Environmental Fiscal Reform in Morocco: Options and Pathways

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I. Background

In response to the request from the Ministry of Environment and in close collaboration of the Ministry of Economy and Finance, the World Bank Group, with support from the Partnership for Market Readiness (PMR) and the NDC Support Facility, provided technical support to Morocco aimed at exploring the opportunities offered by environmental fiscal reform (EFR), such as that incorporating carbon pricing, to strengthen green growth. As part of this support, the WBG has assessed carbon pricing options that oculd be appropriate for Morocco and simulated their selected economic impacts with macroeconomic model in collaboration with the Research and Forecast Department of the Ministry of Economy and Finance (MoEF) of Morocco. This report outlines the key considerations for policy-makers in Morocco and presents a preliminary finding from modelling conducted by the MoEF in collaboration with the WBG, as well as identifies the needs for the secondary analysis.

II. Introduction

Morocco has made significant progress in recent years towards achieving sustainable development. As its latest Systematic Country Diagnostic (SCD) notes, "Over the last 15 years, thanks to pro-poor growth performance, investment in education, health and other social services, and the deployment of social safety nets, Morocco has succeeded in eliminating extreme poverty, reducing poverty and to a lesser degree sharing prosperity".[1] However, the same World Bank report noted that Morocco's current growth model shows signs of weaknesses as it is confronted with a series of sustainability issues (from economic to financial, territorial, environmental or social), which risk impeding further progress.

An early reform of fossil fuel subsidies was a big leap towards economic efficiency and sustainability. Between 2013 and 2015 Morocco phased out direct subsidies to all imported fuels, except butane in a

[1] World Bank (2018). "Kingdom of Morocco Systematic Country Diagnostic: Governing Towards Efficiency, Equity, Education and Endurance." Washington, DC: World Bank. http://hdl.handle.net/10986/29929.

bold move that enabled progress towards balanced budget (Figure 5) and more efficient use of resources use across the economy.

As part of its national development strategy, Morocco is implementing and planning further reforms of its fiscal systems, energy sector, industrial structure, as well as an ambitious climate change action as per the objectives of the Nationally Determined Contribution. This note explores whether and how these reforms might be supported by aligning fiscal incentives with sectoral policy objectives to accelerate the rate of future growth while reducing its carbon emission intensity. The potential for this alignment lies in shifting the tax base from economic "goods" to economic "bads" and integration of these shifts with a broader fiscal, economic and sectoral policies, including how the existing taxes and subsidies would be restructured and how the revenues would be used. In economic literature such tax-subsidy-expenditure adjustments are called "environmental fiscal reform", hereafter EFR.[2]

Environmental fiscal reforms (EFRs) are a collection of changes to tax, expenditure, and other policies which collectively seek to raise national development and welfare.[3] Such reforms do so by reflecting the costs of environmental damage in prices such as energy prices – e.g. through reductions in fossil fuel subsidies or increases in environmental taxes - while allocating funds raised or saved towards development objectives such as expanding investment in infrastructure, health, or education. Designed and implemented well, such reforms should help reduce the various losses from environmental pollution, increase the quality and quantity of public goods such as health, transport, and education, foster innovation, and improve the economic efficiency of the tax system, while achieving a more socially-desirable economic allocation. The economic rationale of the EFRs is further described in Annex 1.

This report explores potential options for implementing an environmental fiscal reform (EFR) as part of Morocco's broader economic strategy and tests the impacts of these options with the Morocco's CGE model. It is structured as follows. *The second section* discusses Morocco's national development challenges and the strategic policy goals, where EFR can play a role. *The third section* provides an overview of options for EFR in Morocco, as identified by the World Bank Group team and national experts, including (i) modifications of fuel tax structure (TICs) to better reflect social costs of fuel use, (ii) butane subsidy reform, or (iii) more direct environmental pricing through taxes or emissions trading. *The fourth section* introduces the CGE model for Morocco, used by the DEPF, and simulates impacts of several potential EFR design options identified in the previous section. It also discusses the limitations of the existing CGE model to reflect the impacts of the EFR, and in this context analyzes the results of scenario analysis conducted with the CGE model. The fifth and final section concludes.

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[2] OECD (2017). "Environmental Fiscal Reform". Retrieved from https://www.oecd.org/tax/tax-policy/environmental-fiscal-reform-G7-environment-ministerial-meeting-june-2017.pdf

[3] There are numerous definitions of EFR. This includes defining EFR as: an application of environmental taxes generally; a revenue-neutral tax shift in which increases in environmentally-related taxes are used to decrease taxes on labor or capital, and; the use of market-based instruments like taxes to "reflect the cost of environmental damage in prices faced by polluters" while "raising public revenue and deploying it in a socially-useful way" (OECD 2017). This report adopts the latter, more broad definition of EFR, as used by the OECD, as a package of policies which raise prices on polluters (in this case, through taxes) while allocating revenues towards socially-desirable ends.

III. Potential contribution of EFR to Morocco's national development goals

Morocco faces numerous development challenges. As the Country Partnership Framework (Cadre Partenariat-Pays pour Maroc, 2019-2024) notes, Morocco faces several barriers to inclusive development. This includes: (a) weakening social cohesion, fueled by high unemployment of youth and women and the exclusion of some of the poorest regions; (b) slow private sector job creation, due to low private sector investment and lack of access to financing for entrepreneurs and SMEs; (c) weak human capital formation, with an education system that fails to deliver the competencies and skills required for the changing business and labor market; (d) lack of productivity growth in rural areas; (e) water scarcity and vulnerability to climate change; and, finally, (f) governance and the rule of law, which perpetuates the inefficient and inequitable distribution of power and resources, undermines initiatives and hinders inclusive development. In summary, Morocco suffers from an insufficient inclusion in market institutions, public governance, human capital formation and social capital development which hinders its inclusive and sustainable development.

Morocco has articulated several national objectives to overcome such barriers. These objectives include reforms to fiscal policy, industrial policy and innovation, and the energy sector, alongside ambitious environmental and climate policy objectives, articulated in the country's nationally determined contribution (NDC) submitted under the Paris Agreement. **EFR has the potential to contribute to each of these reform areas.**

A. Fiscal policy

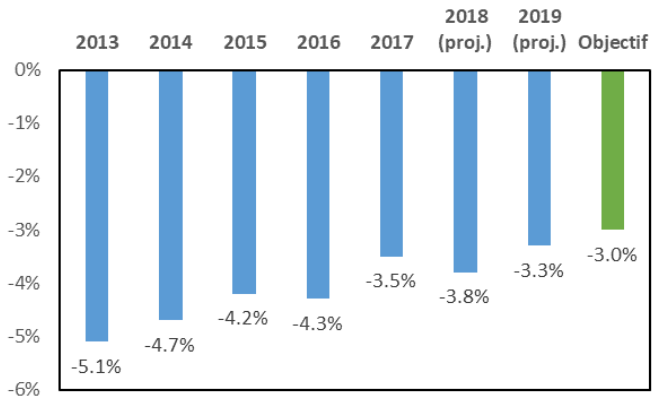
Environmental fiscal reform can contribute to achieving the broader goals of fiscal policy. *The revenues raised (for taxes) or saved (from reducing subsidies) could make an important contribution to reducing Morocco's budget deficit. Alternatively, revenues could be equitably funneled into equity-enhancing lump-sum transfers or reduced labor or capital taxes, enhancing the economic efficiency of the tax system while maintaining existing debt-to-GDP ratios. A 'co-benefit' of EFR can also be in supporting macroeconomic stability by reducing Morocco's dependence on imported fossil fuels, and therefore increasing the economy's resilience to global energy prices shocks. Implemented through adjusting the rates of existing energy taxes EFR can reduce the cost of tax administration, minimize tax evasion and fraud and discourage informal economy.*

Morocco's tax system follows international standards of modern fiscal policy however opportunities exist to further improve fiscal efficiency and reduce budget deficit. In its report '*Morocco: Selected Issues*'[4], the IMF argued that Morocco would benefit from some reforms that would, among others, improve fiscal efficiency and reduce budget deficit. The government goal of reducing the budget deficit

[4] IMF (2017). "Morocco: Selected Issues." Washington, DC: International Monetary Fund. Middle East and Central Asia Dept. https://www.imf.org/en/Publications/CR/Issues/2018/03/12/Morocco-Selected-Issues-45714.

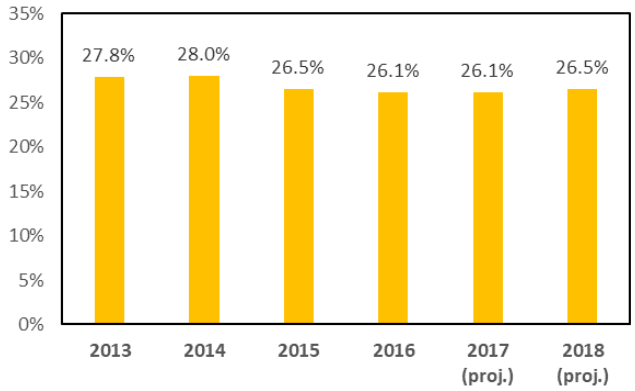
from 4.2 percent of gross domestic product (GDP) in 2015 to 3 percent of GDP by 2017 was not fully met (notwithstanding progress) and was forecast to rise to 3.8 percent in 2018 (Figure 1). To bridge this gap, the government aims to accelerate privatization of state assets including La Mamounia hotel in Marrakech and the Tahaddart gas-fired power plant to reduce the budget deficit to 3.3 percent of GDP in 2019 (Morocco's 2019 draft budget). One-off sales of state assets may not be a sustainable long-term strategy of fiscal consolidation, however.

Figure 1. Budget deficit evolution (% of the GDP)



Source: MoF

Figure 2. Tax-to-GDP ratio evolution (% of the GDP)



Source: IMF[5]

Some existing tax expenditures and differentiation in fuel tax rates offer an opportunity for relatively simple improvements towards the declared goals of fiscal policy with significant environmental co-benefits. Fossil fuels in Morocco are subject excise taxes imposed on consumption of fuels ("*taxe intérieure de consummation"* or TIC). These are collected by the customs authority 'upstream' – that is, at the point where fuels enter the economy to minimize the tax administration costs – with rates that are specific excises, i.e. based on the volume of imports (Table 1). Fuel consumption is also taxed with value

[5] IMF (2018). "Morocco: 2017 Article IV Consultation." Washington, DC: International Monetary Fund. https://www.imf.org/en/Publications/CR/Issues/2018/03/12/Morocco-2017-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-45713.

added tax (VAT). However, certain tax expenditure and rate differentiation may be inconsistent with development objectives of Morocco:

- *Fuels used for electricity generation (coal, natural gas) are exempt from TIC, while TIC rates on coal and coke used for industrial production are lower than on heavy fuel oil*. The forgone TIC revenues from this exemption were estimated at 525 MDh for 2014 and may reach 800 MDh by 2020 with the operation of two new coal power plants at Jerada and Safi.[6]

- *In case of liquid fuels, mainly used in transport, diesel is currently taxed 36% less than gasoline*, notwithstanding its significantly larger contribution to the health cost of local air pollution.

- *Fuels used in many industrial sectors benefit from a reduced 10 percent VAT rate.* In line with the modern VAT practice Morocco has gradually reduced the divergence between the VAT rates applied to different products and services. This has contributed not only to raising revenues but also to improving the tax neutrality of the fiscal system, thus lowering distortions to economy-wide allocative efficiency. But some rate differentiations remain.

- *Reduced rates of TIC cause further revenue losses to the VAT.* The VAT tax expenditure is intensified by the TIC exemption of fuels discussed above. TIC exemptions reduce the effective VAT rate further, since the VAT is imposed on the after-TIC product price (as in all modern VAT systems).

Table 1. TIC rates on fossil fuels

Combustible	Unité	TIC
GPL (butane et propane)	Dh/t	46
Essence	Dh/hl	376,4
Gasoil	Dh/hl	242,2
Gaz naturel		Exonéré
Fuel lourd N°2, charbon et coke de pétrole pour usage de production d'électricité dans des centrales de puissance supérieure à 10 MW		Exonéré
Fuel lourd N°2 autres usages	Dh/t	182,4
Charbon pour autres usages	Dh/t	64,8
Coke de pétrole pour autres usages	Dh/t	83,5

Source: Dahir portant loi n° 1-77-340 du 25 chaoual 1397 (9 octobre 1977), actualisé

[6] Own estimates by the authors.

