Cancun in that year. A constitutional reform took place in December 2013 that allowed private investment in the oil and power industry, which were state monopolies until then – the oil industry in the form of the public company Pemex.

The most important ETR element entered into force on 1 January 2014 and comprised two new taxes for environmental protection: a carbon tax and a tax on pesticides. Further laws were approved, amended and abrogated in August 2014, such as the revenue law on hydrocarbons. The carbon tax is a first tax on the sale or import of fossil fuels.

The carbon tax rate varies between EUR 0.51/tCO_2e and EUR 2.55/tCO_2e and is capped at 3% of the sales price of the fuel. This is very low, yet it represents an important first step, supporting the transition from the subsidisation of fossil fuels to their taxation. The rate is linked to the consumer price index, so will not lose real value over time as a result of inflation. The tax covers fossil fuel sales and imports by manufacturers, producers, and importers. It is not a tax on the full carbon content of fuels, but rather on the additional amount of emissions that would be generated if the fossil fuel were used instead of natural gas. As a result, natural gas is therefore not subject to the carbon tax, although this could change in the future. Products which are subject to the tax are: propane, butane, gasoline, jet fuel, kerosene, diesel, fuel oil, oil coke and mineral carbon (IETA [International Emissions Trading Association], 2015). Companies liable to pay the tax may choose to pay the carbon tax with credits from Clean Development Mechanism (CDM) projects developed in Mexico, equivalent to the value of the credits at the time of paying the tax (World Bank, s. a.).

The introduction of the tax reaffirms Mexico's commitment to reduce GHG emissions substantially, with a domestic commitment to reduce CO_2 emissions by 30% by 2020 (Waty, 2015), or as stated in its INDC, to reduce 22% of GHG emissions by 2030 compared to 2013, as stated in its INDC (UNFCCC, 2015c).

3.3.2 Environmental impacts and effectiveness

The carbon tax in Mexico covers 40% of greenhouse gas emissions. However, it is too early to identify effects on the environment as the tax only came into force in early 2015. However, given the very low rate, which adds

just 3% onto the value of fossil fuels, the environmental impact is likely to be minimal. Particularly as natural gas is not taxed, a transition towards natural gas rather than renewable energies is incentivised as a result of the carbon tax (Waty, 2015).

Anecdotal evidence seems to indicate that insufficient attention has been given to facilitating a transition to more sustainable forms of energy, as in the transport sector. This may mean that private consumers simply pay the higher price for transport fuels, but do little to change their behaviour. Companies may use carbon credits generated from CDM projects in Mexico, which will have some impact on CO_2 emissions.

Going forward, improvements to environmental effectiveness can be achieved by including natural gas in the carbon tax, increasing the carbon tax rate, and the introduction of an escalator to increase the carbon price year on year.

Similar experiences in Costa Rica, where a tax on fossil fuels has also not sufficiently incentivised changes in the transport sector, are described in Box 7.

Box 7: Taxation of fossil fuels in Costa Rica

In 1997, Costa Rica enacted a tax on fossil fuels, set at 3.5% of their market value (World Bank, s .a.). 30% of the revenue generated by the tax is earmarked and goes toward the country's very successful Payment for Environmental Services (PES) programme, which offers incentives to forest owners to practice sustainable management of forest and water resources. Revenues from the fuel tax passed on to the PES programme average USD 11.3 million annually, which is not sufficient to cover the costs of the programme, and additional revenues are raised through a water tax, international loans, sales of carbon credits to developed countries to use as offsets, and other sources (Porras, Barton, Miranda, & Chacón-Cascante, 2013). However, sales of carbon credits have faced the problem that the average price in Costa Rica, USD 8/tonne CO_2, is too high for global carbon markets (Porras et al., 2013).

Tourists and businesses are also charged a voluntary 'tax' to offset their carbon emissions, with one tonne of carbon valued at USD 10. The money is used to fund conservation, reforestation, and research in protected areas (Worldwatch Institute, 2007).

Box 7 (cont.): Taxation of fossil fuels in Costa Rica
With environmental tax revenues raising well over 2 % of GDP, Costa Rica's GDP-to-environmental-tax ratio is well above the OECD average of 1.7 % (OECD, 2016). However, while much of the electricity production is based on renewable sources – famously, it has been claimed that 99 % of electricity was generated using renewable sources in 2015 (although the OECD puts this figure at 88 % (OECD, 2016)) – transport emissions are a growing problem in the country and car use is higher than in other countries in the region. Addressing this efficiently requires an increase in transport fuel taxation to incentivise a shift to public transport, electro-mobility, and other low-emissions alternatives.
Source: Authors

3.3.3 Impacts on private investment

In Mexico, it is too early to seriously identify effects on private investments as a result of the carbon tax itself. However, given the very low rate, at best minor positive impacts on investment in renewables or energy efficiency are to be expected.

Conversely, constitutional reform and liberalisation of the energy market has opened up the sector to competition and private investment in power generation. According to some estimates, this will increase long-term petroleum output in Mexico by 75 % (OECD, 2015).

3.3.4 Fiscal impacts

The carbon tax in Mexico is predicted to raise revenues worth about USD 1 billion per year – equivalent to less than 0.1 % of Mexico's GDP. While this sounds relatively insignificant, receipts from the United Kingdom's climate change levy, carbon price floor, aggregates and landfill taxes in 2014-2015 raised roughly 0.17 % as a proportion of GDP.[19] Some countries have carbon taxes which raise much higher revenues: Sweden's ambitious carbon tax

19 This figure does not include Air Passenger Duty, which raised the equivalent of 0.18 % of GDP in the same year. Other tax bases with environmental relevance which are not included are petroleum revenue tax, or duties on hydrocarbons (United Kingdom Government, 2016b).

of about USD 168/tCO_2e raises the equivalent of 0.7% of GDP (Garcia & Barrera, 2013). At the same time, a contradictory element in the carbon tax in Mexico is that the country still spends (an unpublished) amount of revenue subsidising the price of transport fuels, probably more than it will raise with the carbon tax – although gasoline prices will be liberalised by 2018, thus phasing out the subsidy in the medium-term (OECD, 2015).

Tax rates are linked to the consumer price index, so it is reasonable to expect the tax take to remain relatively stable, or to drop very gradually, assuming some behavioural change. However, revenues can be increased by adjusting rates, reducing exemptions and broadening the tax base. Permitting companies to submit carbon credits to reduce their tax bills clearly also reduces the fiscal impact of the tax.

The fiscal impact is very low in any case, a problem exacerbated by a clause which permits companies to use carbon credits to reduce their tax bills. On the other hand, the Mexican government might also save revenues through this mechanism, as the alternative might prove to be for government to buy Certified Emissions Reduction Units (CERs) to achieve the emissions reduction targets specified in its INDC.

The case of environmental taxes in Mauritius, in Box 8, provides a contrasting case to Mexico, where the fiscal impact of the carbon tax is relatively low, and Costa Rica, where ETR tax rates have been too low to reduce fossil fuel use in road transport.

Box 8: Environmental taxes in Mauritius

In Mauritius, excise taxes on petroleum products and a green tax – the so-called MID levy, more or less a tax on CO_2 emissions – as well as excise duties on motor vehicles between them accounted for 9.1% of total tax revenues in 2008/2009 (Parry 2011). Total revenues from environmentally related taxes have been relatively consistent since this time, amounting to roughly 11% of total tax revenues or in 2013, about 2.6% of GDP (UNEP, 2014). This represents a forty-fold increase in ETR revenues within the space of a decade (UNEP, 2014).

Mauritius has been able to implement high environmental taxes, which have met with sufficient political acceptance to survive democratic changes of government. Because revenues raised are substantial, there is a strong fiscal driver in favour of environmental tax instruments on the island – and also a strong political will to promote sustainable development.

Box 8 (cont.): Environmental taxes in Mauritius

Interestingly, although the main motivation for the MID levy has been to raise revenues, the tax is very close in design to an ideal carbon tax (Parry, 2011). Steps have also been taken to increase the MID levy; for instance in 2011, the rate per kg of coal, LPG and other petroleum products was doubled (Green Fiscal Policy Network, s. a.). In spite of this, limited short-term abatement opportunities in the country have limited environmental effectiveness, while also keeping revenues relatively stable over time. In the medium term, a shift towards renewable energy on a larger scale, which is feasible in the country, might reduce revenues as emissions fall (Cottrell et al., 2015).

Source: Authors

3.3.5 Social impacts

Pollution costs in Mexico are estimated to be worth about 5 % of GDP each year, largely due to severe health impacts associated with high levels of air pollution, while nine of Mexico's cities are amongst the 20 most polluted in the world (Waty, 2015). Thus, there is a strong social equity imperative driving a reduction of air pollution, which means an effective carbon tax, or other measures to reduce fossil fuel emissions, would certainly have positive social impacts.

There are wide disparities in income across the population, and families living in poverty in Mexico have limited protection from economic adversity. Income and consumption at the lowest income levels are volatile and closely follow macroeconomic trends (OECD, 2015). Thus, it is extremely important that the government closely observe social impacts resulting from the carbon tax.

Thus far, as fuel price increases have been capped at 3 %, the social impacts of the tax are likely to have been minimal. Cash transfers targeted at low-income households could be implemented through Mexico's established anti-poverty programme *Oportunidades*, which has operated since 1997 and is specifically geared to provide aid to Mexico's poorest.

3.3.6 Administrative feasibility and costs

The tax is based on calculations of the carbon content of various fuels, using UN-emission factors. The administrative structures of the existing fiscal system will be used, so administrative costs will be kept to a minimum.

3.3.7 Use of revenues, acceptance, political economy

The carbon tax was introduced as one element within a broad fiscal reform in Mexico, covering personal, corporate, consumption and energy taxes (OECD, 2015). Many countries have found this approach to be a preferable strategy for the implementation of ETR measures, and such reforms generally meet with higher levels of acceptance than the introduction of one, specific environmental tax. Box 9 looks at a recent example of this in Chile, where a raft of environmental taxes was introduced as part of a broad reform package announced in 2014.

In Mexico, the use of revenues for climate financing was undoubtedly helpful in terms of boosting political acceptance – but nevertheless, political acceptance on the part of industry was moderate at best, with several industries explicitly rejecting and resisting the approach. Industry organisations succeeded in watering down the initial proposal from the Finance Ministry substantially.

Box 9: A carbon tax as part of broader fiscal reform in Chile

Chile has traditionally been a very liberal state, with a tax-to-GDP ratio of around 30 % and an associated low level of state intervention in the country. Plans to introduce a carbon tax on power generation and a range of ETR measures in the transport sector were announced in September 2014 as one element within a broader and relatively comprehensive tax reform. As in Mexico, experts have suggested that **political approval of environmental and carbon tax owes much to their being elements within a broader reform package** (Galbraith, 2014). Measurement of CO_2 emissions from thermal power plants will begin in 2017, and the new tax will come into force from 2018.

Box 9 (cont.): A carbon tax as part of broader fiscal reform in Chile

The carbon tax represents a small proportion of the fiscal reform package – indeed, the carbon tax is expected to raise just USD 160 million of the USD 8.3 billion tax reform package. The tax will be largely paid by four large companies, which have complained that other industrial sectors were not targeted but have not been able to prevent its introduction (Reuters, 2014).

The new tax of USD 5/tCO_2 will target emissions from thermal power plants of over 50MW capacity, which produce about 55% of Chile's carbon emissions (Galbraith, 2014). Thermal plants fuelled by biomass and smaller installations will be exempt. The objectives of the new tax are to incentivise increased renewable electricity generation (target: 20% by 2025), reduce GHG emissions (target: 20% down by 2020 on 2007 levels) (Galbraith, 2014). Studies have predicted CO_2-emissions reductions of 3 million tonnes by 2020 (6% of total projected emissions from electricity generation) and 6 million tons by 2030 (11% of total electricity generation).

The tax reform package also includes several additional ETR elements: New vehicle registration taxes based on CO_2 emissions, circulation taxes based on CO_2 emissions and local air pollution emissions (on particular matter, NO_x and SO_2). The package has also introduced an additional (one-off) tax on the import of light vehicles using diesel as fuel. The formula to calculate the tax takes into account 'urban performance' in km/litre of fuel, which will add 18-30% of the price of the vehicle. Annual revenues from the tax have been estimated between USD 247-265 million.

Source: Authors

Similarly, gaining political acceptance for carbon pricing measures, and getting industry on board, has not proved easy. Interestingly, in China, the economic cost of various different instruments has been influential in instrument choice, resulting in the implementation of pilot emissions trading schemes, rather than ETR, as described in detail in Box 10.

Box 10: China's attempts to introduce a carbon tax

Political acceptance, related to the cost of environmental policy options and use of revenues has played a significant role since the Chinese government took its first steps towards limiting GHG emissions in the early 2000s. Between 2006-2010 energy intensity in the country was reduced by 19% by means of top-down regulation and administrative orders – but the costs for these reductions were 'prohibitive' and the government shifted its attention to market-based instruments for subsequent phases (Lo, s. a.).