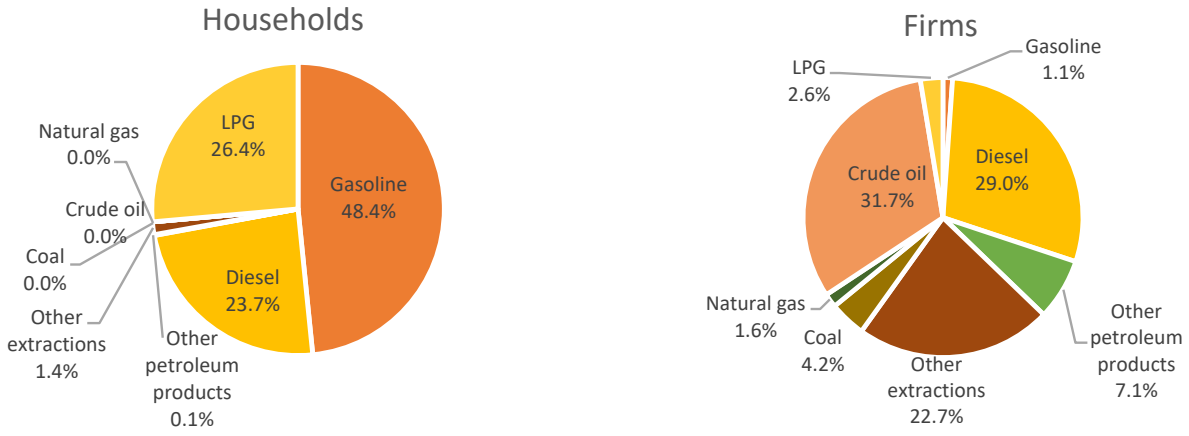
B. Energy policy

EFR would establish broad price incentives to improve efficiency and sustainability of energy systems while reducing poverty and inequality. *The efficient pricing of fuels proportional to their social costs can incentivize efficient production and use of energy. It would also encourage long-term switching to cleaner and renewable energy sources thus reducing import-dependency of final energy consumption and reducing the fiscal burden of remaining energy subsidies (Concentrated Solar Power and butane). A portion of additional revenues could be earmarked towards energy innovation or domestic production of some generation technologies, such as solar water heaters. It could also be earmarked for targeted transfers to the poorest households.*

Morocco is highly dependent on imported fossil fuels for its energy needs. Almost a quarter of the total import bill is accounted for by energy commodity imports. At the same time, Morocco faces rising energy demand, driven mainly by increasing transport fuel use and electricity generation to meet industrial and urban development needs. The national energy strategy is focused on meeting this demand while shifting the energy mix toward more sustainable low-carbon energy sources Promoting energy efficiency and domestic renewable sources such as solar, wind and hydropower are the important objectives of the national energy policy, as they also reduce fuel imports and its contribution to the current account deficit.

In terms of energy, Morocco is a net importer of fossil fuels, with households consuming mostly gasoline, LPG and diesel. Morocco exported only a small amount of diesel in 2013, and imported crude oil, diesel, and LPG (butane), as well as smaller quantities of gasoline and coal (highlighted red in Figure 3). For households, roughly half of fossil fuels consumed in 2013 were gasoline, with the remainder evenly split between LPG and diesel (Figure 3). By contrast, firms consumed a broader array of fossil fuels as intermediate inputs, with crude oil and diesel comprising around a third of demand each, in addition to smaller shares in other extractions and petroleum products, coal, LPG, and natural gas (Figure 3).

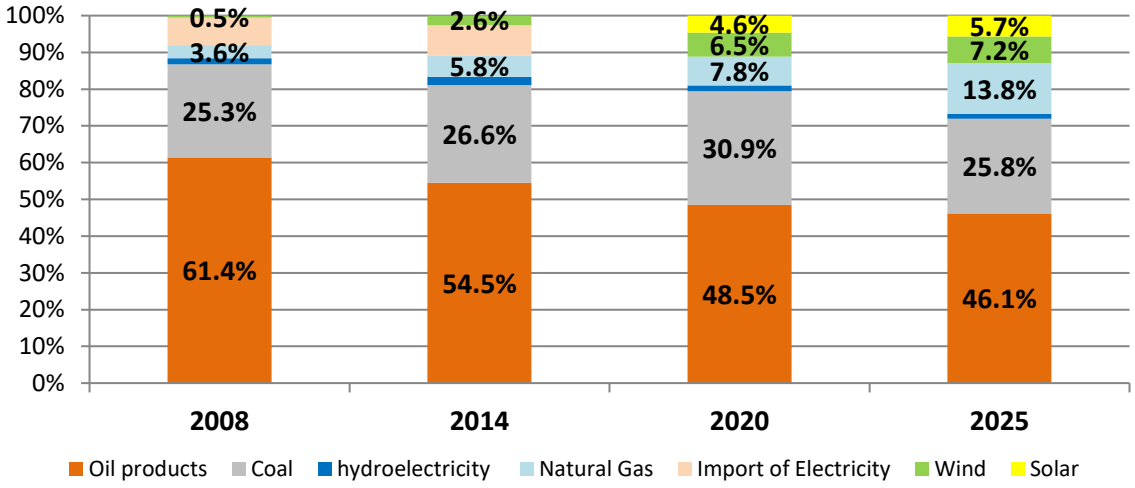
Figure 3. Fossil fuel demand by households (left) and firms (right), 2013



Source: MoF

By 2025, Morocco plans to reduce its energy dependence to less than 85%. Fossil fuel will continue to dominate energy sources (85% in 2025; see Figure 4). New power plants (renewable energy, natural gas and coal) will help meet the increasing demand and gradually reduce reliance on imported electricity. Investment in renewable energy is expected to reach $30 billion by 2030. Morocco is expected to cover all its electricity needs by 2020 domestically (without imported electricity).

Figure 4. Structure of total energy consumption

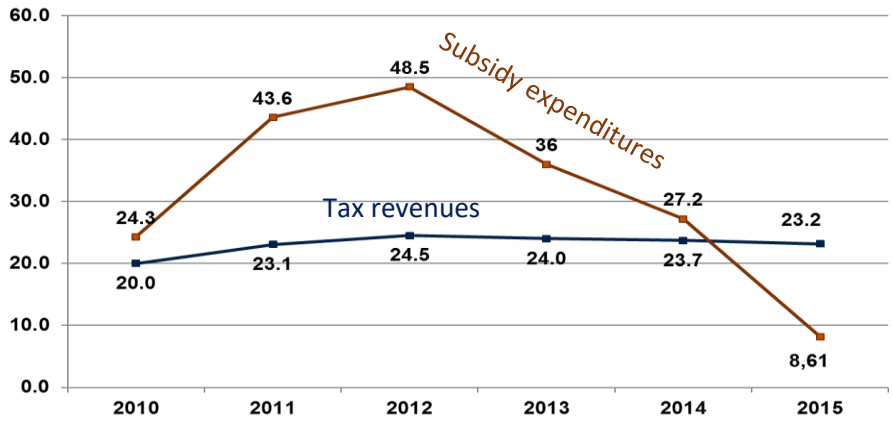


Source: MEMEE

Morocco's power generation is still dominated coal (almost half of annual generation) but this high carbon content of electricity is expected to decline in line with the National Energy Strategy as RES are scaled-up and natural gas is introduced into the energy mix. In 2017 renewables accounted for 13 percent of annual generation (19 percent of installed capacity). The RES target was initially set in National Energy Strategy at 42 percent of installed power generating capacity in 2020 and was increased to 52 percent by 2030 in Morocco's Nationally Determined Contribution (NDC). This implies the need to attract massive private investments in renewable power plants given that total electricity demand growth is projected to continue at 5.6 percent p.a. until 2030, requiring to add almost 1 GW of total capacity per year on average**.** Power sector is concentrated with a dominant role throughout the entire value chain (generation, transmission and distribution) played by the state-owned enterprise *Office National d'Electricité et de l'Eau Potable* (l'ONEE). Generation plants either belong to ONEE directly (30 percent) or to the independent power producers (IPPs – 52 percent) selling electricity to ONEE as a single buyer, under individually negotiated power purchase agreements (PPAs). Small volumes of electricity are self-produced by large industrial companies or sold by renewable IPPs to large consumers via bilateral PPAs. This concentrated sector structure with limited market-based power trading limit the opportunities to use prices to influence dispatch and investment decisions. Retail prices to small customers are still regulated, and the wholesale competition is limited, although national strategy envisages liberalization of the mid- and low-voltage markets for RES. The financial standing of l'ONEE remains fragile, as the company regained profitability in 2017 after several years of running on losses. The hard-earned profitability was due to several years of increasing revenues and expenditure efficiency, although remaining subsidies also play a role (fiscal transfers to CSP through MASEN and tax expenditures on coal and gas used in power generation).

Morocco was one of the pioneers among developing countries in implementing successful reform of fossil fuel subsidies. To help reduce the budget deficit and improve economic efficiency, the country since 2013 has phased out fiscal subsidies for all fuels except butane. Some tax expenditures (implicit fiscal subsidies) remain however in the power sector. This includes reduced VAT rate for fossil fuels, exemption of fossil fuels used for power generation from the TIC taxes. The options for their adjustments are discussed in the next chapter.

Figure 5: Evolution of taxes and subsidies for fossil fuels (MDh) - Évolution des taxes et des subventions aux combustibles fossiles (en MMDh)



Source: Administration des Douanes et impôts indirects - Rapport d'activité, 2015.

The rates of taxes on fossil fuels use is not aligned with the abovementioned energy policy objectives:

- VAT rate on fossil fuels is reduced to 10 percent, compared to 20 percent on most other goods, except specific goods (such as equipment for solar and wind plants or transport, medical services or books) which are taxed at a preferential rate of 14 percent;
- Fuels used for power generation are exempt from TIC, and TIC rates on coal and coke used for industrial production are lower than on heavy fuel oil (as discussed above);
- In transport gasoline is taxed 36% more than diesel.

Both TIC and VAT tax expenditures distort the choices of firms and citizens, incentivizing them to spend more on energy instead of increasing consumption of other, welfare improving products or services. They also support the use of dirtier energy sources and undermine cost-competitiveness of renewable energy plants to the wholesale buyer (l'ONEE).

The domestic price of butane has been maintained at a low rate of 3.3 Dh/kg for more than a decade, while the unsubsidized price has been around 10 Dh/kg[7]. In 2014, the total butane subsidy represented a budget burden of 11.8 billion Dh[8]. Figure 5 below illustrates that while the combined revenue from energy

[7] Verme P., El-Massnaoui K. (2015). *An Evaluation of the 2014 Subsidy Reforms in Morocco and a Simulation of Further Reforms*. DEC Working Paper 7224. The World Bank Group. March 2015.

[8] Verme P., El-Massnaoui K. (2015). Based on the own calculation by the authors, in 2015, the burden of butane subsidy represented about 1% of the Moroccan GDP.

excise taxes and VAT on energy products was relatively constant in nominal terms in local currency, the level of fossil fuel subsidies in Morocco significantly decreased after 2012 and remaining butane subsidies are now well below the value of energy tax revenue.

There are two main rationales of subsidizing butane, which is mainly used by households for cooking, hot water preparation and heating. The first reason has social character – to provide poor rural households with the low-cost means for meeting essential needs. The second rationale is environmental: widespread use of butane by rural households reduces consumption of fuel wood and charcoal at homes, which improves air quality and reduces pressure on deforestation.

Despite its social purposes, the butane subsidy is not targeted at poor households. As demonstrated in Table 2, Verme and El-Massnaoui (2015) found that the largest part of it is captured by relatively wealthy households, with the poorest quintile receiving 12 percent of total subsidy, while the riches quintile 31 percent.[9] Arguably, the wealthy households would be able to afford paying cost-recovery prices or switching to even more convenient and environmentally friendly options for heating and hot water preparation, such as solar water heaters or electricity.

Table 2: Distribution of butane subsidy (million Dh).

Population quintile	**Total household expenditure,** MDh	**Butane subsidy received,** MDh	**Total butane subsidy received** (% of total household expenditure)
1 *(poorest)*	34,789	1,406	4.0%
2	58,543	1,845	3.2%
3	82,599	2,321	2.8%
4	118,540	2,642	2.2%
5 *(richest)*	285,699	3,619	1.3%
Total	***580,170***	***11,833***	***2.0%***

Source: Authors own calculation based on Verme P. and El-Massnaoui K. (2015).

The availability of subsidized butane is often perceived as one reason preventing households from installing building-integrated solar water heating systems, and thus slowing down job creation in domestic manufacturing and servicing of this equipment. However, solar water heaters cannot be used for cooking, so the risk remains that removal of butane subsidies could encourage poor rural households to revert to wood and charcoal for cooking purposes and increase the pressure on air quality and forests again.

[9] General equilibrium analysis by the WBG suggested that, based on 2007 data, 71% of the benefits from the butane subsidy accrue to households in the top 60% of the income spectrum. The highest quintile benefits more than double as much from the butane subsidy than the lowest quintile.

C. Industrial and innovation policy

EFR can incentivize structural transformation towards an innovative, high value-added economy. *EFR send price signals which favor knowledge-intensive (as opposed to fuel-intensive) activities. These activities require more productive labor and capital inputs, helping incentivize productivity-enhancing investments in education and innovation. In addition, EFR can reduce the opportunity costs of formal sector participation, especially when revenues are recycled through reductions in labor taxes. The increased formal sector participation can boost competitiveness, improve employee working conditions and terms, increase returns to education, and improve a country's ability to benefit from knowledge and technology transfer. That said, EFR can have a negative impact on the competitiveness of exporting or import-competing energy-intensive sectors, effects which will need to be managed.*

Morocco is positioning itself as a reliable and competitive industrial destination at the crossroads of Europe, Africa, the Middle East and the Americas.[10] The target industrial activities are production of vehicles and their components, as well as mechanical and metallurgical industries.

The Moroccan economy is still dominated by non-tradable and labor-intensive activities. (German Watch, 2016; Mansour and Castel, 2014). For several years trade deficit in the industrial products remained high (about 30%).[11] The investments in Research and Development (R&D) are low and domestic labor skills do not match the demands of modern, high technology sectors. Stronger incentives to improve human and institutional capital are needed to unlock the country's transition to the knowledge-based and high value-added economy (World Bank, 2014[12]; Moody's Investor Service, 2015).

In 2013, the last year complete structural data was available, services dominated the economy, both in terms of output and value-added (in Figure 6), followed by agriculture, food & tobacco, and construction. Engineering and chemicals (including mechanical & electrical engineering, chemical & petrochemical industries) formed a smaller component of the economy in terms of value-added and output but accounted for larger shares of international trade (exports and imports in Figure 7).