This realisation led the government to consider market-based measures for carbon reductions. Within this process, in 2008-2009, the China Council for International Cooperation on Environment and Development invited international experts to develop a roadmap for economic instruments for energy efficiency and the environment (CCICED [China Council for International Cooperation on Environment and Development], 2009). The Council's recommendation for the gradual phase-in of a carbon-energy tax was included in the 2011-2015 five year plan. At the time of writing, however, no carbon or energy tax had yet been introduced. Recent government statements have announced that there is no confirmed schedule for the tax and that disagreements still exist – although a possibility might be to integrate a levy into existing pollution regulations (Parnell, 2013).

A far greater interest has been shown in emissions trading, however. By 2015, pilot trading schemes had been launched in 7 manufacturing centres – major cities and provinces – regulating up to 1 billion tons of CO_2 emissions. A nationwide scheme has been announced for 2017. Even at the pilot stage, the Chinese trading system is the world's largest outside Europe.

The reasons for this preference have not been made transparent. Clearly, industry tends to prefer emissions trading with free allocation of permits, as was initially the case in several pilot regions – although there has been some auctioning in most pilot schemes. At the same time, governments may prefer to implement trading as it can be linked to a global/broader scheme in the future, such as the EU ETS.

It seems likely that various influential actors including government, state-owned enterprises and the financial sector all recognised the potential to boost financial flows into China by means of trading schemes and participation in carbon markets – and thus, opposition to trading was much less.

Box 10 (cont.): China's attempts to introduce a carbon tax
At the same time, it seems that the Chinese government has considerable political will to reduce CO_2 emissions and assumes that it will be easier to link CO_2 trading to the EU emissions trading system. It has also become ever more apparent in China that capping emissions is feasible (Lo, 2015). Finally, it may also be that this approach appeals to China because of its considerable experience of selling carbon offsets on international markets.
Source: Authors

The introduction of taxes on fossil fuels in Costa Rica, carbon taxes in Mexico and Chile, and emissions trading in China all represent an important step towards increasing the limited experience of taxing fossil fuels in developing countries. In the latter three countries, energy intensity is high and renewables penetration low while potentials exist to improve significantly on current performance.

In Mexico, while per capita emissions are well below those in developed countries – Mexico estimated each person emits 3.8 tons of CO_2 per year – the energy and carbon intensity of the Mexican economy is high, and a carbon tax can incentivise energy and carbon efficiency and so reduce carbon intensities (OECD, 2015), while at the same time generating a significant amount of revenue for public finances.

4 Conclusions: how to design and implement EFR in developing countries

4.1 Initial comments

Section 2 of this report reviewed experiences with ETR in the literature, largely on the basis of the developed country experience and with a view to extracting lessons learned for developing countries. Section 3 looked at some specific case country studies where the authors have several years of experience, in more depth. This section of the report, Section 4, will now pull together some advice for policymakers drawn from the commonalities and the differences we have observed between developed and developing countries.

In developed countries, if well-designed, the environmental effectiveness and fiscal, economic and social co-benefits of environmental taxes are demonstrable. The Annex[20] to this document examines in depth a range of ETR measures in practice, provides details on the objectives of measures, their environmental, economic, fiscal and social impacts, and looks briefly at political economy aspects to give interested readers further information on ETR in practice.

In developing countries, however, the case is less clear-cut. While it seems reasonable to assume that ETR can play an important role in efficiently addressing problems associated with the rapid growth of GDP, pollution and GHG emissions typical in developing countries, the evidence of this being successfully implemented in practice is limited. Often, environmental tax rates in developing countries are too low to realise the potential co-benefits of such measures, while environmental effectiveness has been compromised by these low tax rates. There are some exceptions to this, such as Mauritius, where environmental tax revenues raise substantial revenues and, as abatement options become more available, can reasonably be expected to have a real impact on CO_2 emissions in the country in the medium term. For developing countries to leapfrog onto a more sustainable development path, bold steps such as these are needed.

The underlying reasons for this reluctance on the part of many developing countries to impose higher taxes have also been highlighted in the report. Policymakers face many political economy challenges when designing and implementing ETR instruments. The opposition of influential stakeholders has in many cases toppled ETR implementation, or has resulted in far lower tax rates than initially planned. The influence lobby groups from industry can have on ETR design, leading to substantial deviations from the theoretical ideal, is thus of great importance.

In the light of this, how to deal with obstacles to ETR, overcome opposition, and design instruments which meet with political acceptance, while guaranteeing social equity, fairness and environmental effectiveness, are the subjects of this last section of the report.

20 www.die-gdi.de/studies/article/environmental-tax-reform-in-developing-emerging-and-transition-economies/

4.2 Environmental effectiveness

4.2.1 ETR in practice – deviations from the theory

There is little doubt that well-designed ETR measures can be environmentally effective. Practice has demonstrated rather conclusively that ETR – even ETR measures with exemptions or low tax rates – can bring about significant environmental improvement. In Germany, for example, energy taxes – in spite of some eye-watering exemptions – have made by far the single largest contribution to emissions reductions of any policy tool (Deutscher Bundestag, 2016). Another good example is the very successful phasing out of lead from gasoline (Lovei, 1998), where most high-income and many middle-income countries, including Brazil, India and Thailand, drastically reduced or even achieved a complete phase out in the 1990s (Lovei, 1998, p. 15).

Many international organisations, including both the World Bank and the IMF are also very supportive of ETR measures. Following the adoption of the Paris Agreement in December 2015, the IMF immediately called for carbon pricing measures – either through taxes or trading systems designed to behave like taxes, which the organisation claimed are "the most effective mitigation instruments" (IMF, 2016, p. 5).

In practice, however, developing and implementing ETR measures, and setting tax rates, is a political process. As a result, many measures in both developed and developing countries do not live up to OECD recommendations for best practice: The tax base is often rather narrow, exemptions are numerous, tax rates are inconsistent and risk creating market distortions themselves, and often rates are too low to bring about the change required to achieve substantial environmental impacts.

Nevertheless, experience in, for instance, Vietnam with the Environmental Protection Tax demonstrated that implementing ETR measures represents an important first step, which can be improved at a later date by progressive tax rate increases, the introduction of a tax escalator and indexation to inflation or GDP growth for example, or the extension of a tax to other environmental sectors. Initial experiences with environmental taxes in developing countries can be a means of preparing the ground for additional measures later. In Mauritius, the government increased revenues from ETR measures forty-fold in the course of just ten years, as it introduced new

measures and progressively increased existing taxes on the back of existing experiences.

While upstream taxes to maximise coverage may be desirable in theory, in practice in some developing countries, political economy and regulatory considerations may mean that taxes are more effective when levied downstream. In developing countries with regulated energy markets and fixed prices, for example, pass-through of upstream taxes to consumers is limited. In such cases, downstream taxes on electricity consumption will be more effective in changing behaviour and enhancing energy efficiency.

This is not to understate the potential gravity of deviations from a theoretical ideal: while ETR measures are the most cost-effective and efficient environmental policy tools in theory (Goulder & Parry, 2008), if poorly designed, this advantage may be put at risk. As well, in developing countries resources are particularly scarce, and it is vital that welfare is maximised by implementing the most efficient policy instruments wherever possible.

4.2.2 Tax design to maximise effectiveness – minimal exemptions, escalators and indexation

Clearly, the devil is in the detail. Designing taxes in a way which makes them politically acceptable and feasible, while also maximising their effectiveness poses a serious obstacle to the implementation of ETR all over the world. Strong political opposition from affected industry groups and concerns regarding the adverse effects of such measures on vulnerable households can put a stop to, or significantly undermine, the effectiveness of ETR measures. Indeed, as demonstrated by the cases of Vietnam and Thailand, in practice environmental taxes do not always lead to an increase in price of a particular environmental 'bad' in the short-term, which may make ETR measures less environmentally effective than would otherwise be the case.

Often, it is only possible to implement ETR measures if industry receives exemptions or support to adjust to changing prices. These support measures must be targeted, time-limited and subject to regular review to ensure that trade-offs between political feasibility and environmental effectiveness are kept to a minimum. With this in mind, introducing ETR as part of a broader policy package including such support can help to foster higher rates of

acceptance while using revenues to facilitate adjustment and innovation, so reducing the cost of the green economy transition.

To enhance political feasibility in developing countries in particular, where equity impacts are a serious concern, it may also be necessary to implement environmental taxes at an initially low rate, while including an automatic tax escalator to implement annual/biannual tax increases and indexing ETR measures to inflation/GDP growth. The United Kingdom has implemented this type of ETR instrument for many years – the so-called fuel duty escalator – and many Scandinavian countries have indexed energy taxes to inflation.

The benefits of this kind of tax design are manifold:

a. In terms of environmental effectiveness: Gradual, predictable increases can ensure that the price incentive remains stable or increases over time, thus maintaining the positive environmental effects of the tax.

b. In terms of investment flows: Creating a long-term perspective for an ETR incentivises not only behavioural change in the short term but also structural change in the longer term – investment and innovation.

c. From a fiscal perspective, such measures can insure government budgets against price risks and keep tax revenues proportionally stable – indeed, an escalator can act to keep revenues stable when consumption of a particular pollutant falls, by increasing revenue per unit of pollution emitted.

d. In terms of political economy, such measures may be more politically feasible, because initial tax rates are low and economic actors have time to adjust.

Designing taxes to keep revenues relatively stable over time – such as tax escalators and indexed tax rates – is crucial for developing countries seeking to raise additional revenues to increase public financial resources. At the same time, a fiscal driver – that is, some degree of dependence on ETR revenues – can help to safeguard ETR measures in the medium and long term, as successive governments leave measures in place to fund essential services or public investments.

In developing countries, indexation should be implemented carefully, as they may be more vulnerable to price shocks and usually experience more unstable price levels than OECD countries, and tend in general to have

higher rates of inflation. There is a risk in developing countries that a tax escalator may lead to anticipatory inflation (Beaton et al., 2013) and that indexation will feed back into price levels and amplify inflation inertia. To put this in perspective, however, the share of energy/environmental taxes is small in most countries and for this reason no major impacts are to be expected. Moreover, while increasing energy prices in developing countries may cause a short-term spike in inflation, in the medium term, this tends to flatten out (Beaton et al., 2013).

4.3 Effects on private investment

Closely related to indexation and the introduction of a tax escalator is the importance of the stability and predictability of environmental taxes within a stable investment framework to minimise risk for investors. Environmental tax structures must be coherent and tax rates sufficiently high to guarantee a return on green investment. If investors anticipate regulatory changes or price instability, they will not invest in green technologies.

Thus far, in the majority of developing countries, and in many OECD countries as well, environmental taxation alone has not proven sufficient to redirect private funds from polluting and into environmentally friendly investment. Additional factors, such as the greenhouse gas emissions reductions implied by the Paris agreement, may combine with carbon taxes as twin drivers of greener investment for big investors as they address the problem of stranded assets – see subsection 2.3.3 for details.

It is worth mentioning again here that developing countries are likely to be negatively affected by stranded assets; their fossil fuel reserves are estimated to be worth USD 627 billion per year up to 2050 (excluding China) (Oxfam, 2016b). One possible solution to this problem might be for developed countries to pay developing countries to not extract fossil fuels, along similar lines to the REDD programme (for more details see section 2.3.3; Carney, 2016).

In the main, because developing countries rarely apply high environmental tax rates, impacts on private investment have so far been limited. The case of differentiated sulphur charges on electricity in China in the 1990s demonstrates how investments can be incentivised by means of environmental tax instruments (see Box 11). At the same time – as proven by OECD countries' experience – ETR does have a substantial impact on investment once ETR is applied more broadly and effectively.

ETR is typically one element in a larger policy framework to incentivise investment and minimise the risk for investors. In the case of renewable energy investment, for example, ETR and fossil fuel subsidy reform can create a level playing field in energy markets by internalising the high external costs of fossil fuel energy. Other policy measures to support renewable energy investment include guaranteeing investors a return on investment (ROI) through feed-in-tariffs and guaranteed access to electricity grids, as well as by reducing the cost of renewable energy (RE) technologies, for example by means of differentiated import duties, tax credits, reduced VAT rates and depreciation rules (Cottrell et al., 2015). Instruments can also be implemented to reduce risk, such as stable and enforceable contracts for electricity purchases, clear long-term policy and objectives, institutional support for investors, provision of supportive infrastructure, credit/loan guarantees and insurance mechanisms to reduce the cost of financing (Cottrell et al., 2015).

Box 11: Differentiated sulphur charges on electricity in China

Using the power of the market, the Chinese government managed to incentivise electricity producers to invest heavily in desulphurisation and thus to reduce SO_2 emissions from power stations. Within a short period of time, desulphurisation facilities worth RMB (Renminbi) 8 to 13.4 billion (USD 1 to 1.9 billion) were built. SO_2 emissions fell by more than 1.8 million tonnes per year. The costs of environmental damage were cut by RMB 36 billion (USD 5 billion).

Investments were spurred by the introduction of differentiated electricity prices for desulphurised electricity in 2004. The grid price for desulphurised electricity was set RMB 0.015 per kWh higher than for non-desulphurised electricity. End-user prices were increased to RMB 0.025 in 2006 to cover the higher costs associated with this higher purchase price. Additionally, a monitoring system was put in place to ensure enforcement.

Higher prices helped the power industry to bear the costs of desulphurisation. At the same time, fewer emissions meant lower pollution payments, on account of lower pollution charge bills being due (RMB 0.6 per kg of SO_2). This resulted in savings amounting to RMB 1.08 billion (USD 150 million).