Morocco's new industrial policy has been successful in several dimensions. It created hundred thousand of industrial jobs, increasing manufacturing exports and attracting foreign direct investment for example in the automotive and aeronautic industries.[13] Two industrial clusters in Casablanca and Tangier produce vehicles and components for the world market, and have contributed to stable growth rates in the industry sector. Cement industry is well developed.

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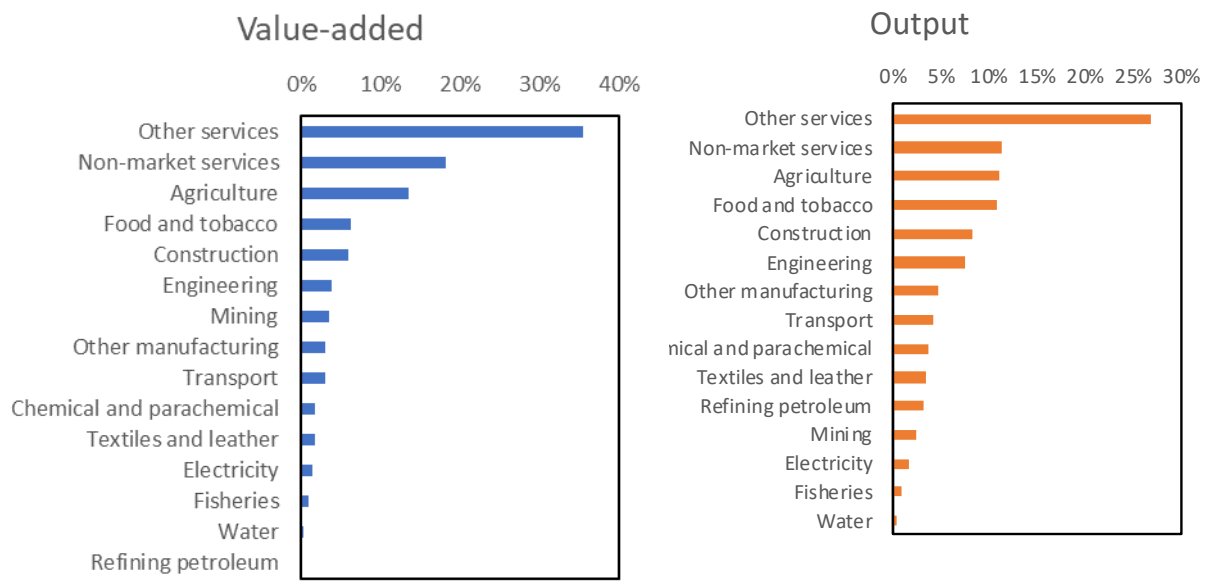
[10] Le Ministère de l'Industrie, du Commerce, de l'Investissement et de l'Economie Numérique: Plan d'Accélération Industrielle 2014 – 2020; L'industrie, locomotive de la croissance et de l'emploi. http://www.mcinet.gov.ma/~mcinetgov/fr/content/plan-d%E2%80%99acc%C3%A9l%C3%A9ration-industrielle-2014-2020

[11] Ibid.

[12] World Bank (2014). Country Partnership Strategy (CPS) for the Kingdom of Morocco (2014-2017). Rabat, pp. 2-10.

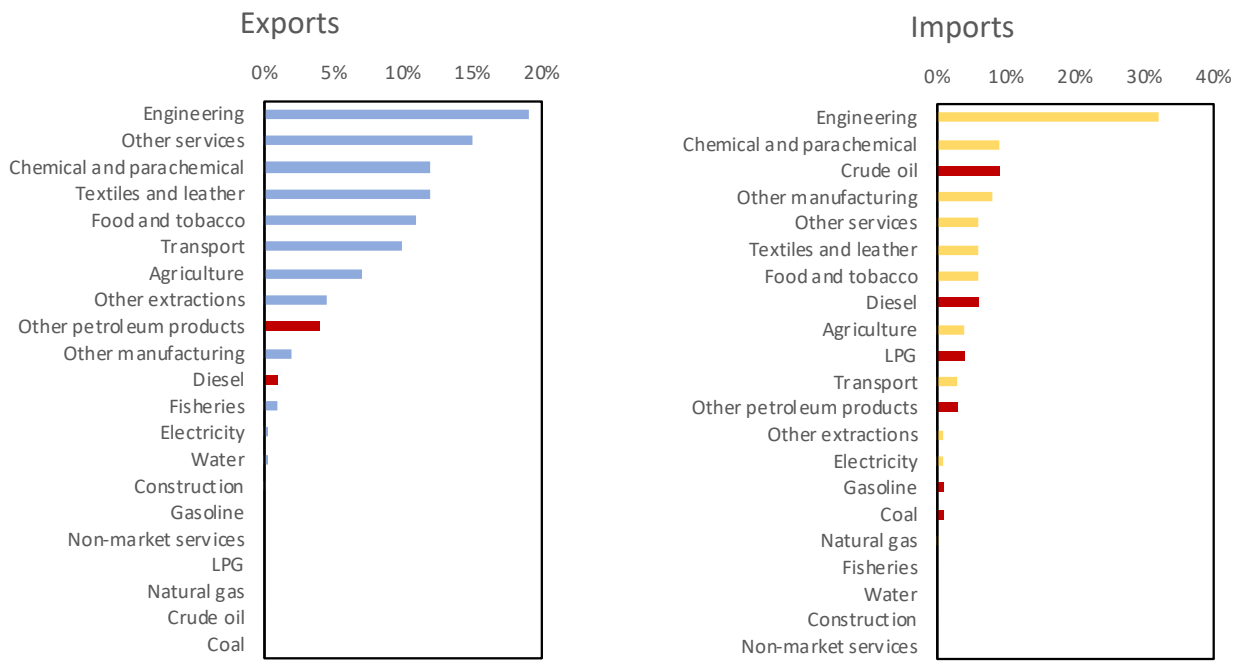
[13] Germanwatch (2016), *Background Paper: Country Fact Sheet Morocco Energy and Development at a glance*. https://germanwatch.org/en/download/15121.pdf.

Figure 6. Economic structure - share of sectoral output (left) and value-added (right), 2013



Source: MoF

Figure 7. Economic structure - share of exports (left) and imports (right), 2013



Source: MoF. Fossil fuel exports and imports are highlighted in red.

The new industrial policy aims at supporting mechanical and metallurgical industries, including the recovery of the metals copper and aluminum, new activities such as “agricultural machinery and bicycles”,

and metal processing.[14] The government and public agencies (such as *Société d'Investissement Energetique* (SIIE), the Moroccan Agency for Sustainable Energy (MASEN) are also seeking to actively support the development of domestic manufacturing for renewable energy technologies, in particular to be used for solar electricity and hot water production.

In addition, high rates of informality in the labor market prevent advancements in human capital. In 2014, 80% of all workers did not contribute to social security. These high informality rates, especially among small and medium size firms represents one of the barriers to improving productivity and competitiveness of the labor force in the manufacturing sector (Cafos, 2015)[15]. The government is seeking to reverse this trend and integrate workers into the formal economy.

EFR would contribute to enlarging Morocco's formal sector employment. The reason is two-fold. First, unlike most other taxes, fuel taxes reach the whole economy, formal and informal alike. When fuel taxes are applied at the most upstream point where the fuels enter the economy, such as at the port or refinery level, it is not possible anymore to avoid taxation by escaping to the informal sector. This removes one of the incentives not to take up formal sector employment or not to register small businesses. Second, this effect can be further strengthened by using a portion of the extra fuel tax revenues to reduce taxes which are exclusively paid by the formal sector, such as income taxes or obligatory social security contributions. The employment benefits can be large in particular when income tax reduction is targeted at the portion of the population with the greatest propensity to escape to informal economy: low-earning workers and small to medium-sized enterprises. Reducing formal income taxes would encourage poor households to seek employment, self-employment or establish micro-enterprises among family members and friends.

Yet, tax expenditures discussed above slow down structural transformation to knowledge-intensive industry, since they represent a fiscal transfer to the energy-intensive industries, paid for by all other industries. Better alignment of price incentives with efforts to improve human and institutional capital could accelerate the country's transition to an innovation-driven and high value-added economy.

[14] Available at http://www.mcinet.gov.ma/~mcinetgov/fr/content/plan-d%E2%80%99acc%C3%A9l%C3%A9ration-industrielle-2014-2020

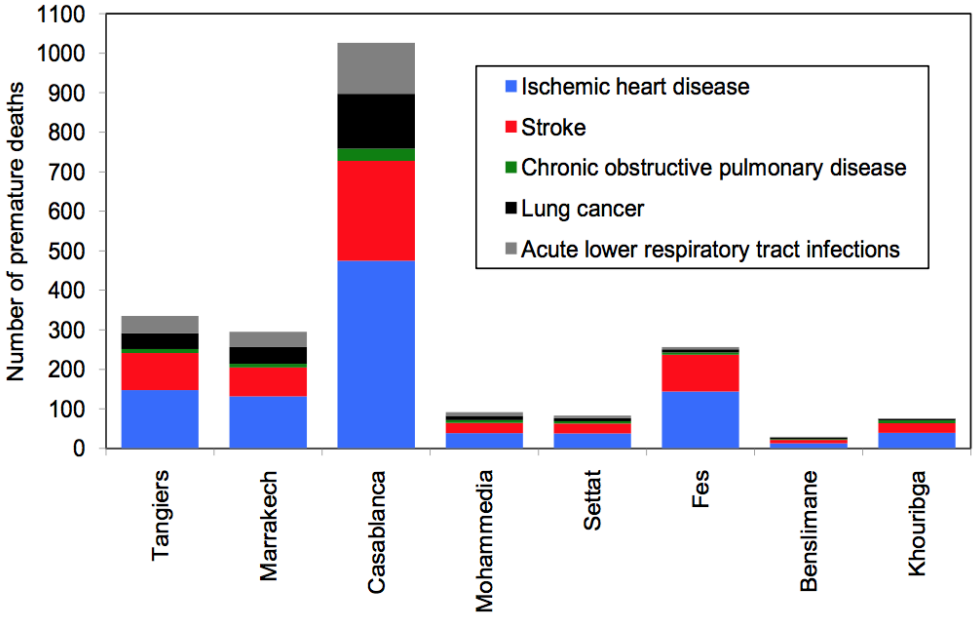
[15] Coface Group MENA Economist (2015). Morocco: the challenge of becoming an emerging economy, page 16. Retrieved from http://www.coface.com/content/download/111581/1728915/file/PANORAMA-+Morocco+-+the+challenge+of+becoming+an+emerging+economy.pdf.

D. Air pollution and climate policy

Environmental fiscal reform can help Morocco avoid premature deaths and diseases caused by air pollution and achieve its climate mitigation goal (NDC) cost-effectively. *EFR can reduce targeted pollutants in the most cost-effective way by allowing firms and consumers to independently and flexibly choose how and where to reduce harmful emissions. Such reforms are complementary with technological innovation policies as they provide the long-term price signals needed to facilitate investments in clean technology innovation and dissemination. As a result, EFR could strengthen sustainability of Morocco's development.*

The rapid expansion in population, economic activity and road traffic has raised ambient concentrations of pollutants in urban centers. Air pollution related heart disease and stroke, for instance, cause approximately 700 premature deaths annually in Casablanca alone (Croitoru and Sarraf 2017). Premature deaths (mortality) account for the majority of the costs of air pollution, above increases in chronic and acute health maladies (morbidity).

Figure 8. Premature deaths caused by air pollution in Moroccan cities, 2014

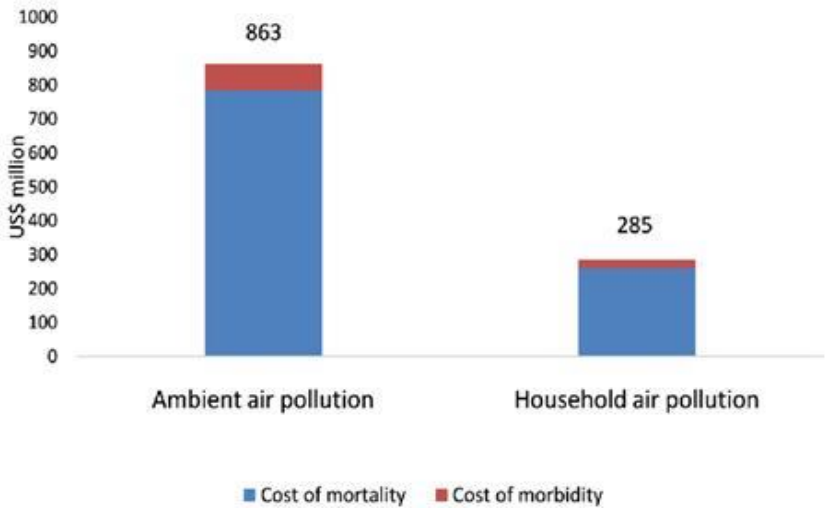


Source: Croitoru and Sarraf (2017).

Air pollution is estimated to cost Moroccan society about $1.14bn annually in premature deaths and diseases, which is equivalent of 1.05 percent of GDP in 2014. Ambient air pollution is responsible for roughly three quarters of this cost or 7.2 billion dirhams in 2014, equivalent to 0.8% of GDP (Croitoru and Sarraf 2017). Most costs are associated with health impact (mortality and morbidity) due to higher

concentration of particulate matters in urban and industrialized centers, such as Casablanca, Tangier, and Marrakesh.

Figure 9. Estimated costs of air pollution in Morocco, 2014



Source: Ibid.