Source: GTZ [Gesellschaft für Technische Zusammenarbeit] (2008)

Not all investments driven or funded by ETR measures in developing countries are large-scale. ETR revenues can also drive locally-based investments to create decent green jobs, such as the installation and maintenance of small-scale renewable energy or biogas plants, the assembly of green products, or recycling (Raworth, Wykes, & Bass, 2014). The Prosol programme in Tunisia, for example, which is partly funded by import duties on the import of air conditioning units to the country, has been estimated to have created about 3,000 jobs in solar water heating for households (Trabacchi, Micale, & Frisari, 2012).

4.4 Fiscal impacts

To facilitate planning and ensure revenue stability, predicted revenues and the time required to raise them should be calculated as accurately as possible at the tax design stage. Taxes with the objective of driving a phase-out of particular substances or rapidly changing behaviour will erode their tax base relatively quickly, as has been the case with environmental taxation on sulphur or lead in transport fuels, as exemplified by the Thailand case, above. Other taxes targeting less easily avoidable pollutants or other tax bases (energy is not in itself a pollutant) will be in place over a much longer timeframe (see GTZ, 2008). This is particularly important in developing countries, where revenues are much lower and tend to be more vulnerable to price shocks.

In developing countries, tax-to-GDP ratios tend to be rather low at 10-25%, whereas tax-to-GDP in OECD countries averages 30-40%. This lower proportion of tax revenues collected by developing countries restricts the capacity of their governments for poverty reduction or investment in infrastructure, healthcare, education, or the green economy transition, and thus has significant implications for policy making. This problem has been acknowledged by many developing countries, which are making a concerted effort to increase the overall tax take. In Mexico, for example, one of the key objectives of the recent tax reform was to increase overall tax receipts from 19.5% in 2014 to 24% by 2018 (OECD, 2015).

But what are the causes of such low rates of revenue collection? Besley and Persson have suggested such low tax-to-GDP ratios in developing countries are attributable to a number of factors (Besley & Persson, 2014):

a. Developing countries have a larger informal sector and thus rely on different tax structures to OECD countries, with personal income taxes (PITs) being much less important in terms of revenue-raising than taxes on goods and services, imports, customs duties and corporate income taxes (CITs). Indeed, in some countries PITs are largely absent, due to administrative difficulties and the existence of a large informal sector beyond the reach of tax policy.

b. Aid dependence might reduce incentives to increase taxes.

c. Developing economies need the political will and government action to reform their tax system, as tax revenues do not always automatically grow with economic development – and the more tax revenues increase, the greater the incentives for tax evasion.

d. In some countries, politically weak institutions and weak checks and balances, due to a weak legislature and judiciary, reduce the ability of governments to implement tax measures. Perceived corruption within government may also reduce willingness to pay on the part of taxpayers.

Such low tax-to-GDP ratios in developing countries can be perceived as an indication of considerable potential to boost state revenues – to increase 'fiscal space'. Fiscal space can be defined as follows: "Concrete policy actions for enhancing domestic resource mobilisation, and the reforms necessary to secure the enabling governance, institutional and economic environment for these policy actions to be effective" (Roy, Heauty, & Rodríguez, 2009, p. 170).

In this context it is important to note that few countries have reached a high level of prosperity alongside a low-tax state. Indeed, a typical development path consists in expanding powers of the state and its capacity to tax alongside the development of institutions and structures necessary for the state to support institutions and provide non-market goods and associated benefits for their citizens (see, for example, Besley & Persson, 2014).

The EU model has demonstrated that there is considerable revenue-raising potential in energy and transport taxes with some EU countries raising around 10% of total tax revenues from environmental tax measures. Also, in Mauritius, total revenues from ETR are relatively stable at around 11-12% and the main motivation of ETR measures is to raise revenue for government (Parry, 2011). Environmental taxes can also bring foreign exchange earnings into the country, for instance, by imposing an import

duty on older vehicles, and reduce the dependency of local governments on central government revenue in those cases where revenues are raised locally (GTZ, 2008).

Very often, developing countries do not charge fees commensurate with cost coverage for essential services, such as water supply and sanitation. This can have a tremendous fiscal impact on government budgets and undermines willingness to pay due to the negative impact of chronic underinvestment in such services over time. In Mauritius, for example, water tariffs recover operating costs, but not the costs of investments and upgrades to the system (Parry, 2011). Increased tariffs are essential to break this cycle and ensure cost coverage for essential services – although this may be difficult to implement in practice. Step-by-step implementation of charges can help to soften the transition and investment to make service improvements can foster higher willingness to pay in the short and medium term.

To summarise, the vast majority of developing countries have potential to increase their tax take, while benefitting from the environmental improvements associated with ETR measures.

4.5 Social impacts

4.5.1 ETR and social equity in developing countries

Many developing countries have large inequalities and there is a clear risk that ETR, as a policy instrument which deliberately brings about an increase in prices of goods and services, can have a negative impact on the most vulnerable in society – particularly if these groups are not supported to change behaviour or make a transition to cleaner technologies. The Gini index, which measures the extent to which the distribution of income among individuals/households within an economy deviates from a perfectly equal distribution, highlights the scale of this problem. More equal societies, such as Denmark (29.1) or Germany (30.1) have a much lower rating on the Gini index, that is, much more equal income distribution, than the majority of the developing countries examined in this report: Chile (50.5), Costa Rica (49.2), Mexico (48.1), Mauritius (35.8), Thailand (39.3) or Vietnam (38.7) (World Bank, 2016b).

A general statement about the regressivity or progressivity of particular environmental taxes cannot be made. At the same time, concerns

regarding equity impacts often prevent environmental taxation from being implemented in developing and developed countries. The key to addressing equity impacts is sound policy design, as examined in subsection 4.5. Research has suggested that, if designed well, environmental taxes can redistribute wealth in developing country populations and so improve social equity (see, for instance, del Granado et al., 2010). In addition, ETR is a revenue-raising instrument and, if spent wisely, the revenues can protect the poor through direct or conditional compensation schemes, or facilitate behavioural change such as through micro-credits for energy-efficient technologies or technology installation, or fund energy efficiency measures or other investments. More problematic, however, is targeting such measures accurately – see subsection 4.5.2 below.

The positive impact of environmental improvements on social equity should also be taken into account when analysing the social impact of ETR. As a general rule, the poor stand to gain disproportionately from environmental improvements, even those resulting from carbon taxes, as they tend to live in the most polluted areas and benefit from reduced local air pollution (SO_2, particulates, NO_x) and corresponding improvements to human respiratory health.

4.5.2 Social protection schemes in developing countries: implementation issues

Although policymakers can predict the social impacts of an ETR proposal based on their knowledge of the proposed tax base of ETR measures and consumption patterns in the country – for instance, motorisation, electrification, energy mix, type of cooking fuel used in poor households – in practice, lack of coverage of compensation schemes along multiple dimensions of inequality such as gender, age, race, ethnicity and disability can prevent redistribution being realised effectively. In many low-income and lower-middle-income countries, coverage of such schemes does not exceed 50% of the population. Many transfers are inequitable and poorly targeted, benefitting the wealthy more than the poor. A further risk is that, if state resources are limited and the middle classes do not have access to private means, they tend to be better and more able to demand and obtain support from governments at the expense of poor households (Hallegatte et al., 2016).

Thus, it is essential in developing countries that policymakers design policy packages which ensure that the most vulnerable are protected from or compensated for the impact of the tax. It is not possible to generalise about the best way to accurately target the poor and ensure that compensation measures are effective and efficient, as this depends very much on the country context and on existing redistribution mechanisms, the quality of data on household income, and so on. For cash transfers to be effective, institutional capacity and procedural mechanisms to accurately target poor households and distribute funds must be in place (Raworth et al., 2014). Over-compensation should be the default option, if accurate targeting is not possible. For example, in Iran, when fossil fuel subsidies were reformed in 2010, the government set up a bank account for approximately 80% of all households – due to problems in identifying the most vulnerable. While this was less than ideal in terms of administrative effort and cost, the measure lifted virtually the entire population out of poverty and fostered widespread political acceptance for subsidy reform at the time (Guillaume, Zytek, & Farzin, 2011).[21]

A further option for countries where there are serious concerns that compensation will not reach the most vulnerable might be to focus on tax bases which per se tend to be progressive, such as taxes on air travel (kerosene or air ticket tax) or on (carefully selected) transport taxes. Indeed, bearing political economy issues in mind and the need for political feasibility, approaches to identify which taxes will be most progressive can be helpful in all developing countries to introduce redistributive taxation, while raising revenues which can fund institution building and improved financial governance.

Relatively accurate targeting is possible and developing countries can learn from each other's experiences. Compensation mechanisms in Indonesia are described in Box 12.

21 Subsequent sanctions placed on Iran after the subsidies had been phased out had a severe impact on the Iranian economy and the positive impact of subsidy reform was largely lost.

Box 12: Indonesia's reduction of fuel price subsidies, accompanying social programmes and its potentials for an ETR

In 2000, Indonesia tried to reduce fuel subsidies and increase prices for diesel by 9%, for gasoline by 15% and for kerosene, which is mostly used for cooking, by 25%. The revenues were recycled via general spending (for example, in health-care and education) (see Beaton & Lontoh, 2010).

Since price increases were mostly felt by Indonesians on low or middle incomes, violent demonstrations, mainly by students, taxi and bus drivers and small entrepreneurs broke out and plans to cut subsidies further were put on hold. In 2005, however, fuel prices had risen substantially, forcing the government to take steps to increase subsidies again. However, having learned from previous mistakes, Indonesia used well-targeted compensation programmes to keep the peace. The Indonesian government removed subsidies for industrial users and raised gasoline and kerosene prices by more than 150% within one year (World Bank, 2006).

Despite this immense increase, opposition against the reform was relatively low, which can be explained through the compensation programme *Bantuan Langsung Tunai* (BLT). Revenues were used to reduce the state budget deficit by EUR 3.78 billion in 2005 and EUR 8.4 billion in 2006 and a cash transfer programme to compensate poor households was implemented. All households with monthly fuel expenditures below the threshold of 175,000 Indonesian rupiah (IDR) (EUR 15) received monthly payments of IDR 100,000 (EUR 8.6) over six months. 28% of all Indonesian households received those payments (Widjaja, 2009). Between 2005 and 2006, compensatory spending for the BLT programme amounted to EUR 1.93 billion and made up more than 50% of the added revenues from subsidy cuts in 2005.

Social compensation for rising energy prices in the Indonesian case illustrates that, to maintain the economic and environmental appeal of ETR measures, policymakers may need to be prepared to recycle large parts of revenues to those who cannot easily carry the burden of higher prices. While compensatory spending may often try to remedy regressive effects of ETR instruments, they can also be issued to obtain political support and maintain the international competitiveness of certain industries.

Box 12 (cont.): Indonesia's reduction of fuel price subsidies, accompanying social programmes and its potentials for an ETR

There is potential in Indonesia for ETR to be implemented on a much wider scale than has thus far been the case. In a recent study, the huge potential for an ETR in Indonesia was identified and concrete steps developed and analysed. That proposal builds on the sound tax bases at local levels, which are often on natural resources and other environmentally relevant activities and proposes how they could be extended and increased, while payments from the federal level could be reduced (Schlegelmilch, 2011).

Source: Authors

4.5.3 Compensation mechanisms as a means of driving the green economy transition

Compensation schemes to compensate or protect the vulnerable include: cash transfers or handouts; food stamps or subsidies; free schooling; cash or food-for-work programmes; free or subsidised health services; housing or utility subsidies; vouchers or green cheques; social or health insurance; labour market policies; provision of alternatives, such as LPG stoves to replace kerosene; and lifeline tariffs – zero or lower tax rates for the first units of consumption, targeting the poorest households (Cottrell et al., 2015; Fay et al., 2015).

As noted in subsection 2.5.2, compensation measures should not undermine the incentive effect of ETR but should be parallel to it – unless the risk of negative social impacts is too great to allow for such an approach. Lifeline tariffs on electricity – provision of a basic amount of electricity at low or no cost – are an example of this. The free/cheap electricity undermines incentives for energy efficiency created by an ETR, but at the same time, ensures that the poorest households can access electricity.

If possible, measures which not only compensate but also facilitate behavioural change and innovation should be prioritised, as these kinds of measures enhance the efficiency and effectiveness of ETR measures and reduce the overall cost of the green economy transition and low-carbon development (Ekins, 2009). A range of policy options which can better integrate social and environmental policy making have been proposed

by the International Institute for Environment and Development (Raworth et al., 2014):

a. **Safeguarding policies** which compensate for the social cost of green policies, such as cash transfers, social protection, redundancy payments, micro-finance access, and enterprise and skills training

b. **Co-benefits policies** which are designed to exploit win-win opportunities to drive the green transition, such as conditional cash transfers, access to sustainable and affordable energy, water, sanitation, transport and housing, sustainable produce certification, and pro-poor payments for ecosystem services

c. **Social transformation policies** which include redistributing control over assets, labour rights reform, tackling women's reproductive care burden, deepening participation, and ensuring procedural justice.

The second and third strategies are preferable because they are most likely to bring about lasting gains, as they are more transformative approaches which not only compensate directly for negative equity impacts, but also help drive the green economy transition. Revenues from ETR measures can be used to implement all three approaches, although thus far, safeguarding and co-benefits policies have been most common in developing countries.