Environmental fiscal reforms can reduce emissions of certain local air pollutants and greenhouse gasses. The greatest local health benefit can be expected in urban areas from shifting TIC on liquid fuels used in transport from petrol to diesel, as the latter fuel is associated with significantly higher emissions of fine particles. An increase in taxes on coal would incentivize a long-term switch to less polluting fuels (like natural gas and renewables) in power generation and industry. This would cut GHG emissions, although the impact on local air pollution could be relatively small, as the poor air quality is mainly attributed to emissions from dispersed small sources, including vehicles, households cooking and heating with wood and charcoal, as well as burning of municipal agricultural waste. But the quantification of health benefits due to adjustment of the fuel taxes would require additional analysis.

Environmental fiscal reform can be designed in a way that targets specific pollutants – global or local or both. Several countries (e.g. Chile, Sweden, Poland, Czech Republic) apply separate taxes or charges on emissions of specific pollutants such as CO_2, or local pollutants including So_2, NO_x, PM or benzene. Taxing local pollutants can have more immediate benefits to air quality and health, but is administratively more complex, since it requires either downstream taxes continuous emissions monitoring by each source (like in Chile, Poland or Czech Republic), or upstream taxes with downstream rebates to those polluters who remove pollutants from flue gasses by the end-of-pipe filters (like SO_2 charges in Sweden).

Local air pollutants tend to be co-emitted by the same sources as greenhouse gases, but their abatement does not always lead to climate co-benefits. Some of them, like fine particulate matter (e.g. PM2.5) including black carbon and substances that are precursors of low-level ozone, also contribute to global or local warming. Others, like SO_2 or organic carbon lead to formation of aerosols that cool the planet. NOx can lead to warming or cooling depending on timescale and location (Myhre et al., 2013). It is the method of abatement of local air pollutants that determine the sign of its impact on climate. Increased energy efficiency and switching to cleaner fuels usually reduce both local and global emissions.

However, removing local pollutants from flue gasses with end-of-pipe filters usually slightly reduce thermal efficiency of energy production hence increase greenhouse gas emissions per unit of final energy. Several stakeholders in Morocco also stressed that removing subsidies for butane may lead to increased local pollution if households switch back to biomass, although the effect of that switch on climate mitigation should be positive.

Annual per-capita emissions of greenhouse gases in Morocco are relatively low at approximately 3tCO_2 per capita (compared to worldwide average of 5t CO_2 per capita), although significant growth is expected by authorities under a 'business as usual' scenario – rising from around 115 MtCO_2 at present to around 171 MtCO_2 in 2030 (NDC of Morocco, 2016)[16]. The main sources of CO_2 emissions are energy use in electricity generation (37 percent) transport (28 percent), industry (15 percent), commercial and residential buildings (11 percent and 8 percent respectively).[17] Accordingly, Morocco's NDC seeks to reduce emissions from these sectors by an unconditional 17 percent relative to business-as-usual until 2030, while adapting to climate change. Morocco has made a commitment conditional upon international support to reduce its GHG emissions 42 percent below from the baseline by 2030. According to the NDC Morocco is considering using international market mechanism in delivering its contributions to the global goals of the UNFCCC.

IV. Options and pathways for environmental fiscal reform in Morocco

A. Three broad options for environmental fiscal reform

Morocco has several options to design and implement environmental pricing reforms to support its national development objectives. In conjunction with national experts, the World Bank preliminary assessed a variety of these options, including:

(I) Domestic and international emission trading systems (ETSs),
(II) New carbon and local pollution taxes; and
(III) Adjusting rates of existing energy taxes and subsidies.

Emissions trading systems (ETS) and carbon taxes represent alternative instruments to implement explicit and new 'carbon pricing' policies. Unlike options II and III which are typical components of the EFR, the option I (ETS) does not belong to the canvas of fiscal reform, and is implemented by line ministries, rather than Ministry of Finance. Its consideration in this study was requested by the Ministry of Environment.

[16] MOROCCO's NATIONALLY DETERMINED CONTRIBUTION UNDER THE UNFCCC (2016), available at: http://www4.unfccc.int/ndcregistry/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

[17] International Energy Agency: Morocco 2014.

Option I: Domestic or international carbon emissions trading

Emissions trading systems (ETS) set a quota of emissions of a specific pollutant from a specified territory and distributes this quota as emission allowances to individual sources (usually large point source only). If the quota is lower than current aggregated emissions, a price for emitting one ton of that pollutant emerges and fluctuates according to the supply and demand of emissions allowances which can be traded between sources firms. Because of the quantitative cap on total emissions ETSs provide more certainty about overall emission outcomes. If well-designed, the trading aspect can achieve emissions reductions at least-cost: allowances will end-up in the hands of those that value them the most, whilst those firms that can reduce emissions within their own operations more cheaply will do so enjoying additional revenues by selling allowances they can spare. Emission trading systems operate most efficiently under competitive market conditions, and when there are many large emission sources with significant differentiation of abatement costs. Transaction costs of participating in and regulating ETS tend to be relatively high, so usually they only cover large sources and firms.

ETSs appear less appropriate in the context of Morocco. The concentrated structure of energy market with the dominant role of ONEE and relatively few large industrial emitters suggest that an emissions trading system may not deliver its cost-saving potential and could be difficult to regulate. Emissions trading realizes its full potential when the market for emission allowances is deep and competitive, i.e. when there are many large polluters with diverse emission control measures and large differences in abatement costs. It is also important that these players compete on underlying product markets to prevent the risk of abuse of monopoly power on emissions trading market to increase barriers to entry for new local entrants and FDIs, so much needed to reinvigorate growth and productivity in Morocco.

One way to overcome the limitations of small size and concentrated nature of Morocco carbon market would be to link it with international carbon markets. Such international mechanisms, if designed as part of a coherent policy package, can support the implementation of domestic carbon pricing, increase efficiency and attract new financial resources to support domestic mitigation actions. The Paris Agreement allows for such linkages of domestic emissions systems, potentially entailing exchanges and trading of mitigation outcomes (Article 6). However, the transparency framework governing the international emissions trading under the Paris Agreement (the 'Paris Rulebook') has yet to be clarified. As a result, an international carbon markets, such as those that existed under the Kyoto Protocol, has yet to emerge, and it remains unclear how such mechanisms will work in practice. Therefore, international emissions trading has not been the focus of further analysis in this report.

One variation of emissions trading are emission reduction credits. They can be a complementary type of carbon pricing approach that attributes a carbon price to the reductions of GHG emissions ("credit") against a pre-established threshold (baseline) which can then be used to compensate for, or to offset, emissions made elsewhere. Crediting instrument can be used at the international level (as part of the

The discussion of possible options for environmental pricing in Morocco led to a conclusion that emissions trading may not be currently appropriate for Morocco, given the relatively few and concentrated players on the market. In these circumstances, environmental tax reform seems to be the realistic option for domestic environmental pricing, at least in the short-to medium term. Therefore, a more detailed analysis and macroeconomic modeling of impacts below is conducted for the EFR pathways only.

international cooperative approaches established by the Article 6 of the Paris Agreement) or at the domestic level. Crediting is most often used to provide additional flexibility to the emitters covered by the carbon tax or ETS to meet their emission liabilities. In the context of a national climate change strategy, the government may decide to implement and seek to (partially) finance mitigation in one or more target areas, e.g., identified in the NDC, through an international crediting approach. Emission reduction credits can also be combined with the emission tax, as in the case of Mexico.

Option II: New carbon or environmental taxes

Carbon or environmental taxes fix a price on emissions, either directly per unit of a specific pollutant emitted or indirectly by adjusting fuel taxes according to the carbon content of different fuels (see option III below). Carbon taxes can be attractive to Ministries of Finance due to their simplicity relative to emissions trading and ability to automatically consolidate revenue with the state budget. They also have the advantage of providing price certainty, allowing firms to incorporate carbon costs into their decision-making and investment choices with confidence and certainty, although are subject to political risk of policy reversal. As reaction of firms and households to price signals cannot be precisely predicted environmental taxes lead to less certain environmental outcomes than ETS or direct regulatory controls.

While several stakeholders in Morocco were interested in assessing the opportunities for new carbon tax, the dialogue with stakeholders led to the conclusion that the more pragmatic and efficient pathway towards environmental fiscal reform in Morocco could start from adjusting the rates and coverages of existing taxes and subsidies. They are discussed as option III below.

Option III: Adjusting rates of existing energy taxes and subsidies

The literature suggests that phasing-out fossil fuel subsidies is a natural starting point for EFR. Subsidy removal can contribute to reducing budget and current account deficits, improve energy security, and encourage industrial efficiency.[18] The subsidies can either be removed entirely or phased out gradually. A portion of fiscal savings can be used to fund a more cost-effective system that supports the outputs of targeted industries instead of their fuel inputs. Subsidy reforms can also contribute to social and poverty reduction objectives, e.g. when the portion of fiscal savings from reducing blanket fuel subsidies for all is used to provide targeted financial transfers to the poorest households or to increase financing for poverty-critical state services such as education, minimum incomes or infrastructure. Only if the removal of energy subsidies is not accompanied by the right policy packages, it may have unintended social and local environmental consequences, which need to be carefully managed.

Another simple and effective pathway to EFR is by adjusting the rates of existing fuel taxes – increasing tax burden on those fuels which lead to large social cost of health and environmental degradation and possibly decrease taxes on cleaner fuels. These price signals would encourage firms and households to use the cleaner fuels – supporting national objectives for health policy, transport policy, as well as energy security and energy transition. Such adjustments to existing tax rates can be implemented relatively easily by using existing tax administration systems to align fuel excise tax rates with their respective social costs.

[18] Pigato, M. A., Heine, D., Black, S., Coste, A., Cali, M., Cantore, N., … Antonio, M. (2019). *Fiscal Policies for Development and Climate Action*. (M. A. Pigato, Ed.). Washington DC: International Bank for Reconstruction and Development / The World Bank. https://doi.org/10.1596/978-1-4648-1358-0

In the Moroccan context, upstream taxes could be a desirable approach to implementing EFR. Revenues from these fuel taxes would furthermore be more easily collected than most other taxes, as fuel taxes in Morocco are collected "upstream" when they are imported or refined. Fuel taxes can be collected at the small number of points where the fuel enters the economy (pipelines, ports, mine mouths, or at the refinery level). From there, the price signal is passed through the whole economy without a need for tax administrations to directly interact with the much larger number of firms and households who consume emission-intensive fuels.

As discussed section B. Energy policy above, the current rates of taxes on fossil fuels use in Morocco are not necessarily aligned with the abovementioned energy policy objectives:

- VAT rate on fossil fuels is reduced to 10 percent, compared to 20 percent on most other goods;
- Fuels used for power generation are exempt from TIC, and TIC rates on coal and coke used by industry are lower than on heavy fuel oil;
- In transport gasoline is taxed 36% more than diesel.

B. Three Pathways for aligning existing energy taxes and subsidies with the social cost of using fuels

Three possible pathways for making relatively simple adjustments to Morocco's existing energy taxes and subsidies were identified through a dialogue with Moroccan stakeholders:

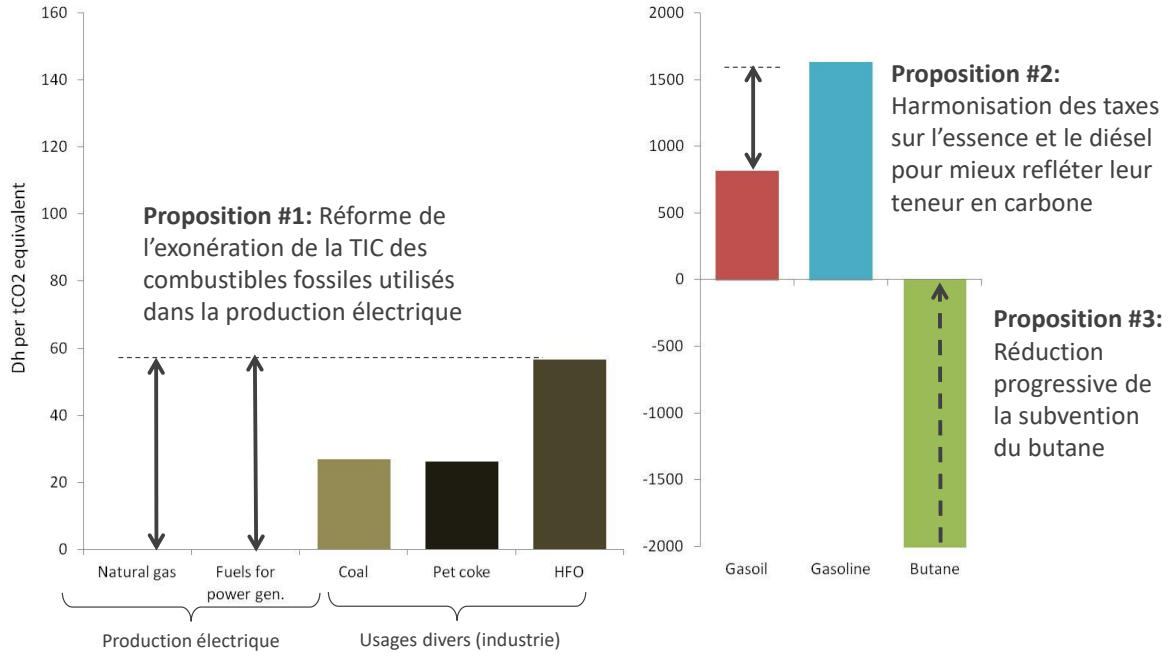
Pahtway 1. **Better alignment of TIC rates on fuels used in power generation and industry** with the cost of local air pollution and climate change.

Pahtway 2. **Better alignment of gasoline and diesel TIC rates** with (local and global) pollution costs of transport emissions; and,

Pahtway 3. **Phased removal of the butane subsidy**.