When developing responses to equity impacts, policymakers should bear in mind that impacts of ETR may be different over time, for example, ETR may result in job losses before new jobs are created, or vice versa. Similarly, taxpayers respond to environmental taxes in different ways as time passes – in the short term, behavioural change is to be expected and, later on, changing patterns of investment.

The tendency for developing countries to introduce ETR at rather low rates might be helpful for policymakers responding to changing equity impacts over time. In subsection 4.2.2 on tax design to maximise environmental effectiveness, we advised that these taxes are improved by the introduction of an escalator and indexation to inflation or GDP growth. Thus, in the short term, policymakers can use the early stages of ETR to support households to adjust to future price increases and put social protection or redistributive mechanisms in place, so that when higher tax rates take effect, the most vulnerable will already be prepared for the changes and protected from their impacts.

4.6 Administrative feasibility and costs

4.6.1 Using ETR revenues to improve administrative feasibility

One of the main challenges for developing countries is the mobilisation of domestic resources. Environmental taxation can provide a relatively simple way of raising revenue while incurring low administrative costs – particularly in the case of energy taxes. A proportion of environmental tax revenues can be used to cover monitoring, collection and enforcement costs (GTZ, 2008).

The ability to tax is constrained by the administrative capacity of the state and here there is an enormous difference between developed and developing countries (Besley & Persson, 2014). Environmental taxes cannot be successfully implemented without a strong, stable governance framework, particularly in relation to financial governance and an established tax system capable of levying, collecting and redistributing revenues and of transparent, competent and accountable public financial management (GTZ, 2008). At the same time, in the context of governance deficits, environmental taxes are sometimes a more feasible option, because they can be linked to existing relatively simple, well-functioning tax collection mechanisms with little administrative effort and are difficult to evade (Fay et al., 2015). Existing fuel excise collection mechanisms, for example, can easily be extended to incorporate a carbon tax.

Another argument in favour of using existing collection mechanisms, and perhaps of even linking new environmental objectives to existing taxes, is that implementing ETR instruments is seldom easy and is not always administratively or politically feasible. As demonstrated in the case of Thailand, old taxes are very often good taxes, because most political opposition has already been overcome and no new struggles are required as with any new measures (Israngkura, 2014).

In countries with few revenue collection mechanisms in place on energy or fossil fuels, the IMF recommends that, when phasing in energy taxes and phasing out inefficient expenditures, policymakers take the opportunity to introduce efficient upstream taxes on energy inputs where possible, to minimise administrative costs, maximise coverage and ensure efficient tax collection from few collection points (IMF, 2012, pp. 29ff). A smaller number of taxpayers can reduce complexity and improve control.

4.6.2 Tackling tax evasion

In countries with high levels of tax evasion, it has been suggested that carbon-energy taxes, which are relatively hard to evade, more than pay for themselves when introduced through improvements in the efficiency of the tax system – effectively meaning zero or even negative costs for the regulator in terms of administration (Liu, 2013). In such cases, ETR instruments can contribute to improving collection mechanisms, such as by raising additional revenues to fund better enforcement, increase revenue-collection capacities and improve financial governance practices, so reducing corruption by ensuring that officials receive sufficient wages to resist bribes.

It may be the case that the elites who benefit most from tax evasion overlap with, or have a strong influence on, policymakers, rendering tax reform difficult to implement in practice. In such cases, support and advisory services, or external pressure such as that from donor countries, international organisations or civil society – including 'name and shame' approaches – might also be appropriate measures. If tax evasion is high and governments do not command a high level of trust, it is often difficult to implement new tax measures. Creating an independent body to manage revenues can reduce opposition and increase transparency and accountability – although this alternative is also associated with a number of challenges (see subsection 4.7.2 below).

4.7 Use of revenues, acceptance, political economy

4.7.1 Use of revenues to overcome opposition and gain political acceptance

How revenues from environmental taxes are used has a crucial influence on the impact of ETR: not only on macro-economic indicators, such as GDP growth and employment, but also on the social equity impacts of a measure, its environmental effectiveness and political acceptance. The benefits of EFR remain rather abstract and diffuse, if the revenue use is not predetermined (World Bank, 2005). In addition, if revenue use is not specified, public support can be expected to be lower, because ETR is associated with higher taxes, rather than increased expenditure.

As noted above, in developing countries a proportion of revenues should be used to resolve social equity issues and protect the vulnerable – either on direct measures for poverty alleviation, or on pro-poor investment or health investments. Research has also indicated that investing a proportion of revenues in the green economy transition and green infrastructure (for instance, public transport, waste and sewage treatment), renewable energy and energy efficiency technologies can increase the efficiency of ETR and keep costs low, as discussed in detail in subsection 2.7.1 (Ekins, 2009).

The use of revenues is also of great importance to overcome opposition and to gain political and public acceptance (Schlegelmilch & Joas, 2015). In developing countries in particular, resources are often relatively limited and economic actors often fight hard to protect their interests. As in developed countries, it is often the case that a proportion of revenues will have to be spent on getting crucial stakeholders on side, to make a particular measure politically feasible. While undesirable from an environmental and economic point of view, such compromises are often unavoidable (for an analysis of such policy compromises and compensation measures in OECD countries, see OECD, 2006). Developing countries should ensure that all measures to compensate business, particular sectors, or households and individuals should be time-limited and subject to regular review (see subsection 2.2.7 for details).

Perhaps the most sensible way to approach such spending decisions is to evaluate them from a political and strategic perspective. For example, it can be useful to identify the highest national priority at any given time – often not related to the environment – and consider using ETR revenues to achieve this goal (Schlegelmilch & Joas, 2015). Given that all spending decisions are fundamentally political in character, approaching spending decisions in this way is politically acceptable (Schlegelmilch & Joas, 2015).'Dividend sharing', that is, distributing revenues between several groups – such as vulnerable rural populations, business and finance ministries – can also ensure that several groups benefit from ETR, so increasing acceptance. Using tax revenues in this way to meet multiple objectives can increase the appeal of environmental taxes to environment and finance ministries and thus boost support for such measures within government.

4.7.2 Political earmarking

In some cases it may be difficult to lay down revenue use in law, as in some countries, it is not legally permissible to hypothecate (or earmark) taxes to a specific policy goal in budgetary law. In such cases, ETR revenues flow into the general budget. For example, this is the case in both Chile and Vietnam. In Chile, legal earmarking requires either a presidential decree or constitutional change. Currently, the government is considering the creation of a special sustainability fund for the mining sector, to avoid this problem. However, funding will have to be found outside the tax system, such as through the public sector and mining companies.

In many other countries, such as Thailand, environmental taxes have been labelled 'charges' or 'fees' so that it is permitted for them to be directed, for instance into an environmental fund. While similar models have been effective in the EU, this model of earmarking has not always proven successful in developing countries. In Thailand, lack of transparency in management practices of environmental funds and disputes between ministerial departments were one factor in the failure of government ministries to agree on a model for the Draft Framework Law on Economic Instruments for Environmental Management (see subsection 3.2.1 for details). In India, a fund to collect revenues from the coal cess (a term for a tax or levy) has also faced serious problems with mismanagement and corruption, and in its initial stages, failed to redistribute revenues effectively or efficiently (see Cottrell et al., 2013).

Nevertheless, to boost political acceptance, when ETR revenues flow into the general budget it might be useful for policymakers to make clear their intentions for the use of ETR revenues, that is, to indulge in political earmarking. This means that there is no legal link between the tax and promised expenditure – which is in any case undesirable from an economist's point of view as ETR revenues and necessary expenditures in a given area may not match up. Such earmarking does not have to take the form of earmarking for a separate fund – which has been successfully implemented in the United Kingdom and Denmark – it could also simply be a statement relating to additional spending on policy priorities. Political earmarking can also be formulated in a stronger way and take the form of an explicit political link, which is made and clearly communicated. Such political earmarking can create political acceptance and facilitate the implementation of ETR measures. Political earmarking may prevent revenue being diverted

or spent on less desirable outcomes by binding governments to a certain political commitment or goal – although in practice, it is not always possible to prevent this.

4.7.3 Introducing environmental taxes as part of broader reform packages

Implementing environmental taxation within broader fiscal reform packages can aid implementation and increase political acceptance in developing countries. Recent broad-based tax reforms in Mexico and Chile included several ETR elements as well as, in the case of Mexico, personal, corporate, consumption and energy taxes. The EEA has also identified advantages to implementing ETR as part of a broad fiscal reform package and broader fiscal reform packages with ETR elements have been seen in many EU countries since the 1990s, including Belgium, the Netherlands, Sweden, Denmark, Finland and Germany (EEA, 2005).

Introducing ETR as part of a policy package has several advantages. Fiscal reform packages can reduce political resistance to ETR measures, as potential opponents have to address a comprehensive package of measures, rather than just one measure – and often, in such cases, opposition to ETR may prove to be a low priority. In addition, a broad-based fiscal reform creates fiscal space and flexibility for policymakers, which may facilitate social compensation schemes and the like through revenue-shifting. Such reforms can also use synergies between particular taxes, for example by introducing collection mechanisms which can be used for more than one tax, such as excise duties and carbon taxes on transport fuels.

4.7.4 Communicating ETR to increase political acceptance

The underlying rationale of ETR is not well understood in civil society in developing – or developed – countries. Why increasing a tax on a particular good or service can improve environmental quality is not immediately apparent to non-experts. Awareness-raising is thus crucial as a means of boosting political acceptance. A number of strategies, listed briefly below, may help to improve communication of environmental taxes:[22]

22 This list is a summary of Cottrell, 2015.

a. **Evolving vocabularies**. It might be helpful to frame ETR in a transparent way that reflects its impacts on households and businesses.

b. **Shifting emphasis towards rewards and benefits.** The perceived coercive nature of ETR 'sticks' can reduce acceptance, while ETR 'carrots', namely rewards for good environmental behaviour, can increase it. Policymakers should build on the good experiences gained in other countries, but also explore novel ways of designing policies which take this into account.

c. **Presenting ETR as a policy choice**. Governments should transparently present the cost of all fiscal and environment-related policies so that taxpayers can compare their actual cost and make decisions about which policies they support on that basis. The costs of inaction should also be presented – for instance, the cost of air pollution in terms of impacts on human health – to make clear the environmental imperative for action.

d. **Reconfiguring the fairness debate.** ETR is often perceived as unfair and may be met with low levels of acceptance as a result. Policymakers should try to focus discussions about fairness on equity and the 'polluter pays' principle.

e. **Framing.** To appeal to a broader audience, EFR should be framed in a way which emphasises fairness (equity) and the realisation of the 'polluter pays' principle and the various co-benefits of ETR.

4.7.5 Coalition-building

An important strategy for policymakers negotiating ETR is to be clear about what its impacts can be expected to be. Policymakers should analyse the economic, cultural and socio-political context in their country – including conducting a thorough impact assessment – so that winners and losers as a result of ETR measures can be identified (Schlegelmilch & Joas, 2015). On this basis, coalition-building with powerful stakeholders who stand to gain from ETR and popular political leaders can foster political acceptance and create momentum for the implementation of ETR measures.

One factor which may prevent the implementation of environmental taxation is the political influence of middle-class elites, who tend to resist the introduction of new taxes, particularly because they will be adversely affected by changes due to their high rates of consumption of, say, transport

fuels or water. In the case of environmental taxation of petroleum products in oil-producing countries, resistance is often widespread on the grounds that the benefits of such resources ought to accrue to all members of society – even though these benefits are disproportionately received by wealthier income deciles (del Granado et al., 2010). This may mean that, particularly when taxes are first introduced, a substantial proportion of revenues raised are redistributed to vulnerable groups, as in Iran in 2010: when fossil fuel subsidies were reformed, all households were permitted to apply for compensation. Although wealthier households were encouraged not to apply, ultimately 80% of all households received compensation. Nevertheless, 50% of revenues remained to foster energy-efficiency in business and other purposes (Guillaume et al., 2011).

Policymakers should be aware that the successful implementation of ETR measures is dependent on whether politically important actors and interest groups are considered during policy design and implementation and whether and to what extent those affected negatively by the reform, at least in the short term, are being compensated, if and when appropriate. Opposition, particularly from influential industries from sectors set to lose out from reform, should be brought on side or at least neutralised, where possible, to maximise support.

4.7.6 Inter-ministerial cooperation

ETR is an inter-ministerial and cross-cutting issue and requires institutional capacities and a high level of collaboration and trust between government institutions and agencies to develop sound policies and implement policy packages. The cooperation of several government ministries and agencies is necessary in negotiating, designing, implementing and enforcing an environmental tax. It requires political, legal and financial capacities like a functioning and transparent tax system that is able to collect and redistribute revenues.

This aspect of ETR can be particularly challenging in the developing country context, where structures for inter-ministerial cooperation tend to be poorly developed and rudimentary, where environment ministries tend to have low budgets and less influence than in developed countries, and where ministries are competing for scarce resources and budgets. To address this issue, a large number of developing countries have among other things set up climate change committees. In developed countries, very

many governments have set up green tax commissions, to examine ETR very specifically. This approach would also be very helpful in developing countries. Although these bodies may not be influential in policy-making, as they tend to be of loose character, in some countries the weight behind such committees has been increased by committee leadership. In Thailand, for example, the Climate Change Committee is headed by prominent and influential politicians and is relatively influential in overarching policy decision-making.

Even if their influence on concrete policy-making is limited, such bodies can help prevent 'silo thinking' within government. ETR is a cross-cutting issue and the compartmentalisation of ETR impacts should be avoided, in order to identify and exploit synergies between environmental and other policy areas (Combet & Hourcade, 2014). For example, finance ministries are much more likely to support ETR measures if they have developed and discussed them in cooperation with other ministries, and if they can also see that ETR can work in their interest. The potential to raise a considerable amount of revenue, not least if partially used for the general budget, can be a strong selling point on the part of environment ministries keen to implement ETR measures. Depending on the ministry concerned, economic and social policy aspects can also strengthen the case for ETR and convince other government institutions to come on board. Finally, such committees can serve to reduce ministerial rivalry and perhaps minimise (very real) concerns on the part of environment ministries that insufficient revenues will be used for environmental purposes. In many developing countries, such concerns are very real while rivalry between ministries still has the potential to affect ETR negotiations.

4.8 Final comments

This report has highlighted a number of trade-offs which may have to be made to achieve the implementation of ETR measures. Deviations from optimal tax design, for example, are often necessary to prevent negative impacts on international competitiveness – and to bring industry on side to build coalitions supportive of change, even though this will impact on environmental effectiveness. Similarly, while it is preferable to maximise welfare and spend state revenues as efficiently as possible by compensating only the vulnerable and not wealthier households, in practice compensation schemes may have to be designed in a way which approaches the issue with

a much broader brush to ensure full coverage of those most in need of social protection.

Bearing this in mind, this report has made the following recommendations to policymakers in developing countries:

Sound tax design is essential to ensure environmental effectiveness. In subsection 4.2.2, we advised that ETR measures in developing countries should be equipped with an escalator, so that low tax rates increase year-on-year, as well as being indexed to inflation or GDP growth. This way, low initial rates can foster political acceptance and give stakeholders time to adjust to the new tax rates, while increases over time will ensure stable revenues and maintain environmental effectiveness. In addition, ETR should accurately target the source of pollution or environmental damage, maximise coverage, apply homogenous tax rates uniformly to all sources of emissions, and keep exemptions to a minimum.

Although ETR sets out to internalise the external cost of pollution, only in the rarest of cases has it thus far created a level playing field between 'green' and 'brown' technologies, that is, between renewable and fossil energy sources. Thus, incentivising private investment still requires additional measures and sound and stable policy frameworks to guarantee return on investment, such as low-cost loans for private investors in green technologies, accelerated depreciation, preferential interest rates or, for renewable energy, long-term power purchase agreements (see, for instance, Cottrell et al., 2015).

The revenues raised by ETR measures have the potential to be substantial, but have thus far tended to be relatively low in the majority of developing countries. However, if developing countries introduce bolder ETR measures, they will have a great deal more revenue to obtain buy-in from industry stakeholders, the middle classes and the socially vulnerable. Bolder ETR measures also give developing countries the chance to 'lock in' environmental taxes and secure their implementation in the medium and long term – by establishing a so-called fiscal driver, or dependence on ETR revenues, to achieve additional policy goals.

In terms of social impacts, it is crucial that during the early stages of an ETR, vulnerable groups are supported to adjust to rising prices so that they are able to respond once prices increase significantly. As impacts change over time, policymakers should monitor social impacts carefully. The report

also highlighted the difficulties some countries face targeting vulnerable groups effectively: in such cases, governments should overcompensate to ensure sufficient coverage. Social compensation mechanisms should aim to drive green transition and take advantage of synergies and co-benefits between social and environmental policies.

Collection mechanisms should be linked to existing administrative structures to keep costs to a minimum. Revenues can be used to improve enforcement and for institutional capacity-building. ETR measures tend to be difficult to evade, which can be an advantage for countries facing institutional difficulties in tax monitoring and collection.

In terms of the political economy of ETR, revenue use is a political question and revenues are a powerful tool for creating political acceptance for ETR measures. Revenue distribution can drive government policy agendas, facilitate coalition-building in favour of ETR measures, protect the poorest from the impact of price increases, or contribute to investment in the green economy transition. Political earmarking can boost acceptance and reduce opposition to ETR. Introducing ETR measures within broader fiscal policy reform packages can further enhance the potential for implementation and reduce opposition.

Communication and cooperation at all levels is crucial: ETR is a cross-cutting issue and the cooperation of government ministries can result in better policy development and more successful implementation. Communication with all stakeholders can improve understanding and foster political acceptance of ETR.

The above has analysed the trade-offs between the factors listed above and developed a series of proposals for the best strategies for developing countries for the implementation of ETR measures. A well-designed environmental tax reform is the most efficient and cost-effective policy instrument for environmental protection, and one which also has the important co-benefit of raising revenue – a very important advantage in developing countries struggling to make ends meet.

References

Allianz. (2015). *Allianz steigt aus Kohlefinanzierung aus*. Retrieved from https://www.allianz.com/de/presse/news/finanzen/beteiligungen/150923_allianz-steigt-aus-kohlefinanzierung-aus/

Andersen, M. S., Barker, T., Christie, E., Ekins, P., Gerald, J. F., Jilkova, J., Junankar, S., …Speck, S. (Eds.) (2007). *Competitiveness effects of environmental tax reforms (COMETR)*. Aarhus, Denmark: University of Aarhus, National Environmental Research Institute.

Andersen, M. S., & Ekins, P. (2009). *Carbon-energy taxation: Lessons from Europe*. New York, NY: Oxford University Press.

APEIS (Asia-Pacific Environmental Innovation Strategies) & Research on Innovative and Strategic Policy Options (RISPO). (2004, May). *Good practices inventory: Shift from leaded to unleaded gasoline in Thailand*. Retrieved from http://enviroscope.iges.or.jp/contents/APEIS/RISPO/inventory/db/pdf/0097.pdf

Asche, F., Nilsen, O. B., & Tveterås, R. (2008). Natural gas demand in the European household sector. *The Energy Journal*, *29*(3), 27-46.

Bardazzi, R., Oropallo, F., & Pazienza, M. G. (2015). Do manufacturing firms react to energy prices? Evidence from Italy. *Energy Economics 49*, 168-181.

Bass, S., Euler, A., Grieg-Gran, M., Viana, C., & Viana, V. (2014). *Green economy in Amapá State, Brazil: Progress and perspectives* (IIED Country Report). London, United Kingdom: International Institute for Environment and Development (IIED).

BBC News. (18 November 2015). *UK's coal plants to be phased out within 10 years.* Retrieved from http://www.bbc.com/news/business-34851718

Beaton, C., Gerasimchuk, I., Laan, T., Lang, K., Vis-Dunbar, D., & Wooders, P. (2013). *A guide to fossil fuel subsidy reform for policy-makers in South East Asia.* Geneva, Switzerland: International Institute for Sustainable Development/Global Subsidies Initiative. Retrieved from https://www.iisd.org/gsi/sites/default/files/ffs_guidebook.pdf

Beaton, C., & Lontoh, L. (2010). *Lessons learned from Indonesia's attempts to reform fossil fuel subsidies*. Winnipeg, Canada: International Institute for Sustainable Development. Retrieved from http://www.iisd.org/gsi/sites/default/files/lessons_indonesia_fossil_fuel_reform.pdf

Besley, T., & Persson, T. (2013). *Taxation and development*. London, United Kingdom: London School of Economics and Political Science (LSE). Retrieved from http://econ.lse.ac.uk/staff/tbesley/papers/TaxationAndDevelopment.pdf

Besley, T., & Persson, T. (2014). Why do developing countries tax so little? *Journal of Economic Perspective*, *28*(4), 99-120.

BMF (Bundesministerium der Finanzen). (2015). *Bundeshaushalt*. Retrieved from http://www.bundeshaushalt-info.de/#/2015/soll/ausgaben/einzelplan/120953201.html

BMWi (Bundesministerium für Wirtschaft und Energie). (2013). *Spitzenausgleich-Effizienzsystemverordnung (SpaEfV) – Ein Baustein im Rahmen der Neujustierung des sog. „Spitzenausgleichs"*. Retrieved from http://www.dena.de/fileadmin/user_upload/Veranstaltungen/2013/16.10._Energieaudit/3_131016_Vortrag_Helmuth_Pallien.pdf

Bragadóttir, H., von Utfall Danielsson, C., Magnusson, R., Seppänen, S., Stefansdottir, A., & Sundén, D. (2014). The use of economic instruments. *Nordic Environmental Policy*, 2010-2013.

Broadway, R., & Keen, M. (2009). *Theoretical perspectives on resource tax design* (mimeo). Retrieved from http://www.wiwiss.fu-berlin.de/fachbereich/vwl/schoeb/gaeste/Boadway/boadway_paper_first_talk.pdf

Brons, M., Nijkamp, P., Pels, E., & Rietveld, P. (2008). A meta-analysis of the price elasticity of gasoline demand. A SUR approach. *Energy Economics*, *30*(5), 2105-2122.

Caney, S. (2016). *Climate change, equity, and stranded assets* (Oxfam America Research Backgrounder series 2016). Retrieved from https://www.oxfamamerica.org/static/media/files/climate_change_equity_and_stranded_assets_backgrounder.pdf

Carbon Pricing Leadership. (2015). *Carbon pricing*. Retrieved from http://www.carbonpricingleadership.org/who/

Carney, M. (29 September 2015). *Breaking the tragedy of the horizon – climate change and financial stability*. Speech given at Lloyd's London. Retrieved from http://www.bankofengland.co.uk/publications/Pages/speeches/2015/844.aspx

CCICED (China Council for International Cooperation on Environment and Development). (2009). *Economic instruments for energy efficiency and the environment* (CCICED Policy research report 2009). Beijing, China: Author. Retrieved from http://www.foes.de/pdf/Research_Report_EN_FINAL.pdf

Citizens Information Centre. (2016). Water Conservation Grant. Dublin, Ireland: Author. Retrieved from http://www.citizensinformation.ie/en/social_welfare/social_welfare_payments/extra_social_welfare_benefits/water_conservation_grant.html

Coady, D., Parry, I., Sears, L., & Shang, B. (2015). *How large are global energy subsidies?* (IMF Working Paper 15/105). Washington, D C: International Monetary Fund. Retrieved from https://www.imf.org/external/pubs/ft/wp/2015/wp15105.pdf

Combet, E., & Hourcade, J. C. (2014). *Carbon tax, pensions and deficits: The hidden cost of the compartmentalization of expertise*. Paper prepared for the Green Growth Knowledge Platform (GGKP), Third Annual Conference on Fiscal Policies and the Green Economy Transition: Generating Knowledge – Creating Impact, Venice, Italy. Retrieved from http://www.greengrowthknowledge.org/sites/default/files/Combet_Carbon_tax_pensions_and_deficits.pdf

Convery, F., McDonnell, S., & Ferreira, S. (2007). The most popular tax in Europe? Lessons from the Irish plastic bags levy. *Environmental and Resource Economics*, *38*(1), 1-11.

Cottrell, J. (2015). Reclaiming the T Word: Ways of improving communication and public acceptance of environmental fiscal reform in Europe. In L. Kreiser, M. S. Andersen, B. E. Olsen, S. Speck, J. E. Milne & H. Ashiabor (Eds.) *Environmental Pricing: Studies in Policy Choices and Interactions* (pp. 195-212). Cheltenham, United Kingdom: Edward Elgar.

Cottrell, J., Bridle, R., Yongqiang, Z., Jingli, S., Xuxuan, X., Beaton, C., …Cheng, H. (2013). *Green revenues for green energy: Environmental fiscal reform for renewable energy technology development in China.* Winnipeg, Canada: International Institute for Sustainable Development (IISD)/China National Renewable Energy Centre (CNREC). Retrieved from http://www.iisd.org/pdf/2013/china_green_revenue_en.pdf

Cottrell, J., Fortier, F., & Schlegelmilch, K. (2015). *Fossil fuel to renewable energy: Comparator study of subsidy reforms and energy transitions in African and Indian Ocean Island States*. Incheon, Republic of Korea: United Nations Office for Sustainable Development (UNOSD).