These proposed changes are illustrated, in a simplified manner, in Error! Not a valid bookmark self-reference. All the tax rates are expressed in Dirhams per ton of CO_2 equivalent relating them to the carbon content of fuels. A comparison is provided of one hand, for different fuels for the use in the power generation and other industrial usages; and on another side - for petrol versus diesel, and the butane subsidy.

Figure 10: Options to better align combined fuel tax rates and subsides to their carbon content



Source: authors' estimates.

Note: this figure doesn't reflect other important impacts of fuel combustion related to the environmental, social and economic cost of local pollution.

Pathway 1: Adjusting TIC rates for fuels used in power generation and industry

This pathway could involve reducing tax expenditures discussed above to align TIC rates of fuels used in power generation and industry with the social cost of local and global pollution. More specifically this could take a form of the following reforms:

- Increasing the rates of TIC on coal used for electricity generation to the levels paid for heavy fuel oil by industry or even above, given higher environmental social cost of burning coal;
- Increasing the rates of TIC for gas to roughly 50 percent of those established for coal;
- Increasing the current TIC rate on coal and petroleum coke used by industry to the tax level on heavy fuel oil, or even above, given higher environmental social cost of burning coal and low-grade petcoke. The latter can have very high content of sulphur and heavy metals and releases up to 10% more CO_2 per unit of energy that normal coal.

These tax reforms would help achieve several energy and industrial strategy objectives, highlighted in the previous chapter, such as improved efficiency and productivity, reduced reliance on imported fossil fuels and enhanced penetration of renewable energy in the poser mix.

Some of the intended side effects would need to be managed by complementary policy interventions. The first is the impact on end-user electricity tariffs. They would initially increase, but this increase would likely be small and would further diminish over time as the carbon intensity of grid electricity declines as an effect of tax adjustments. The second impact is on ONEE financial position. Phasing out of implicit subsidies to coal, oil and gas used by L'ONEE own plants and IPPs would increase the costs of power

generation from thermal power plants and would require either adjustments of consumers' tariffs to enhance ONEE revenues or explicit fiscal transfers under public service contract, or accelerated switch to renewables, with the support of international climate finance.

Most importantly the net increase of the government revenues due to the removal of tax expenditures on fossil fuels would enable implementation of several complementary measures that would mitigate the unwanted side-effects of such environmental fiscal reform. Additional revenues can be recycled to the Moroccan economy through complementary polices in the other parts of the fiscal system. The opportunities of revenue recycling identified as potentially attractive in Morocco include:

1. **Reducing income taxes for poor households or SMEs**. Such tax shifts would reduce the overall burden of the tax system to administration and society.
    a. *Tax administration would benefit* because smaller number of taxable units would release some time and resources for tax administrators currently tied up with auditing of the large proportion of Morocco's population whose income and tax returns are very low. The upstream taxation of fuels (through TIC) requires comparatively little administrative capacity, given that is requires the supervision of only a small number of points at which fuel enters the economy. Upstream fuel taxes are also more difficult to evade by tax-payers than income tax or VAT[19], so the costs of tax policing would also decline.
    b. *Taxpayers would benefit* due to the lower cost of tax compliance. Reduction in the taxation of low-earning workers and SMEs could be made by either reducing nominal tax rates (for example for bottom 40 percent of earners) or by increasing the threshold from which income becomes taxable. The second option has the advantage that it could also help Morocco reduce its tax system's overall burden on society. This is because, as a general rule, the marginal compliance costs for taxpayers fall in the size of income, for instance due to the existence of fixed costs in filling tax declarations. For the lowest-earning workers and small businesses, the costs for complying with the tax system are hence disproportionately large. By contrast, the upstream purchasers of fuel are large companies which routinely engage in these transactions and can therefore manage the tax compliance at much lower cost. The reform would hence reduce the transaction costs of the tax compliance for exactly that section of the population that suffers most from it.

2. **Consolidating budget.** This could help Morocco narrow the budget deficit and help achieve government's fiscal consolidation goals. This could reduce the pressure to sell state assets when urgently needed to patch current fiscal shortfalls and give more space for more strategic approach to privatization.

3. **Reducing tax burden on business in a way that helps stimulate economic competitiveness**. This could include reduction of corporate income taxes or employers' social security contributions. Firms would face weaker incentives to hide profits and stronger incentives to increase productivity (energy efficiency) due to the efficient price signals.

[19] Liu, Antung. 2013. "Tax Evasion and Optimal Environmental Taxes." *Journal of Environmental Economics and Management* 66 (3):656–70. https://doi.org/10.1016/j.jeem.2013.06.004

4. **Compensating poor and vulnerable households and companies for energy cost increase through targeted social transfers.** A portion of additional revenues can be used to provide support to impacted industries and households, while encouraging them to use fuels more efficiently and reduce total energy bill for themselves and for the country. Since such transfers are much better targeted at reaching low-income and vulnerable households than the suppression of fuel prices for all users, Morocco could achieve both budget consolidation and greater social equity at the same time. To determine the optimal shares of revenues that could be used for compensation versus budget consolidation, and to determine the optimal type of compensations, further impact assessment and political debate by the involved ministries, industries and other stakeholders is needed.

Even if EFR design does not increase Morocco's overall tax take, the shifts of tax burden from poor household to wholesale buyers would reduce the burden of the tax system for society and for fiscal administration and release its human resources to intensify enforcement of tax law, where it really matters, i.e. for large enterprises, bulk transactions and wealthier households. An EFR could also benefit the poor, while supporting Morocco's objectives of increasing the size of the formal sector, and strengthening its tax collection capacity

Pathway 2: Rebalancing petrol and diesel TIC rates

Currently in Morocco the TIC rates for petrol (essence/gasoline) are higher than for diesel (gasoil) (Table 1; Figure 10). This tax differentiation promotes the purchase and use of diesel-fueled vehicles and may be misaligned with the aim to reduce health impact of particulate emissions and NOx from transport in urban areas in Morocco. Therefore, the government may consider reduction or elimination of this tax wedge.

Alignment of TIC rates with the social cost of fuels used in transport could involve rebalancing between gasoline and diesel TIC rates in a revenue neutral or revenue enhancing way. The revenue neutral rebalancing would imply increasing the tax rate on diesel while reducing the rate for petrol. In the revenue enhancing EFR the overall TIC take from transport fuels would be increased mainly due to higher diesel taxes and additional revenues can be used for fiscal consolidation or supporting poor households and formal employment, just as the increased TIC in power generation. Policy reform in the Moroccan transport sector that promotes the use of new, efficient and low-polluting vehicles is consistent with the development of the automotive industry, which is one of the key pillars of industrial policy in Morocco.

Morocco is not unique having higher excise taxes on diesel than on petrol. Many countries have such a tax structure because diesel is widely used in freight transport and commerce, including smaller trucks used by small and medium size enterprises. Therefore, keeping excise tax rates for diesel fuel low has historically been used to contain the costs (effectively subsidizing) of commercial transport. Furthermore, the technology progress with diesel engines is making their most modern classes more efficient and less polluting.

Diesel cars often cause higher local pollution damage than petrol cars with catalytic converters, mainly due to higher emissions of solid particles and NOXs per vehicle kilometer. Therefore, several large cities, such as Paris, Madrid, Athens, and Mexico City have announced plans to ban diesel cars in the urban areas. With respect to global pollution of GHG, modern diesel cars are typically slightly "cleaner". Although a liter of diesel contains slightly more carbon than petrol, this is more than offset by the fact that diesel fuel contains more energy per liter and diesel engines are more efficient than petrol engines. Yet, the recent innovations in petrol-fueled internal combustion engines make them almost as thermally efficient as diesel

Increasing TIC rate on diesel would slow-down imports of old inefficient vehicles from Europe, encourage higher turnover of vehicle fleet, and switch to more efficient diesel cars or to petrol cars. With potentially increased revenue support for small businesses may be better targeted than with subsidizing everybody's transport cost.

The local environmental benefits of such tax shift would need to be studied for each urban area to better understand local air-shed conditions and exposure of population. Global environmental benefits may neither be significant if at all. Further analysis would also need to include social and economic consequences, including to small and medium size enterprises.

Further analysis would be needed to design a comprehensive package of price-based and complementary administrative instruments of controlling local emissions from diesel cars, such as stricter emission standards with effective inspection and enforcement, physical restrictions from using old diesel vehicles in certain areas or fiscal support measures in the automobile sector such as the planned bonus-malus system to promote accelerated transition toward more efficient cars.

Pathway 3: Phasing down the remaining butane subsidy

Subsidizing the use of bottled butane gas primarily in households is the last remaining large explicit fiscal transfer in the energy sector in Morocco. It was introduced partly as a social protection measure to facilitate access of poor households to low cost energy for hot water and cooking, and partly to divert rural households from using fuel wood and charcoal, thus preventing deforestation. As discussed above, the total impact of subsidies removal on households was estimated at 11.8 billion dirhams in 2014 (see Table 2). In terms of household welfare (see column "Butane subsidy perceived" in Table 2), the elimination of subsidies would reduce the welfare by an average of 2 percent. This direct impact on welfare would be more than three times as large for the poorest quintile (4 percent) compared to the richest quintile of the population (1.3 percent) (see Table 2).

The final social and environmental impact will depend on the available substitutes – their availability, cost, local environmental impact on health, indirect impact on forests and the carbon footprint. Besides coal, fuel wood and charcoal, the other potential substitutes for butane use in households include electricity and solar water heaters. Electricity has a big advantage of convenience and no local pollution; however it may be costly, and thus bring back the pressure on deforestation.

For the hot water preparation (21 percent of use), solar water heaters can be a substitute for butane, while replacing butane as a cooking fuel (78 percent of use of bottled gas) would remain a challenge. The advantage of solar water heaters is that once installed they have zero operational costs, so they

remove pressure on deforestation even more effectively than butane. Another benefit of solar water heaters is that they can be produced locally, therefore creating jobs in Morocco. The limitations of solar water heaters is that they cannot be the energy source for cooking.

The NDC identifies the creation of the national solar water heaters capacities (to reach 1,700,000 m^2 by 2030) as one of the priority actions (conditional to the international support). The SIE is considering a program of support for local manufacturing of solar water heaters (at the moment all are imported and quite expensive), but competition from subsidized butane is a big impediment to the commercial viability of this program. The removal or reduction of butane subsidies would also help invigorate such programs as PROMASOL.

The GHG emissions impact of butane subsidy phase out would be modest. According to the sectoral modeling conducted in the other WBG supported project[20] the removal of butane subsidy would reduce annual energy consumption in the building sector by 0.5 TWh in 2030, which corresponds to less than 1 percent of the of final energy demand by buildings expected in this year. GHG emission reduction benefits, hence contribution to NDC implementation would also be relatively small – 200 $ktCO_2e$ avoided per year in 2030, or about 3 percent only as compared to the emission reductions that would be achieved in the scenario that assumes a pure continuation of the current policies in the building sector (*status quo*). This is also due to the fact that large share of coal and oil in power generation makes the carbon footprint of grid electricity similar to gas.

Thus, the main rationale for the butane subsidy removal seems to be fiscal and economic, rather than environmental. At the same time, considering a social sensitivity of the phasing out butane subsidy (in particular, through its potential impact on poor households), a detailed impact assessment will need to consider all the above social, economic, local, and global environmental considerations.

C. Learning from international experience

There is a growing body of international experience with EFR, especially those which include carbon pricing. Over sixty national and sub-national governments have implemented or plan to implement carbon pricing in the form of *carbon taxes or emissions trading* systems worldwide, currently covering thirteen per cent of global emissions.[21]

Since 2010, over forty countries worldwide have implemented far-reaching energy and fuel pricing reforms. Notable examples which could be especially informative for Morocco include reforms in Chile, South Africa, Mexico, Iran, and Turkey (outlined in 'Annex 2. International experiences – brief case studies'), in addition to reforms in US and Canadian states, Germany, Indonesia, and Jordan. This growing scope and coverage of carbon pricing schemes provides wealth of knowledge and experience on ways of possible appropriate design, implementation and building acceptance for the domestic carbon pricing instruments.

[20] WB (forthcoming), *Comment aligner la perspective des investisseurs avec les objectifs de l'efficacité énergétique dans le secteur du Bâtiment*, 2018.

[21] World Bank State and Trends of Carbon Pricing Report, 2016.

Several observations flow from these experiences which could be relevant for Morocco:

- **Careful planning and smart design**. Successful carbon pricing systems were usually prepared carefully with prior impact and feasibility studies followed by detailed design options, legal work and gradual implementation stretching between 2-5 years.

- **Stakeholder engagement and communication.** Successful policy implementation will require building support for reform, both internally within the government and agencies and externally with a broader set of stakeholders. International experience shows that changes to energy tax and price support systems, including the introduction of new environmental taxes and charges, can face political opposition and public concerns, although they can also be introduced with strong public support and acceptance of affected entities. Stakeholder engagement should result in design and implementation of the measures to mitigate potential important adverse impacts on competitiveness of exposed industries, as well as on low income and vulnerable groups. Gradually phasing in tax rates and signaling tax increases well in advance help manage cost impacts, allow industries to adjust to carbon pricing and *plan for low carbon investment (Sweden, British Columbia, Japan).*

- ***Use of revenues.*** There is a broad experience of using carbon pricing revenues to reduce other taxes on economic "goods", such as income, reduce deficit, or earmark revenues to alleviate poverty, support innovation or reduce emissions. Mexico has used the revenue gains from its subsidy reform and its carbon tax to create an efficient cash-transfer scheme to directly support poor households' incomes instead of trying to indirectly supporting them through low fuel costs. Iran used half of its revenue gains from increasing fuel prices by over 2000% to effectively pay citizen's a minimum income (see Annex). This contributed to a poverty rate decrease, and to a drastic reduction of income inequality,[1] whilst also improving efficiency and diversification of the economy. In Turkey (see Annex) and Jordan, reforms to fuel taxes and electricity tariffs respectively decisively helped stem budget consolidation needs. The United Kingdom, British Columbia, Finland, Sweden and Germany instead used revenues to lower the tax burdens on employment and businesses.