DECC (Department of Energy and Climate Change). (2014). *Updated energy and emissions projections 2014*. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/368021/Updated_energy_and_emissions_projections2014.pdf

DECC (2015). *Annual Fuel Poverty Statistics Report*. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/468011/Fuel_Poverty_Report_2015.pdf

DECC (2016). *Updated energy and emissions projections 2015*. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/501292/eepReport2015_160205.pdf

del Granado, J. A., Coady, D., & Gillingham, R. (2010). *The unequal benefits of fuel subsidies: A review of evidence for developing countries* (IMF Working Paper 10/202). Retrieved from https://www.imf.org/external/pubs/cat/longres.aspx?sk=24184.0

Department for Business, Energy and Industrial Strategy. (2016). *Energy Trends September 2016.* Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/559574/Energy_Trends_September_2016.pdf

Deutscher Bundestag. (2016). *Antwort der Bundesregierung auf die Kleine Anfrage der Abgeordneten Dr. Julia Verlinden, Oliver Krischer, Annalena Baerbock, weiter Abgeordneter und der Fraktion BÜNDNIS 90/DIE GRÜNEN* (Drucksache 18/7639). Retrieved from http://dip21.bundestag.de/dip21/btd/18/078/1807854.pdf

DivestInvest. (2015). *Divest-Invest Philantropy.* Retrieved from http://divestinvest.org/wp-content/uploads/2015/12/12.5_Divest-Invest%20Brief_FINAL.pdf

EC (European Commission). (2012). *Tax reforms in EU Member States: Tax policy challenges for economic growth and fiscal sustainability* (European Economy 6/2012 Report). Luxembourg: Office for Official Publications of the European Communities. Retrieved from http://ec.europa.eu/economy_finance/publications/european_economy/2012/pdf/ee-2012-6_en.pdf

EC. (2014). *Tax reforms in EU Member States 2014: Tax policy challenges for economic growth and fiscal sustainability* (European Economy 6/2014 Report). Luxembourg: Office for Official Publications of the European Communities. Retrieved from http://ec.europa.eu/economy_finance/publications/european_economy/2014/pdf/ee6_en.pdf

EC. (2015). *Tax reforms in EU Member States: Tax policy challenges for economic growth and fiscal sustainability* (Institutional Paper 008/September 2015). Luxembourg: Office for Official Publications of the European Communities. Retrieved from http://ec.europa.eu/economy_finance/publications/eeip/pdf/ip008_en.pdf

EC & Eurostat. (2011). *Taxation trends in the European Union: Data for the EU Member States, Iceland and Norway.* Brussels, Belgium: Author. Retrieved from https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/taxation-trends-eu-union_en

Edwards, E. (14 January 2016). Claim 61% of households paying Irish Water charges rejected. *The Irish Times.* Retrieved from http://www.irishtimes.com/news/environment/claim-61-of-households-paying-irish-water-charges-rejected-1.2497042

EEA (European Environment Agency). (2005). *Market-based instruments for environmental policy in Europe*. (EEA Technical Report no. No 8/2005). Copenhagen: Author. Retrieved from https://www.cbd.int/financial/doc/eu-several.pdf

EEA. (2011). *Environmental tax reform in Europe: Implications for income distribution* (EEA Technical report No. 16/2011). Copenhagen, Denmark: Author. Retrieved from http://www.eea.europa.eu/publications/environmental-tax-reform-in-europe

Ekins, P. (2009). *Resource productivity, environmental tax reform and sustainable growth in Europe*. London, United Kingdom: Oxford University Press. Retrieved from http://www.petre.org.uk/pdf/FinRepFin.pdf

Espey, J. A., & Espey, M. (2004). Turning on the lights: A meta-analysis of residential electricity demand elasticities. *Journal of Agricultural and Applied Economics, 36*(1), 65-81.

Eurostat. (2015a). *Environmental taxes in the EU*. Retrieved from http://ec.europa.eu/eurostat/documents/2995521/7087192/8-25112015-AP-EN.pdf/044200d1-8970-4960-b4ed-f3649847c685

Eurostat. (2015b). *Statistical Database European Union*. Retrieved from http://ec.europa.eu/eurostat/de/data/database

Fay, M., Hallegatte, S., Vogt-Schilb, A., Rozenberg, J., Narloch, U., & Kerr, T. M. (2015). *Decarbonizing development: Three steps to a zero-carbon future*. Washington, DC: World Bank. Retrieved from http://www.worldbank.org/content/dam/Worldbank/document/Climate/dd/decarbonizing-development-report.pdf

Fell, H., Li, S., & Paul, A. (2014). A new look at residential electricity demand using household expenditure data. *International Journal of Industrial Organization*, *33*(2014), 37-47.

Flues, F., & Thomas, A. (2015). *The distributional effects of energy taxes* (OECD Taxation Working Papers No. 23). Paris, France: OECD. Retrieved from http://d.doi.org/10.1787/5js1qwkqqrbv-en

FÖS (Forum Ökologisch-Soziale Marktwirtschaft). (2015). *Zuordnung der Steuern und Abgaben auf die Faktoren Arbeit, Kapital, Umwelt* (Background paper 02/2015). Berlin: Author. Retrieved from http://www.foes.de/pdf/2015-01-Hintergrundpapier-Steuerstruktur.pdf

Frankfurt School-UNEP (United Nations Environment Programme) Centre, & BNEF (Bloomberg New Energy Finance). (2016). Global trends in renewable energy investment 2016. Frankfurt am Main, Germany: Author. Retrieved from http://fs-unep-centre.org/sites/default/files/publications/globaltrendsinrenewableenergyinvestment2016lowres_0.pdf

Fuest, C., Hebous, & S., Riedel, N. (2011). *International profit shifting and multinational firms in developing economies* (Working Paper S-2008-NOC-1). London: International Growth Centre (IGC). Retrieved from http://www.theigc.org/wp-content/uploads/2011/01/Fuest-Et-Al-2011-Working-Paper.pdf

Fuest, C., Spengel, C., Finke, K., Heckemeyer, J., & Nusser, H. (2013). *Profit shifting and "aggressive" tax planning by multinational firms: Issues and options for reform* (ZEW Discussion Paper No. 13-078). Mannheim, Germany: Centre for European Economic Research/Zentrum für Europäische Wirtschaftsforschung (ZEW). Retrieved from www.dx.doi.org/10.2139/ssrn.2343124

Galbraith, K. (29 October 2014). Climate change concerns push Chile to forefront of carbon tax movement. *The New York Times*. Retrieved from http://www.nytimes.com/2014/10/30/business/international/climate-change-concerns-push-chile-to-forefront-of-carbon-tax-movement.html?_r=0

Garcia, D. A., & Barrera, A. (7 October 2013). *Mexico's carbon tax faces headwinds from energy revamp*. Retrieved from http://www.reuters.com/article/mexico-reforms-idUSL1N0HQ1MB20131007

Garg, V., Bridle, R., & Clarke, K. (2015). *Energy pricing, energy supply and FDI competitiveness in Viet Nam: An assessment of foreign investor sentiment*. Geneva, Switzerland: International Institute for Sustainable Development (IISD)/Global Subsidies Initiative (GSI). Retrieved from https://www.iisd.org/GSI/sites/default/files/ffs_vietnam_fdi.pdf

GIZ (Gesellschaft für Internationale Zusammenarbeit). (2011). *Environmental taxation in Vietnam: Tackling both environmental problems and state deficits with economic instruments.* Retrieved from https://www.giz.de/fachexpertise/downloads/giz2011-en-factsheet-efr-vietnam.pdf

Goodwin, P., Dargay, J., & Hanly, M. (2004). Elasticities of road traffic and fuel consumption with respect to price and income: A Review. *Transport Reviews*, *24*(3), 275-292.

Goulder, L., & Parry, I. (2008). Instrument choice in environmental policy. *Review of Environmental Economics and Policy*, *2*(2), 152-174.

Government of Ireland. (2010). *The National Recovery Plan 2011-2014*. Retrieved from http://www.budget.gov.ie/The%20National%20Recovery%20Plan%202011-2014.pdf

Government of Vietnam. (2012). *Decision No. 1393/QĐ-TTg by the Prime Minister, 25 September*. Retrieved from https://www.giz.de/en/downloads/VietNam-GreenGrowth-Strategy.pdf

Green Budget Europe. (s. a.). *Environmental taxation without damaging competitiveness*. Brussels, Belgium: Author. Retrieved from http://green-budget.eu/wp-content/uploads/Environmental-Fiscal-Reform-without-harming-competitiveness-FINAL.pdf

Green Fiscal Commission. (2010). *Competitiveness and environmental tax reform* (Briefing Paper 7 March 2010). London: Policy Studies Institute (PSI). Retrieved from http://www.greenfiscalcommission.org.uk/images/uploads/gfcBriefing7_PDF_isbn_v8.pdf

Green Fiscal Policy Network. (2011). *Environmental taxation in Vietnam: Tackling both environmental problems and state deficits with economic instruments*. Retrieved from http://www.greenfiscalpolicy.org/wp-content/uploads/2013/08/Environmental-Taxation-in-Vietnam.pdf

Green Fiscal Policy Network. (s. a.). *Countries: Mauritius*. Retrieved from http://www.greenfiscalpolicy.org/countries/mauritius/

Gross, R., Speirs, J., Hawkes, A., Skillings, S., & Heptonstall, P. (2014). *Could retaining old coal lead to a policy own goal? Modelling the potential for coal fired power stations to undermine carbon targets in 2030* (ICEPT Research Report October 2014). London, United Kingdom: Centre for Energy Policy and Technology, Imperial College London. Retrieved from http://assets.wwf.org.uk/downloads/wwf_coal_report_imperial_college_final.pdf?_ga=1.41147810.1665742166.1416851610

GTZ (Gesellschaft für Technische Zusammenarbeit). (2008). *Environmental fiscal reform in developing, emerging and transition economies: Progress & prospects*. Bonn: Author. Retrieved from http://www.worldecotax.org/downloads/info/documentation_gtz-Workshop.pdf

Guillaume, D., Zytek, R. & Farzin, R. (2011). *Iran – The chronicles of the subsidy reform*. (IMF Working Paper 11/167). Washington DC: International Monetary Fund. Retrieved from http://www.greenfiscalpolicy.org/wp-content/uploads/2013/08/Iran-The-Chronicles-of-the-Subsidy-Reform1.pdf

Hallegatte, S., Bangalore, M., Bonzanigo, L., Fay, M., Kane, T., Narloch, U., … Vogt-Schilb, A. (2016). *Shock waves: Managing the impacts of climate change on poverty* (World Bank Climate Change and Development Series). Washington DC: World Bank.

Hammar, H., & Åkerfeldt, S. (2011). *CO2 taxation in Sweden – 20 years of experience and looking ahead* (mimeo). Retrieved from https://www.globalutmaning.se/wp-content/uploads/sites/8/2011/10/Swedish_Carbon_Tax_Akerfedlt-Hammar.pdf

Harring, N. (2013). Corruption, inequalities and the perceived effectiveness of economic pro-environmental policy instruments: A European cross-national study. *Environmental Science and Policy*, *39*(2014), 119-128.

Hayton, B. (2010). *Vietnam: Rising dragon*. New Haven, CT: Yale University Press.

Herd, R., Cournede, B., & Sutherland, D. (2004). *Sustainable development in OECD countries: Getting the policies right.* Paris, France: OECD.

Hosoe, N., & Akiyama, S. (2009). Regional electric power demand elasticities of Japan's industrial and commercial sectors. *Energy Policy*, *37*(11), 4313-4319.

Huong, P. L. (2014). *Evaluating the economic and environmental impacts of the law on environment taxes in Vietnam* (mimeo). Hanoi, Vietnam: GIZ Macroeconomic Reforms Programme/Ministry of Finance.

IETA (International Emissions Trading Association). (2015). *The world's carbon markets: A case study guide to emission trading: Mexico*. Retrieved from http://www.ieta.org/resources/Resources/Case_Studies_Worlds_Carbon_Markets/mexico_case_study_may2015.pdf

IGES (Institute for Global Environmental Strategies). (2004). *Asia-Pacific Environmental Innovation Strategy Project (APEIS), Research on Innovative and Strategic Policy Options (RISPO), Second Progress Report*. Hayama, Japan: Author. Retrieved from http://enviroscope.iges.or.jp/contents/APEIS/RISPO/p_report_2nd/p_report_2nd.html

IMF (International Monetary Fund). (2012). *Fiscal policy to mitigate climate change: A guide for policymakers*. Washington DC: Author. Retrieved from http://www.greenfiscalpolicy.org/wp-content/uploads/2013/08/Fiscal_Policy_to_Mitigate_Climate_Change_IMF2012_Summary.pdf

IMF. (2016). *After Paris: Fiscal, macroeconomic, and financial implications of climate change* (IMF staff discussion note SDN/16/01). Washington DC: Author. Retrieved from https://www.imf.org/external/pubs/ft/sdn/2016/sdn1601.pdf

Irish Water. (s. a.). *New domestic water charges*. Retrieved from www.water.ie/billing-and-charges/charges/

Israngkura, A. (2014). *An analysis of economic instruments for GHG mitigation in Thailand* (paper commissioned by GIZ) (mimeo).

Johansson, B. (2000). *Economic instruments in practice 1: Carbon tax in Sweden*. Retrieved from http://www.oecd.org/sti/inno/2108273.pdf. Paris: OECD.

Joutz, F. L., Shin, D., McDowell, B., & Trost, R. P. (2008, December). *Estimating regional short-run and long-run price elasticities of residential natural gas demand in the U.S*. Paper presented at the 28th USAEE Regional Residential Natural Gas Demand Conference. Retrieved from http://www.usaee.org/usaee2008/submissions/OnlineProceedings/Estimating%20Regional%20Short%2008.pdf

Kallbekken, S., Kroll, S., &Cherry, T. L. (2011). Do you not like Pigou, or do you not understand him? Tax aversion and revenue recycling in the lab. *Journal of Environmental Economics and Management*, *62*(1), 53-64.

Klok, J., Larsen, A., Dahl, A., & Hansen, K. (2006). Ecological Tax Reform in Denmark: History and social acceptability. *Energy Policy*, *34*(8), 905-916.

Kosonen, K., & European Commission, Directorate-General for Taxation and the Customs Union. (2012). *Regressivity of environmental taxation: myth or reality?* (Taxation Papers Working Paper 32/2012). Luxembourg: Office for Official Publications of the European Communities.

Krishnamurthy, K. (2013). *Energy demand and income elasticity:A cross-country analysis* (CERE Working Paper, 5/2013). Umeå, Sweden: Umeå University/ Swedish University of Agricultural Sciences, Centre for Environmental and Resource Economics. Retrieved from http://www.cere.se/documents/wp/2013/CERE_WP2013-5.pdf

Liddle, B. (2012). The systemic, long-run relation among gasoline demand, gasoline price, income, and vehicle ownership in OECD countries: Evidence from panel cointegration and causality modelling. *Transportation Research Part D: Transport and Environment*, *17*(4), 327-331.

Litman, T. (2004). Transit price elasticities and cross-elasticities. *Journal of Public Transportation 7*(2), 37-58.

Liu, A. A. (2013). Tax evasion and optimal environmental taxes. *Journal of Environmental Economics and Management*, *66*(3), 656-670.

Liu, G. (2004). *Estimating energy demand elasticities for OECD countries: A dynamic panel data approach* (Discussion Paper No. 373/March 2014). Oslo, Norway: Statistics Norway, Research Department. Retrieved from http://www.ssb.no/a/publikasjoner/pdf/DP/dp373.pdf

Lo, A. (26 September 2015). Too big to fail: China pledges to set up landmark emissions trading scheme. *The Conversation.* Retrieved from http://theconversation.com/too-big-to-fail-china-pledges-to-set-up-landmark-emissions-trading-scheme-48214

Lo, A. (s. a.). *Commentary: Carbon Emissions Trading in China.* Retrieved from http://www98.griffith.edu.au/dspace/bitstream/handle/10072/50208/81941_1.pdf;jsessionid=FE48050BFC3974B0BB25C5781C4E7251?sequence=1

London School of Economics, Grantham Research Institute. (2016). *The global climate legislation database*. Retrieved from http://www.lse.ac.uk/GranthamInstitute/lw/resolution-24nq-tw-active-response-to-climate-change-improvement-of-natural-resource-management-and-environmental-protection/

Lovei, M. (1998). *Phasing out lead from gasoline: Worldwide experience and policy implications* (World Bank Technical Paper 397). Washington, DC: World Bank.

Macroeconomic Strategy and Planning Office. (20 February 2012). *Thai economic performance in Q4 2011 and outlook for 2012* (Press release 9.30). Retrieved from https://de.scribd.com/document/91318854/Thailand-s-Economic-Performance-in-Q4-and-Outlook-for-2012-0.

Madlener, R., Bernstein, R., & González, M. Á. A. (2011). *Econometric estimation of energy demand elasticities* (E.ON Energy Research Center Series, Volume 3, Issue 8). Aachen, Germany: RWTH Aachen University. Retrieved from https://www.fcn.eonerc.rwth-aachen.de/go/id/dnfj/file/48136

Mathiesen, K. (18 September 2015). Will the UK phase out coal in a decade? *The Guardian.* Retrieved from http://www.theguardian.com/environment/2015/sep/18/will-uk-phase-out-coal-in-decade

McDonald, H. (31 October 2014): Introduction of water charges in Ireland cause widespread street protests. *The Guardian*. Retrieved from http://www.theguardian.com/world/2014/oct/31/water-charges-ireland-cause-protests

Mehling, M. (2008). *Interim Report: Environmental priorities for Vietnam and assessment of current environmental levies in Vietnam*. Hanoi, Vietnam: European Technical Assistance Programme for Vietnam. Retrieved from http://files.foes.de/de/downloads/links/ETV2%20%20ISTE1b%20C1%20POL2%20Interim%20Report%20_7%202008_.pdf

Millock, K., Nauges, C., & Sterner, T. (2004). *Enviornmental taxes: A comparison of French and Swedish experience from taxes on industrial air pollution* (CESifo DICE Research Report 1/2004). Munich, Germany: CESifo. Retrieved from http://www.cesifo-group.de/pls/guestci/download/CESifo%20DICE%20Report%202004/CESifo%20DICE%20Report%201/2004/dicereport104-rr1.pdf

Mirrlees, J., Stuart, A., Besley, T., Blundell, R., Bond, S., Chote, R., …Poterba, J. M. (2011). *Mirrless Review: Tax by design*. London, United Kingdom: Oxford University Press. Retrieved from http://www.ifs.org.uk/publications/5353

Morris, D. F., & Sterner, T. (2013): *Defying conventional wisdom: Distributional impacts of fuel taxes* (Mistra Indigo Policy Paper). Gothenburg, Sweden: Mistra Indigo. Retrieved from http://indigo.ivl.se/download/18.1acdfdc8146d949da6d4b9a/1414743602551/Defying+Conventional+Wisdom+policy+paper+3.pdf

Narayan, P. K., Smyth, R., & Prasad, A. (2007). Electricity consumption in G7 countries: A panel cointegration analysis of residential demand elasticities. *Energy Policy*, *35*(9), 4485-4494.

OECD (Organisation for Economic Co-operation and Development). (2004). *Glossary of statistical terms: Environmentally related taxes*. Retrieved from http://stats.oecd.org/glossary/detail.asp?ID=6270

OECD. (2005). *Environmental fiscal reform for poverty reduction* (DAC Guidelines and Reference Series). Paris, France: Author.

OECD. (2006). *The Political economy of environmentally related taxes*. Paris, France: Author.

OECD. (2010a). *Taxation, innovation and the environment*. Paris, France: Author.

OECD. (2010b). *United Kingdom. Policies for a sustainable recovery*. Paris, France: Author. Retrieved from http://www.oecd.org/unitedkingdom/45642018.pdf

OECD. (2015). *OECD Economic Surveys: Mexico 2015*. Paris, France: Author. Retrieved from http://www.oecd.org/eco/surveys/Mexico-Overview-2015.pdf

OECD. (2016). *OECD Economic Surveys: Costa Rica 2016 Economic Assessment*. Paris: Author. Retrieved from http://www.keepeek.com/Digital-Asset-Management/oecd/economics/oecd-economic-surveys-costa-rica-2016_eco_surveys-cri-2016-en#page1

OECD (s. a.). *Glossary of tax terms*. Retrieved from http://www.oecd.org/ctp/glossaryoftaxterms.htm#T

Office of Natural Resources and Environmental Policy and Planning. (2015). *Thailand's Intended Nationally Determined Contributions*. Retrieved from http://www4.unfccc.int/submissions/INDC/Published%20Documents/Thailand/1/Thailand_INDC.pdf

Oxfam. (2016a). *Who should sell the last of the fossil fuels: Stranded assets, equity and climate change* (The politics of poverty: Ideas and analysis from Oxfam America's policy experts). Boston, MA: Author. Retrieved from http://politicsofpoverty.oxfamamerica.org/2016/05/who-should-sell-the-last-of-the-fossil-fuels-stranded-assets-equity-and-climate-change/

Oxfam. (2016b). *Associated explanation and calculations for "Who should sell the last of the fossil fuels: Stranded assets, equity and climate change"*. Boston, MA: Author. Retrieved from https://www.oxfamamerica.org/static/media/files/Calculations_for_Stranded_Assets_blog_-_April_2016_y0x6RmD.pdf

Parnell, J. (20 March 2013). China to start work on national carbon market in 2015. *Climate Home*. Retrieved from http://www.climatechangenews.com/2013/03/20/china-postpones-launch-of-national-carbon-market-to-post-2015/

Parry, I. (2011). *Reforming the Tax System to Promote Environmental Objectives: An Application to Mauritius*. (IMF Working paper 11/124). Washington DC: International Monetary Fund (IMF).

Pereira, F. G., Hoekstra, W., & Queijo, J. (2013). *Unlocking tax-revenue collection in rapidly growing markets*. Retrieved from http://www.mckinsey.com/industries/public-sector/our-insights/ten-quick-steps-to-unlocking-tax-revenue-collection-in-rapidly-growing-markets

Peter, M., Lückge, H., Iten, R., Trageser, J., Görlach, B., Blobel, D., & Kraemer, R. A. (2007). *Erfahrungen mit Energiesteuern in Europa. Lehren für die Schweiz*. Zurich, Switzerland: Schweizerische Eidgenossenschaft, Bundesamt fuer Energie (BFE). Retrieved from http://files.foes.de/de/downloads/studien/070824_Energiesteuern_Schlussbericht.pdf

Polemis, M. L. (2007). Modeling industrial energy demand in Greece using cointegration techniques. *Energy Policy*, *35*(8), 4039-4050.

Porras, I., Barton, D. N, Miranda, M., & Chacón-Cascante, A. (2013). *Learning from 20 years of payments for ecosystem services in Costa Rica*. London, United Kingdom: International Institute for Environment and Development (IIED).

PwC (PricewaterhouseCoopers). (2015). *PwC COP21 briefing: Paris Climate Summit*. Retrieved from http://www.pwc.com/my/en/assets/services/pwc-cop21-briefing-paris-climate-summit.pdf

Raworth, K., Wykes, S., & Bass, S. (2014). *Securing social justice in green economies: A review and 10 considerations for policymakers* (IIED Issue Paper). London: International Institute for Environment and Development IIED.

RenewEconomy. (2016). *Barclays: German coal generation to be worthless by 2030*. Retrieved from http://reneweconomy.com.au/2016/barclays-german-coal-generation-to-be-worthless-by-2030-2030

Reuters. (27 September 2014). Chile becomes the first South American country to tax carbon. *Global Energy News Reuters*. Retrieved from http://uk.reuters.com/article/carbon-chile-tax-idUKL6N0RR4V720140927

Rodi, M., Schlegelmilch, K., & Mehling, M. (2012). Designing environmental taxes in countries in transition: A case study of Vietnam. In J. E. Milne & M. S. Andersen (Eds.), *Handbook of research on environmental taxation* (pp. 122-138). Cheltenham, United Kingdom: Edward Elgar.

Roland Berger. (2011). *Effizienzsteigerung in stromintensiven Industrien*. Retrieved from https://www.rolandberger.com/media/pdf/Roland_Berger_energieeffizienz_20110830.pdf

Roy, R., Heauty, A., & Rodríguez, F. (2009). Introduction. In R. Roy & A. Heuty (Eds.), *Fiscal space: Policy options for financing human development* (pp. 1-13). New York, NY: United Nations Development Programme (UNDP). Retrieved from http://www.undp.org/content/undp/en/home/librarypage/poverty-reduction/inclusive_development/policy_options_forfinancinghumandevelopmentfiscalspace.html

Sandbag. (2015). *Carbon price instruments for the power sector – Comparing the German proposal to the UK*. Retrieved from https://sandbag.org.uk/site_media/pdfs/reports/Comparing_carbon_price_instruments.pdf

Schlegelmilch, K. (2011): *Rapid assessment on the readiness of Indonesia towards an environmental fiscal reform for greening the economy (mimeo)*. Retrieved from http://www.foes.de/pdf/2011-12-15-Rapid-Assessment-on-the-readiness-of-Indonesia.pdf

Schlegelmilch, K., & Joas, A. (2015, January). *Fiscal considerations in the design of green tax reforms*. Scoping paper presented and the Green Growth Knowledge Platform's Third Annual Conference in Venice, Italy, 29-30 January. Berlin: Forum Ökologisch-Soziale Marktwirtschaft (FÖS). Retrieved from http://www.greengrowthknowledge.org/sites/default/files/Schlegelmilch_Fiscal_considerations_in_the_design_of_green_tax_reforms.pdf

Science for Environment Policy. (2016). *Environmental taxation in the right place can increase business productivity* (Newsletter Issue 441 7 January 2016).

Brussels: European Commission DG Environment News Alert Service/ Science Communication Unit, The University of the West of England. Retrieved from http://ec.europa.eu/environment/integration/research/newsalert/pdf/environmental_taxation_in_the_right_place_can_increase_business_productivity_441na3_en.pdf

Sieber, P. (8 July 2013). *Environmental fiscal reform to promote green economy in countries in transition: Progress on sustainable development and poverty eradication in Vietnam* (Bachelor Thesis, Vienna). Retrieved from http://www.foes.de/pdf/2013-07-15_Bachelor%20Thesis_Petra%20Sieber.pdf

Son, T. (11 March 2015). Vietnam to raise environment tax on fuel, as import tariffs set to decrease. *Thanh Nien News.* Retrieved from http://www.thanhniennews.com/business/vietnam-to-raise-environment-tax-on-fuel-as-import-tariffs-set-to-decrease-39662.html

Statens Offentliga Utredningar. (2013). *Trängselskatt – delegation, sanktioner och utländska fordon*. Stockholm, Sweden: Author. Sveriges Risk. Retrieved from https://data.riksdagen.se/fil/32CA95AD-2E16-4DBD-AE4F-56DE439895E1

Sterner, T. (2012). Distributional effects of taxing transport fuel. *Energy Policy*, *41*(2012), 75-83.