- ***Packaging reforms and serving multiple objectives.*** The examples of Chile, Mexico and Sweden demonstrate the benefits of combining the carbon pricing systems within an integrated package of reform measures to meet several fiscal, energy, social and environmental policy goals jointly. The most successful and the most acceptable carbon pricing systems were prepared and presented as integrated part of broader policy reforms.

- ***Pricing carbon through fuel taxes***. Japan and Mexico examples show the simplest and quickest approach to carbon pricing which is building on existing fiscal arrangements such as fuel taxes.

V. Analyzing impacts of options: a CGE model of EFR in Morocco

Rigorous quantitative analysis is needed to understand how policy interventions like EFR affect economic output, employment, disposable income, and pollution in Morocco. There are several ways to assess these effects. Of these, the most common quantitative approach to ex ante analysis of EFR is the use of computable general equilibrium (CGE) models.

This section introduces a CGE model for Morocco. The CGE model was constructed by the MoF with input from the World Bank and was used to analyze a number of different options for EFR in Morocco. The CGE model was set up to reflect the economic structure of the economy in 2013. This was the latest year for complete data available at the time of running the model. The 2013 economic and trade structure (shown in Figure 6 and Figure 7) and fossil fuel consumption by households and economic sectors were used to calibrate the CGE model's Social Accounting Matrix (SAM) for Morocco.

Overall, based on the outcomes of the stakeholders' consultation on the most relevant scenarios for an ERF, adjustments to TIC rates, phased butane subsidy removal, and carbon taxation, and different combinations of these policies alongside various expenditure policies were analyzed and tested using the CGE model.

A. Policy scenarios and revenue recycling methods

As discussed in section IV, initial assessment conducted by the World Bank together with national experts suggests that with relatively simple and quick modifications, EFRs could be designed and implemented through Morocco's existing fuel tax system.

The most environmentally effective, fiscally efficient and simple to implement changes to the existing fuel tax system identified were:

- Removal of the remaining butane subsidy;
- Better alignment of TIC rates for with the social cost of local pollution and carbon content of fuels used in power generation (coal and gas);
- Better alignment of gasoline and diesel TIC rates with local and global pollution costs of transport emissions;
- Carbon taxes which apply a uniform tax across fossil fuels in proportion to their carbon content; and
- Combinations of the above reforms.

These potential policy changes were further refined into **seven 'tax policy scenarios'** for analysis**:**

1. Removal of the 50% LPG subsidy
2. Setting TIC for coal and gas at 15% ('C&G')
3. Setting TIC for diesel 10% higher than for gas ('Dies.')
4. The above three reforms combined ('Fuels')

5. A low carbon tax of MAD100 p/tCO_2e[22] ('C100')
6. Comprehensive reform (all the above reforms combined)
7. A moderate[23] carbon tax of MAD300 p/CO_2e

These scenarios represent a variety of potential tax bases that an EFR in Morocco could target. However, tax policy is only one side of the equation for EFR: the choice of how to allocate revenues is critical to determining overall effects (Goulder and Parry 2008). The scenarios were further based depending on how revenues (additional tax revenues from raising new or existing taxes, plus revenue gains from reductions of subsidies) from the reform are allocated.

Five 'revenue recycling' methods were therefore also analyzed, with their relative expected merits as follows:

- **Reduced capital taxes ('K')** - using revenues raised from the above scenarios to reduce corporate tax rates in a revenue-neutral manner can encourage firm investments, including in R&D;
- **Increased public investment ('I')** - increasing public investment in infrastructure, such as roads, can help raise productivity and economic output;
- **Export subsidies ('X')** - providing direct grants, rebates, and other forms of subsidization to encourage exports can improve the competitiveness of exporting firms, improving the trade balance;
- **Lump-sum rebates to households ('HH')** - providing direct transfers to households may more-than compensate for any losses from increased taxation, providing additional disposable income to households in a distributionally-progressive manner; and
- **Reduced labor taxes ('L')** - reducing the labor tax wedge (e.g. firm and worker social security contributions and income tax rates) can encourage employment and investments in human capital.

The combination of tax/subsidy policy change and expenditure allocation is the core of all environmental fiscal reforms. The above scenarios and revenue recycling methods were analyzed using the CGE model, to yield numerous estimates of, *inter alia*, effects on output, disposable income, and CO_2 emissions, with results described hereafter.[24]

B. Limitations of the CGE model in capturing the impacts of EFR scenarios

Before analyzing the results, there are a number of substantive limitations, weaknesses, and uncertainties of this CGE modelling exercise which warrant highlighting. Notably, the data used to

[22] 'per tonne of carbon dioxide equivalent'

[23] In this note, 'low' and 'moderate' are defined in reference to recent literature on optimal carbon pricing levels. Stiglitz et al., for instance. find that lower-bound estimates of the needed global carbon price consistent with cost-effectively achieving the Paris Agreement is US$40 to 80/t$CO_2$ (per tonne of CO_2) by 2020 and US$50 to 100/t$CO_2$ by 2030 (Stiglitz et al. 2017). Carbon taxes analyzed here (MAD100 and MAD300) correspond to about US$11 and US$32, and so are hereafter referred to as 'low' and 'moderate' carbon tax levels.

[24] Where scenarios are compared against each other (e.g. to understand relative effects on fossil fuels), the analysis generally assumes recycling via increased public investment ('I'). Where revenue recycling methods are compared against each other, the 50% LPG subsidy removal scenario (S1) has been assumed.

calibrate the model is old: sectoral shares, emissions, and other structural factors are modelled based on Morocco's economy in 2013. Since then, numerous reforms including to fossil fuel subsidies have already helped shift Morocco's economy to a more sustainable pathway. Further CGE analysis is therefore required, incorporating a more up-to-date snapshot of the Moroccan economy.

However, there are other limitations of the model beyond the data. There are weaknesses in estimates of economic activity and international trade effects which are common to most CGE models. In addition, the analysis has not attempted to estimate effects on household distribution and on 'development co-benefits'. Neither are easy to estimate, but both are crucial to assessing the desirability and feasibility of various EFR designs in Morocco. These limitations necessarily entail caveats to the findings.

Economic activity

There are weaknesses in the CGE model's ability to predict the effects of the EFRs proposed on measures of economic activity. A large number of issues have been identified with the use of CGE modelling for EFR specifically for developing countries (World Bank , forthcoming).

For example, for revenue-neutral EFRs (where revenues are recycled through reduction in other taxes), the net effect on output is determined by the balance between two opposing effects. Firstly, the 'tax interaction effect' means an increase in the price level tends to reduce real output. However, secondly, the 'revenue recycling effect', whereby a reduction in taxes which are more economically distortionary (such as labor or capital taxes), has the potential to reduce the net economic costs of the tax system (Goulder and Parry 2008).

However, interactions between the formal and informal sector are a major source of uncertainty. A large informal sector is known to be economically costly by reducing innovation, investments in human capital, and, by lowering the tax base for labor and capital taxes, further increase the overall costs ('excess burden') of the tax system. A revenue-neutral EFR can reduce the relative size of the informal sector by reducing the opportunity costs of participation in the formal sector (reduce labor taxes for employees or reduced capital taxes for firms).

As a result, a country with a large informal sector, such as Morocco, could reap additional economic benefits from EFR. Morocco's informal sector accounts for a large and growing share of employment. The informal sector is estimated to account for 15 percent of total economic activity and 22 percent of total employment, with more than two thirds of both being concentrated in the services sector (IMF 2017). The government is seeking to combat informality and integrate workers into the formal economy.

By raising participation in the formal sector, revenue-neutral EFR could help raise economic activity in Morocco more than results of the model in this report imply. However, this dynamic is difficult to model and so is rarely accounted for by most CGE models, including the one used in this study. In addition, informal-formal sector interactions are only one channel through which EFR is more likely to positively affect economic activity than the CGE model used here implies. But there are others, such as inducing technological innovation and encouraging entrepreneurial activities among firms (World Bank, forthcoming). These channels are others pervasive uncertainties that affect most CGE models. Their net effect, however, is likely to be that estimates of models understate positive effects (or overstate negative effects) of EFRs on economic activity.

International trade and competitiveness effects

Most of the scenarios and recycling methods appear to have small to moderate negative effects on trade in Morocco (Figure 18). However, such negative effects on competitiveness may not bear out in reality. For instance, there is recent empirical evidence that EFRs, including those which do not include export subsidies, can in fact increase international competitiveness and therefore trade (World Bank, forthcoming).

The idea that environmental policies can have positive effects on firm competitiveness is known as the 'Porter hypothesis'. Such policies can, for instance, induce firms to make investments in innovations or diffusion of existing technologies which improve energy efficiency. These investments could provide cost savings which more than compensate for the costs of increased input prices. There is recent evidence supporting this hypothesis. A forthcoming World Bank report, for instance, uses firm-level statistical analysis to show that EFRs in Indonesia and Mexico increase firm productivity (World Bank, forthcoming). In both countries, rising gas (but not electricity) prices tended to force firms to make investments in energy-efficiency, which tended to raise productivity.

There are other reasons beyond energy efficiency investments to suspect the hypothesis that trade effects in the long-run may not be negative. It should also be noted that price is not the only - or even most important - factor by which firms compete internationally. But, it is the only factor which can be considered by the CGE model as constructed. In addition, though effects on trade in most cases are estimated to be slightly negative, effects will vary significantly at the level of sectors. For instance, while exports of energy-intensive sectors such as the petroleum refining industry are likely to be negatively affected, non-energy intensive sectors such as services could gain overall, for instance through capital tax cuts or improvements public infrastructure financing by environmental tax revenues.

Another consideration for policymakers, linked to trade, is the effect of EFR on international competitiveness. By increasing input costs for energy-intensive exporting or import-competing industries, fossil fuel subsidy reform and environmental taxation has the potential put some domestic firms at a competitive disadvantage. Higher energy prices could make it harder for domestic firms to compete in both foreign and domestic markets, especially in energy-intensive tradable sectors.

However, there are also reasons to suspect that environmental taxes may not harm competitiveness in aggregate. Energy represents a relatively small share of production costs in most industries. Energy-intensive firms may be able to deal with cost increases by substituting inputs, seeking efficiency gains, or innovating. Cost is also just one of several dimensions on which firms compete, although it is key for commodity producers. Moreover, impacts are unlikely to be uniform and competitiveness losses for some types of firms or sectors may be more than offset by gains in others.

That said, though competitiveness effects of EFR are not necessarily negative in general, policymakers may seek to protect affected firms, for instance to maximize political support among industry for reform. **Though this note includes some preliminary analysis of likely trade effects, it has not sought to analyze the overall effects on firm competitiveness, or policies that seek to protect affected firms in Morocco.**

Lastly, there may be other gains to the external position not well reflected in the existing CGE model. For instance, by raising energy efficiency among firms and households, economies tend to consume less fossil fuels. As a result, net energy importing countries like Morocco tend to become more energy self-

sufficient over time, shielding them from external shocks to global energy prices. This improvement in macroeconomic stability may partially or fully offset negative trade effects, should there be any.

Nonetheless, most existing CGE models tend to show small to moderate negative trade effects of EFR. Given the importance of trade to Morocco's development plans, future augmented analyses should pay close attention to estimated trade effects of EFR for Morocco, considering gains and losses for sectors and other benefits to Morocco's external position.

Distributional and poverty effects

In general, under certain conditions, environmental taxation can have regressive effects on income distribution. For fossil fuel subsidies, a clear majority of the benefits accrue to the wealthiest members of society (in the form of consuming subsidized fuel). As a result, removing these subsidies and implementing carbon taxes are likely to disproportionately affect the wealthy. But, while wealthier households are likely to bear a larger absolute portion of the burden of environmental taxation, in certain circumstances, the poor may be more affected relative to their own income. For instance, many studies in developed countries, in particular for North America, have found environmental taxation negatively affects the incomes of poorer households relatively more than wealthier households as a proportion of income (OECD 2006).

However, outside of developed countries the reality is complex. The effects of environmental taxation on equity across households and generations will vary across countries and tax types. A number of contextual factors determine whether environmental taxes are distributionally progressive or regressive. In lower- and middle-income countries a number of these factors tend to be skewed towards progressive distributional effects. This includes: development levels, demand responses, distribution of capital ownership, industrial structure, distribution of averted damages and development co-benefits. For example, poorer households in poorer countries tend to spend a lower portion of income on polluting goods than poorer households in wealthy countries. As a result, fuel and coal taxes are likely to have progressive effects (Parry, Mylonas, and Vernon 2017). In addition, the choice of tax bases and revenue usage strongly affects distributional outcomes.

However, even where environmental taxes are likely to be progressive, targeted compensation may still be needed to protect the incomes of poorest. While the burden of taxation may be progressive, without appropriate expenditure policies, this can still entail net income losses for the poorest. As a result, poverty could still rise. Without supplementary policies to compensate low-households, environmental taxes can negatively affect a government's equity objectives. This compensation could be funneled through a variety of instruments, such as lump-sum transfers, reduced labor taxes, targeted cash transfers, or minimum basic incomes.