Tax Strategy Group. (2015). *Energy and environmental taxes and vehicle registration tax*. Retrieved from http://www.finance.gov.ie/sites/default/files/TSG%2015%2006%20Energy%20and%20Environmental%20Taxes%20and%20Vehicle%20Registration%20Tax.pdf

Trabacchi, C., Micale, V., & Frisari, G. (2012). *San Giorgio Group case study: Prosol Tunisia* (CPI Report 2012). Jakarta, Indonesia: Climate Policy Initiative. Retrieved from http://climatepolicyinitiative.org/wp-content/uploads/2012/08/Prosol-Tunisia-SGG-Case-Study.pdf

Umweltbundesamt (UBA). (2014). *Environmentally harmful subsidies in Germany* (Updated Edition 2014). Dessau, Germany: Author.

UNEP (United Nations Environment Programme). (2011). *Towards a green economy: Pathways to sustainable development and poverty eradication*. Nairobi, Kenya: Author

UNEP. (2014). *Fiscal Policy Scoping Study – Mauritius*. Nairobi, Kenya: Author.

UNEP. (2016). *Global trends in renewable energy investment*. Frankfurt: Frankfurt School-United Nations Environment Programme (UNEP) Collaborating Centre for Sustainable Energy Finance. Retrieved from http://fs-unep-centre.org/publications/global-trends-renewable-energy-investment-2016

United Nations. (2015). *Addis Ababa Action Agenda of the Third International Conference on Financing for Development*. New York, NY: Author. Retrieved from http://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA_Outcome.pdf

UNFCCC (United Nations Framework Convention on Climate Change). (2015a). *Adoption of the Paris Agreement* (FCCC/P/2015/L.9/Rev.1 Draft Decision). Bonn: Author. Retrieved from https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf

UNFCCC. (2015b). *Intended Nationally Determined Contribution of Viet Nam*. Bonn, Germany: Author. Retrieved from http://www4.unfccc.int/submissions/INDC/Published%20Documents/Viet%20Nam/1/VIETNAM'S%20INDC.pdf

UNFCCC. (2015c). *Mexico Intended National Determined Contributions*. Bonn, Germany: Author. Retrieved from http://www4.unfccc.int/submissions/INDC/Published%20Documents/Mexico/1/MEXICO%20INDC%2003.30.2015.pdf

United Kingdom Government. (16 March 2016a). *Landfill tax: Increase in rates*. Retrieved from https://www.gov.uk/government/publications/landfill-tax-increase-in-rates/landfill-tax-increase-in-rates

United Kingdom Government. (11 July 2016b). *HMRC Tax & NIC Receipts: Monthly and annual historical record*. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/508913/Feb16_Receipts_NS_Bulletin_Final.pdf

Vatn, A., Kvakkestad, V., & Rorstad, P. K. (2002). *Policies for multifunctional agriculture: The trade-off between transaction costs and precision* (Report No. 23). Ås, Norway: Agricultural University of Norway.

Vietnam Economic Times. (2016). Issue 265, March 2016. Retrieved from http://vneconomictimes.com/

Vivid Economics. (2012). Carbon taxation and fiscal consolidation: The potential of carbon pricing to reduce Europe's fiscal deficits. London, United Kingdom: Author. Retrieved from http://www.foes.de/pdf/2012-05_CETRiE_Carbon_Pricing_Report_web.pdf

Vollebergh, H. (2015). *Green tax reform: Energy tax challenges for the Netherlands* (PBL Policy Brief). The Hague, Netherlands: Netherlands Environmental Assessment Agency (PBL). Retrieved from http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2015-green-tax-energy-tax-challenges-for-the-netherlands-1501.pdf

Waty, E. (2015). Is Mexico the emerging leader of Latin America in post-carbon politics? *Pepperdine Policy Review*, *8*(2015), Article 6. Retrieved from http://digitalcommons.pepperdine.edu/cgi/viewcontent.cgi?article=1113&context=ppr

Webb, T. (2008). *Fury as fuel poverty soars close to a 10-year record.* Retrieved from http://www.theguardian.com/business/2008/jan/20/utilities.householdbills

Widjaja, M. (2009). *An economic and social review on Indonesian Direct Cash Transfer Program to Poor Families 2005.* Retrieved from. http://umdcipe.org/conferences/policy_exchanges/conf_papers/Papers/widjaja.pdf

Willenbockel, D. (2010). *Impact assessment report of draft environmental tax law for Vietnam*. Eschborn, Germany: Gesellschaft für Technische Zusammenarbeit. Retrieved from http://www.macroreforms.org/index2.php?option=com_docman&task=doc_view&gid=189&Itemid=99999999

Withana, S., ten Brink, P., Illes, A., Nanni, S., & Watkins, E. (2014*). Environmental tax reform in Europe: Opportunities for the future* (IEEP Report for the Netherlands Ministry of Infrastructure and Environment). Brussels, Belgium: Institute for European Environmental Policy (IEEP). Retrieved from http://www.ieep.eu/assets/1397/ETR_in_Europe_-_Final_report_of_IEEP_study_-_30_May_2014.pdf

World Bank. (1998). *Successful conversion to unleaded gasoline in Thailand* (World Bank Technical Paper No. 410/1998). Washington DC: Author. Retrieved from http://documents.worldbank.org/curated/en/530551468778459674/Successful-conversion-to-unleaded-gasoline-in-Thailand

World Bank. (2005). *Environmental fiscal reform: What should be done and how to achieve it*. Washington, DC: Author.

World Bank. (2006). From curse to blessing: Natural resources and institutional quality. *Environment matters* 2006, 24-28. Retrieved from http://siteresources.worldbank.org/INTENVMAT/64199955-1162240805462/21125342/9FromCurse.pdf

World Bank. (2016a). *Data: Taxes on international trade (% of revenue)*. Retrieved from http://data.worldbank.org/indicator/GC.TAX.INTT.RV.ZS

World Bank. (2016b). *Data: GINI Index*. Retrieved from http://data.worldbank.org/indicator/SI.POV.GINI

World Bank. (s. a.). *Putting a price on carbon with a tax*. Retrieved from http://www.worldbank.org/content/dam/Worldbank/document/SDN/background-note_carbon-tax.pdf

Worldwatch Institute. (2007). *Costa Rica aims to become first "Carbon Neutral" country*. Retrieved from http://www.worldwatch.org/node/4958

Wrap. (2015). UK Voluntary Carrier Bag Agreement – 2014 Data. Retrieved from http://www.wrap.org.uk/sites/files/wrap/UK-Voluntary-Carrier-Bag-Agreement-Presentation_v4_0.pdf

Yoo, S. H., Lim, H. J., & Kwak, S. J. (2009). Estimating the residential demand function for natural gas in Seoul with correction for sample selection bias. *Applied Energy*, *86*(2009), 460-465.

Zimmer, A., Jakob, M., & Steckel, J. C. (2015). What motivates Vietnam to strive for a low-carbon economy? – On the drivers of climate policy in a developing country. *Energy for Sustainable Development*, *24*(2015), 19-32.

Publications of the German Development Institute/ Deutsches Institut für Entwicklungspolitik (DIE)

Studies

92 Berger, Axel, Dominique Bruhn, Andrea Bender, Julia Friesen, Katharina Kick, Felix Kullmann, Robert Roßner, & Svenja Weyrauch. (2016). *Deep preferential trade agreements and upgrading in global value chains: The case of Vietnam* (119 pp.). ISBN 978-3-96021-016-0.

91 Ströh de Martínez, Christiane, Marietta Feddersen, & Anna Speicher. (2016). *Food security in sub-Saharan Africa: a fresh look on agricultural mechanisation: how adapted financial solutions can make a difference* (171 pp.). ISBN 978-3-96021-009-2 .

90 Brüntrup, Michael, Katharina Becker, Martina Gaebler, Raoul Herrmann, Silja Ostermann, & Jan Prothmann. (2016). *Policies and institutions for assuring pro-poor rural development and food security through bioenergy production: Case studies on bush-to-energy and Jatropha in Namibia* (204 pp.). ISBN 978-3-88985-681-4.

89 von Haldenwang, Christian, Alice Elfert, Tobias Engelmann, Samuel Germain, Gregor Sahler, & Amelie Stanzel Ferreira. (2015). *The devolution of the land and building tax in Indonesia* (123 pp.). ISBN 978-3-88985-673-9.

88 Abdel-Malek, Talaat. (2015) *The global partnership for effective development cooperation: origins, actions and future prospects* (409 pp.). ISBN 978-3-88985-668-5.

87 Ashoff, Guido. (2015). *Die Global Governance-Qualität der internationalen Aid Effectiveness Agenda: eine theoretische Analyse und Bewertung der Systemreform der internationalen Entwicklungszusammenarbeit* (220 pp.) ISBN 978-3-88985-663-0.

86 Hampel-Milagrosa, Aimée. (2014). *Micro and small enterprise upgrading in the Philippines: The role of the entrepreneur, enterprise, networks and business environment* (169 pp.). ISBN 978-3-88985-640-1.

85 Zelli, Fariborz, Daniela Erler, Sina Frank, Jonas Hein, Hannes Hotz, & Anna-Maria Santa Cruz Melgarejo. (2014). *Reducing emissions from deforestation and forest degradation (REDD) in Peru: A challenge to social inclusion and multi-level governance* (178 pp.). ISBN 978-3-88985-651-7.

[Price: 10.00 Euro; books may be ordered from the Institute or through bookshops.]

Discussion Papers

23/2016 Pegels, Anna. *Taxing carbon as an instrument of green industrial policy in developing countries* (29 pp.). ISBN 978-3-96021-016-3.

22/2016 Castillejo, Clare. *The European Union Trust Fund for Africa: A glimpse of the future for EU development cooperation* (32 pp.). ISBN 978-3-96021-014-6.

21/2016 Durand, Alexis, Victoria Hoffmeister, Romain Weikmans, Jonathan Gewirtzman, Sujay Natson, Saleemul Huq, & J. Timmons Roberts. *Financing options for loss and damage: A review and roadmap* (35 pp.). ISBN 978-3-96021-011-5.

20/2016 Grävingholt, Jörn, & Christian von Haldenwang. *The promotion of decentrali-sation and local governance in fragile contexts* (26 pp.). ISBN 978-3-96021-010-8.

19/2016 Striebinger, Kai. *The missing link: Values and the effectiveness of international democracy promotion* (16 pp.). ISBN 978-3-96021-008-5.

18/2016 von Haldenwang, Christian. *Measuring legitimacy – new trends, old shortcomings?* (35 pp.). ISBN 978-3-96021-006-1.

17/2016 Burchi, Francesco, Margherita Scarlato, & Giorgio d'Agostino. *Addressing food insecurity in sub-Saharan Africa: The role of cash transfers* (34 pp.). ISBN 978-3-96021-007-8.

16/2016 Strupat, Christoph. *From protection to reduction? The impact of the public health insurance scheme on child labour in Ghana* (20 pp.). ISBN 978-3-96021-005-4.

15/2016 Schützhofer, Timm B. *Ecuador's fiscal policies in the context of the citizens' revolution: A 'virtuous cycle' and its limits* (62 pp.). ISBN 978-3-96021-004-7.

14/2016 Baumann, Max. *Reforming the UN Development System: Can North and South overcome their political differences in making the UN fit for purpose?* (38 pp.). ISBN 978-3-96021-003-0.

[Price: EUR 6.00; publications may be ordered from the DIE or through bookshops.]

Analysen und Stellungnahmen (ISSN 1434-8934)

13/2016 Hampel-Milagrosa, Aimée, & Sarah Holzapfel. *Lebensmittelsicherheits- und Qualitätsstandards in Thailand und Indien: Vielfalt der Standards und Auswirkungen.*

12/2016 Brüntrup, Michael. *Erweiterung des OECD-Modells der fünf ländlichen Welten für die sektorübergreifende armutsorientierte Analyse, Kommunikation und Planung.*

11/2016 von Haldenwang, Christian, & Armin von Schiller. *Die Mobilisierung subnationaler Einnahmen ist ein entscheidender Faktor für die Umsetzung der Agenda 2030.*

10/2016 Hoffmann, Harry, Michael Brüntrup, & Clara Dewes. *Holzenergie im Subsahara-Afrika: Nachhaltigkeit für eine Schattenwirtschaft.*

[Analysen und Stellungnahmen free of charge available from the DIE.]

Briefing Papers (ISSN 1615-5483)

23/2016 Berensmann, Kathrin, & Nannette Lindenberg. *Green finance: actors, challenges and policy recommendations.*

22/2016 Pauw, Pieter, & Adis Dzebo. *Private finance for climate change adaptation: challenges and opportunities for the case of Kenya.*

21/2016 von Haldenwang, Christian, & Armin von Schiller. *The mobilisation of sub-national revenues is a decisive factor in the realisation of the 2030 Agenda.*

20/2016 Rudolph, Alexandra. *Ensuring SDG-sensitive development cooperation*.

19/2016 Kreibaum, Merle. *Build towns instead of camps: Uganda as an example of integrative refugee policy.*

18/2016 Baumann, Max-Otto. *An executive authority for the UN Development System: why this is necessary and how it could work.*

17/2016 Hampel-Milagrosa, Aimée, & Sarah Holzapfel. *Diversity and implications of food safety and quality standards in Thailand and India.*

16/2016 Brüntrup, Michael. *Revamping the OECD's Five Rural Worlds model for poverty-oriented inter-sectoral analysis, communication and planning.*

[Briefing Papers free of charge available from the DIE.]

For a complete list of DIE publications:
http://www.die-gdi.de