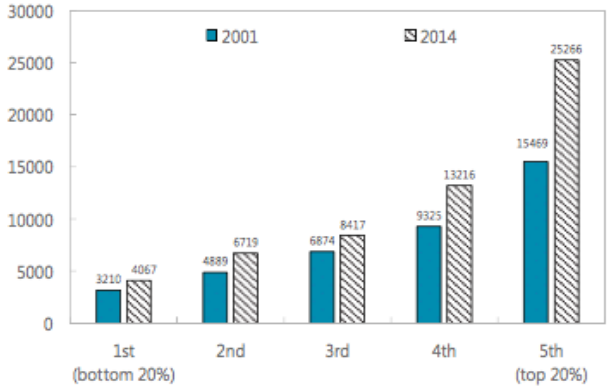
Fortunately, a small portion of revenues may be needed to compensate low-income groups. In Europe and the USA, less than 12% of the tax revenues would be sufficient to compensate the 20% poorest for the distributional impacts of a broad-based carbon tax (Dinan 2015; Vivid Economics 2012).[25] In lower-

[25] Vivid Economics (2012) find that compensating the lowest 20 percent of households would require at least 6% of environmental revenues in Hungary, 7% in Spain, and 8% in Poland. Dinan finds that compensating the first 20 percent in the USA would cost 12% of revenues, while compensating the next 20% of poor households require 27% of revenues (2015).

and middle-income countries, where environmental taxes are more likely to be progressive, revenues required for compensation may even less.

In Morocco's context, transfers beyond mere compensation may be highly desirable from an equity perspective. Morocco's public transfers have expanded in recent years, but they remain poorly targeted (Figure 11). The share of households receiving public transfers rose from 10.8 percent in 2001 to 22.9 percent in 2014 (IMF 2017). However, only 8.9% of households in the bottom quintile receive public transfers. By comparison, 40.2 percent of households in the top quintile were covered by public transfers, receiving about six times more on average than households in the bottom quintile (Figure 11). Lump-sum transfers or targeted transfers to low-income households of environmental revenues could help improve overall targeting of public transfers in Morocco.

Figure 11. Public transfers by income quartile in Morocco, 2001 and 2014 (in Moroccan dirhams)



Source: IMF (2017) and Haut-Commissariat au Plan.

To properly assess EFR in Morocco's context, further analysis is needed of distributional effects by design choice. In certain circumstances, compensatory mechanisms may need to be designed and implemented. **Though this note has outlined some of the key factors, it does not analyze distributional effects or compensatory mechanisms for Morocco.**

Development co-benefits

Lastly, and perhaps most importantly, the CGE model used does not fully incorporate 'development co-benefits'. These are the effects of EFR on non-economic, non-climate measures of wellbeing, such as human health. Most technical analyses of EFR tend to focus on effects on economic output, employment and emissions. However, the effects of EFR on human wellbeing extend beyond these two domains. In addition to cutting greenhouse gases by disincentivizing polluting activities and potentially raising economic activity by reducing distortions of the tax system or raising formal sector activity, EFR can also raise other measures of human wellbeing.

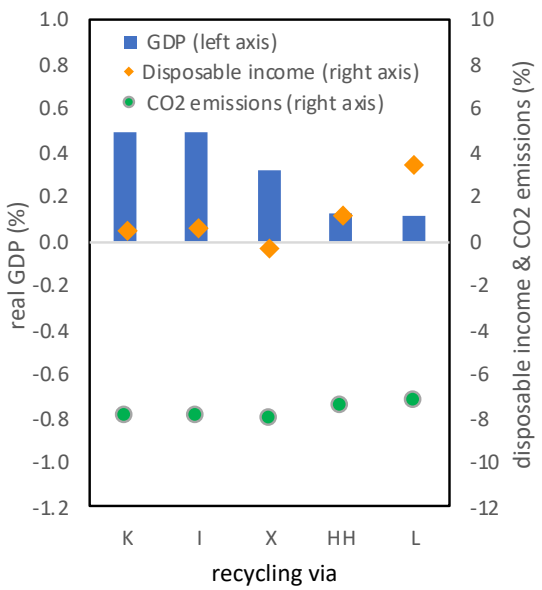
C. Scenario 1 - 50% LPG subsidy removal

The first scenario analyzed was removing the remaining 50% subsidy on LPG. Effects were estimated for five different types of revenue recycling: reducing capital taxes (K), increasing public investment (I), providing subsidies for exports (X), transferring to households via lump-sum rebates (HH), and reducing labor taxes (L).

Removing the LPG subsidy has a positive effect on GDP, irrespective of recycling type (between 0.12 percent and 0.49 percent of real GDP). This underpins just how economically distortionary fossil fuel subsidies can be, even in Morocco's context of having reformed most other subsidies.

Of the five recycling schemes, reductions in capital taxes, increases in public investment, and export subsidies are expected to have the strongest effects on output. In addition, these three expenditure approaches have the strongest effects on reducing CO_2 emissions (8 percent reduction against the baseline of no policy change).

Figure 12. Effects of 50% LPG subsidy removal, by revenue recycling type



Source: Ministère de l'Economie et des Finances & authors. K = reduction in capital taxes, I = increased public investment, X = export subsidies, HH = household rebates; L = reduction in labor taxes.

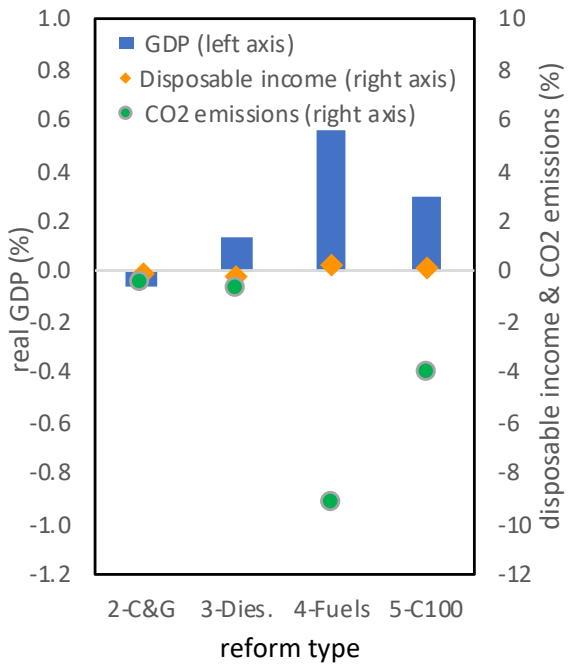
In addition, all expenditure choices (except export subsidies which have result in a small decrease) are expected to increase household disposable income. Recycling through a reduction in labor taxes is estimated to most strongly increase disposable income (3.4 percent), followed by lump-sum rebates to households (1.2 percent). That reducing labor taxes yields stronger positive effects on disposable income than rebating directly to households, underpins the importance of the taxation system's impact on incentives. In this case, reductions in the tax wedge on labor, and corresponding effects on labor supply and demand, result in greater positive effects on household income than merely transferring funds to households; a finding that is consistent across scenarios.

That said, as with this and other scenarios, there will be varying distributional consequences for each of these policies no reflected in Figure 12. Lump-sum transfers may increase output and disposable income more than lump-sum rebates, for instance, but lump-sum transfers tend to be more distributionally progressive. At the extreme, capital tax reductions tend to be among the most effective at raising output but are well-known to be the most distributionally regressive. All interpretations of effects on output and disposable income across the scenarios must be caveated with the point that they are mere parts of a complex and incomplete story.

D. Scenarios 2 to 5 - various fuel reforms (LPG subsidy; diesel, coal and gas TICs; low carbon tax)

Scenarios 2 to 5 focus on other fuel tax reforms: setting TIC for coal and gas at 15 percent ('2-C&G'); setting TIC for diesel 10 percent higher than for gas ('3-Dies.'); a combination of the previous two reforms plus removing the 50 percent LPG subsidy ('4-Fuels'); and a low carbon tax, set at MAD100 p/tCO_2e ('5-C100'). For ease of comparison across policies, each of these scenarios assume that revenues used to fund increased public investment, which had the strongest positive effects on output and disposable income in Scenario 1 (Figure 12).

Figure 13. Various fuel reform estimates (Scenarios 2-5; assumes revenues are recycled via increased public investment)



Source: Ministère de l'Economie et des Finances & authors. LPG = 50% LPG subsidy removal; C&G = 15% TIC on Coal & Gas, Dies. = Diesel TIC 10% higher than petrol TIC, Fuels = combination of three policies on fuels (50% LPG subsidy removal, 15% TIC on coal and gas, and TIC 10% higher for diesel than petrol), C100 = carbon tax at MAD100p/tCO2e.

Scenarios 2 and 3 have little impact on measures of interest (Figure 13). Setting the coal and gas TIC at 15 percent is expected to have negligible effects on output (-0.1 percent) , disposable income (-0.1 percent) , and emissions (-0.6 percent). Setting the TIC for diesel to be 10 percent higher than gas has slightly stronger effects on output (0.1 percent), disposable income (-0.3 percent), and emissions (-0.8 percent).

Scenario 4, which combines Scenarios 1 to 3, has a stronger effect on output (0.6 percent), disposable income (0.2 percent), and emissions (-9.2 percent). However, results for Scenarios 4 are not significantly dissimilar to simply reforming the LPG subsidy and recycling through investment (second item from the left in Figure 12). This shows the importance of reforming LPG subsidy, relative to tweaks in TIC on other coal, gas, petroleum, and diesel. **LPG subsidy removal remains the most important of the potential fossil fuel reforms under consideration.**

Scenario 5, a low carbon tax, has more moderate effects. It raises output slightly (0.3 percent), cuts emissions moderately (-4.1 percent), and has negligible effects on disposable income (0.1 percent). This shows that carbon taxes can have similar effects to ad hoc tweaks to fossil fuel taxes and subsidies, but the strength depends critically on the carbon tax level (refer to Scenario 7 below).

E. Scenario 6 - 'comprehensive reform' (various fuel reforms plus MAD100 carbon tax)

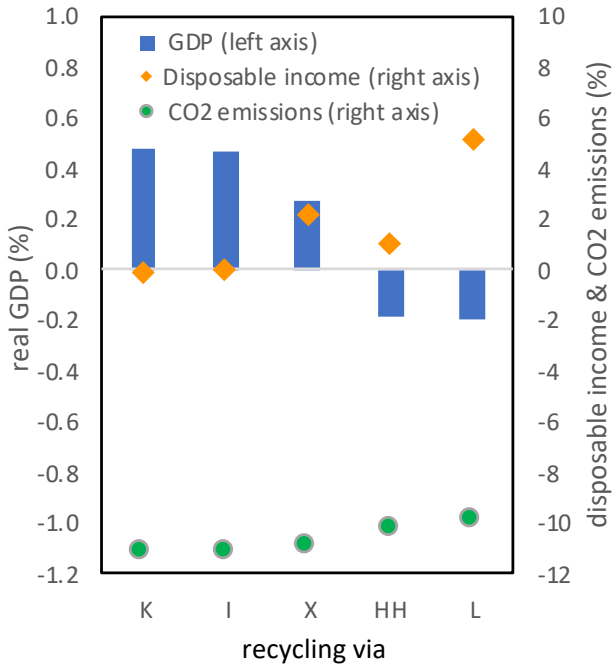
Scenario 6 is a comprehensive reform package. It combines the various fossil fuel reforms with the low carbon tax described above into one package (Scenarios 1 to 5). Effects are then compared across the five types of revenue recycling methods discussed above.

This reform has the strongest estimated effects overall on emissions. Comprehensive reform also has a stronger effect on emissions than LPG subsidy removal alone, without negatively affecting output and disposable income (Scenario 1).

Effects on disposable income and output vary with revenue use. CO_2 emissions decline by between 9.9 percent and 11.2 percent across revenue recycling types. Recycling revenues through capital tax reductions both increase public investment increase GDP strongly (0.5 percent) with negligible effects on disposable income. Export subsidies raise both GDP and disposable income moderately.

By contrast, recycling through household lump-sum transfers and reduced labor taxes are both expected to reduce GDP by 0.2 percent. In this case, the tax interaction effect (effect of tax wedge on increasing prices) dominates the revenue recycling effect (positive economic effects of revenue use).

Figure 14. Comprehensive reform (LPG subsidy removal; coal, gas, & diesel TIC reform; MAD100 carbon tax), by revenue recycling type



Source: Ministère de l'Economie et des Finances & authors. K = reduction in capital taxes, I = increased public investment, X = export subsidies, HH = household rebates; L = reduction in labor taxes.

So, while in both cases households receive a boost in terms of disposable income, aggregate economic activity declines. However, as with all the results for scenarios and revenue recycling methods, there are number of important caveats to this analysis (refer to 'Limitations of the CGE model' section above).

F. Scenario 7 - moderate carbon tax (MAD300)

The final Scenario analyzed using the model considers a moderate carbon tax of MAD300/tCO_2e.

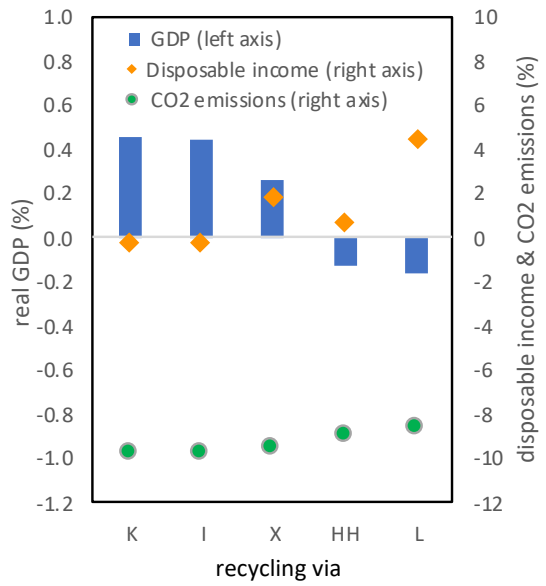
Similar to the comprehensive reform (Scenario 6), a moderate carbon tax would have very similar effects to a comprehensive reform package (Figure 15). Recycling through capital taxes and investment, for instance, has strong positive effects (0.5 percent and 0.4 percent); recycling through export subsidies has more moderate positive effects (0.3 percent); and household recycling has some negative effects on GDP (-0.1 percent for household transfers and -0.2 percent for labor taxes).

Similarly, effects on disposable income are negligible for the first two methods, weakly positive for export subsidies and household transfers, and strongly positive for labor tax reductions. Lastly, emissions reductions are strong across the board, and are similar to the comprehensive approach.

However, carbon tax rates are crucial for determining environmental and economic effects of the reform. Such effects may vary with the tax rate in a uniform way. For instance, with a 300MAD carbon tax and the household transfer method of revenue recycling, as noted above, effects on emissions and output are expected to be negative and impact on disposable income positive. At lower levels, the effect on emissions and disposable income tend to decline (Figure 16). However, effects on GDP vary at different tax levels, with slight positive estimated effects below MAD200p/tCO_2e.

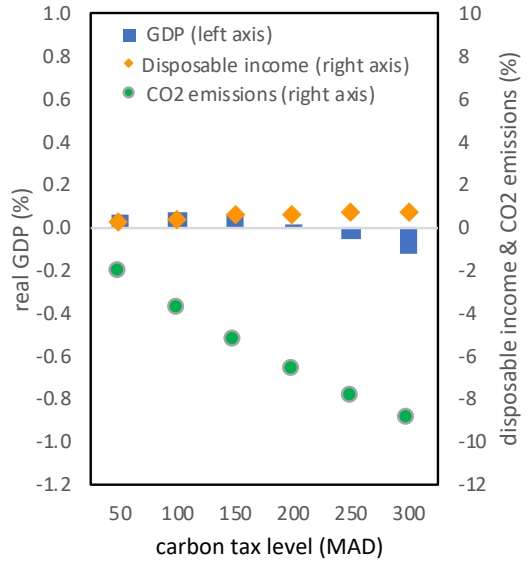
This underpins the point that a carbon tax - which is a tax which varies with carbon content - can emulate many of the facets of a shift towards a comprehensive reform of Morocco's regime with respect to fossil fuels. However, the strength and sign of the effects on metrics of interest depend on the level of the tax as well as the use of expenditures.

Figure 15. Estimated effects of removal of a carbon tax (MAD300p/tCO_2e), by revenue recycling type



Source: Ministère de l'Economie et des Finances & authors. K = reduction in capital taxes, I = increased public investment, X = export subsidies, HH = household rebates; L = reduction in labor taxes.

Figure 16. Carbon tax rates determine effects



Source: as above; assumes revenues are recycled via lump-sum household transfers.

G. Other effects

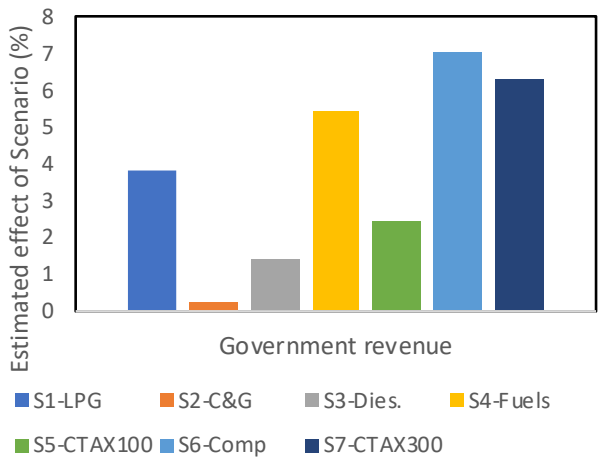
EFR has important effects beyond GDP, disposable income, and emissions. Of note are effects on government revenue, sectoral distribution, international trade, and fossil fuel demand.

1. Government revenue

The tax policy scenarios vary in the amount of revenues they could raise (Figure 17**).** While all of the scenarios assume that revenues raised are fully recycled (through increases in government expenditure or reductions other taxes), the amount of revenues they raise to be recycled vary.

Removing the LPG subsidy (S1), raises revenue by about 3.8 percent. This is considerably more than tweaks to TIC rates (0.2 percent for S2 and 1.4 percent for S3), as well as a low carbon tax (2.4 percent for S5). Comprehensive reform (7 percent) and a moderate carbon tax (6.3 percent) raise even more in government revenues.

Figure 17. Effects on government revenue, by scenario (recycling via public investment)



Source: ibid.

2. Sectoral distribution

The results from the different scenarios, and recycling methods within each scenario, will also vary at the level of sectors. Given the large number of potential tax or rebate change scenarios and use of revenues which make up an EFR, sectoral effects can vary significantly. However, general patterns for sectors do emerge across EFR types.

In general, the petroleum refining industry tends to lose output under all recycling schemes, while electricity, water, and food sectors tend to experience gains. Mining tends to be relatively unaffected. What determines 'winning' and 'losing' sectors in the CGE model (in terms of output gains or losses) tends to vary most by recycling method.

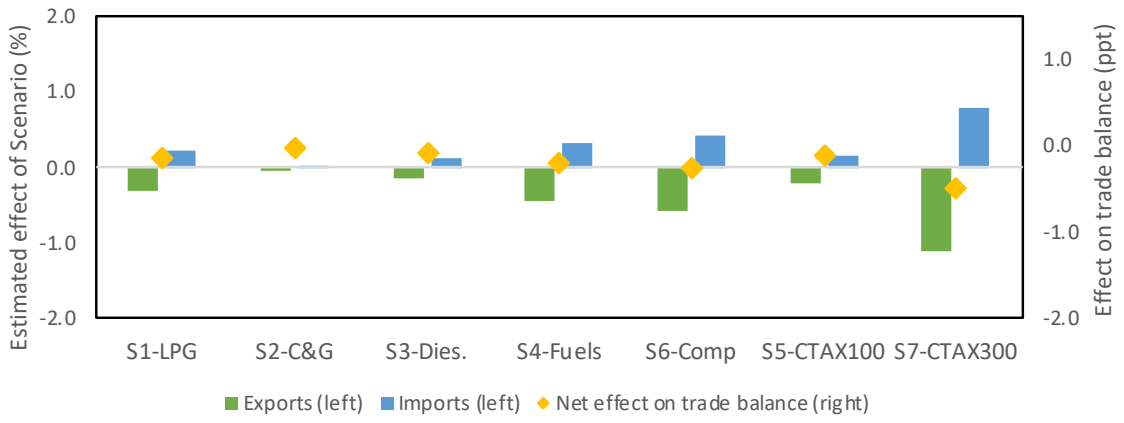
In general, in Morocco the CGE model predicts that relative 'winning' and 'losing' sectors by recycling methods are as follows:

- Reduced capital taxes ('K') - winning sectors include construction, manufacturing, and electrical engineering; while losing sectors include fisheries and non-market services.
- Increased public investment ('I') - the construction sector tends to gain by far the most in output, while fisheries tend to lose out the most.
- Export subsidies ('X) - sectors which gain the most include textiles, engineering, and chemical industries chemical; while sectors that lose output include agriculture and services.
- Lump-sum rebates to households ('HH') - electricity, water, and food sectors gain most, while non-market services and engineering sectors lose most.

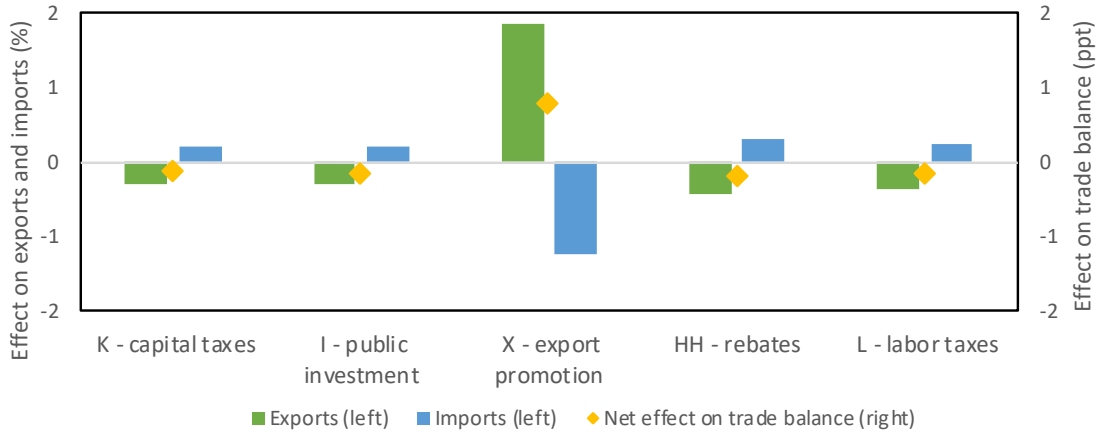
- Reduced labor taxes ('L') - electricity, water, food, and fisheries gain most, non-market services and textiles lose most.

That said, the above general patterns that result from this modelling exercise must be caveated taking into account the limitation of the model discussed above. Notably the inputs into the model of sectoral shares ('Social Accounting Matrix' - SAM, refer to 'Limitations of the CGE model' section) which has changed since 2013. However, given the importance of including industry in consultations for the formulation and implementation of an EFR, in addition to the importance of industrial strategy, future analyses need to pay close attention to the sectoral effects of differing EFR designs.

Figure 18. Effects on trade vary by scenario (assumes recycling via public investment)…



…and by recycling method (assumes scenario is 'S1' - LPG subsidy removal)



Source: ibid., and IMF (2018a). K = reduction in capital taxes, I = increased public investment, X = export subsidies, HH = household rebates; L = reduction in labor taxes. Note that the net effect on the trade balance is not a simple sum of the estimated effect on exports minus imports, as the two have different bases.

International trade

Another measure of interest is the effect of EFR on international trade. The CGE model used is an open-economy model, allowing for changes in exports and imports (assuming that policies in other countries does not change).

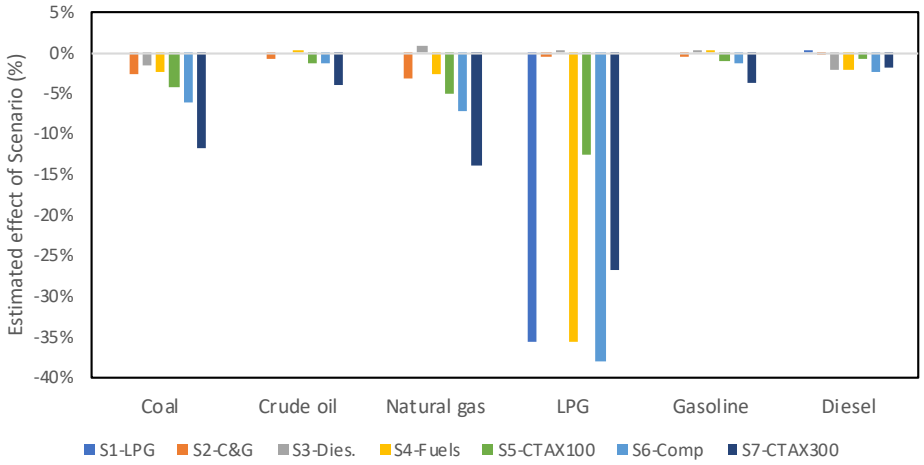
Most of the policy scenarios show a moderate decrease in exports, increase in imports, and slight worsening of the trade balance (top panel of Figure 18). This reflects the assumed pass-through of increased input costs to output prices, negatively affecting the position of exporting or import-competing firms.[26] A moderate carbon tax (S7) has the largest effects on international trade overall, followed by the comprehensive reform (S6) and general fuel policy reform (S4) scenarios. The LPG subsidy removal (S1), TIC tweaks (S2 and S3), and low carbon tax (S5) have smaller or negligible effects.

Among recycling methods, effect do not seem to vary significantly with the exception of export subsidies (bottom panel of Figure 18). As could be expected, export subsidies have strong positive effects on exports and the trade balance, while also reducing imports. Other recycling methods are not substantially different from each other in terms of their effects on trade.

Fossil fuel demand

A moderate carbon tax (S7) tends have the strongest effects at reducing fossil fuel demand. The carbon tax reduces total demand for coal (-11.8 percent), crude oil (-4.1 percent), natural gas (-13.9 percent), and gasoline (-3.6 percent) much more sharply than any of the other six scenarios.

Figure 19. Effects on fossil fuel demand by scenario (assumes recycling via public investment)



Source: Ministère de l'Economie et des Finances & authors. LPG = 50% LPG subsidy removal; C&G = 15% TIC on Coal & Gas, Dies. = Diesel TIC 10% higher than petrol TIC, Fuels = combination of three policies on fuels (50% LPG subsidy removal, 15% TIC on coal and gas, and TIC 10% higher for diesel than petrol), CTAX100 = carbon tax at MAD100p/tCO2e, CTAX300 = carbon tax at MAD300p/tCO2e.

However, scenarios which include removal of the 50 percent LPG subsidy (S1, S4, and S6) tend to have a stronger effect at reducing LPG subsidy demand. This shows the importance of relative prices: as the carbon tax affects the prices of natural gas, coal, crude oil, and gasoline, it has a lower negative effect on the relative price of LPG compared to LPG subsidy removal scenarios. Because the carbon tax affects a larger base of fossil fuels in a way that's linked to emissions, this mix of reduced fuel demand results in more emissions reductions at a lower (or more negative) economic cost (refer to Figure 20). **So, while the moderate carbon tax is less *effective* at reducing LPG demand, it is more *efficient* at reducing emissions.**

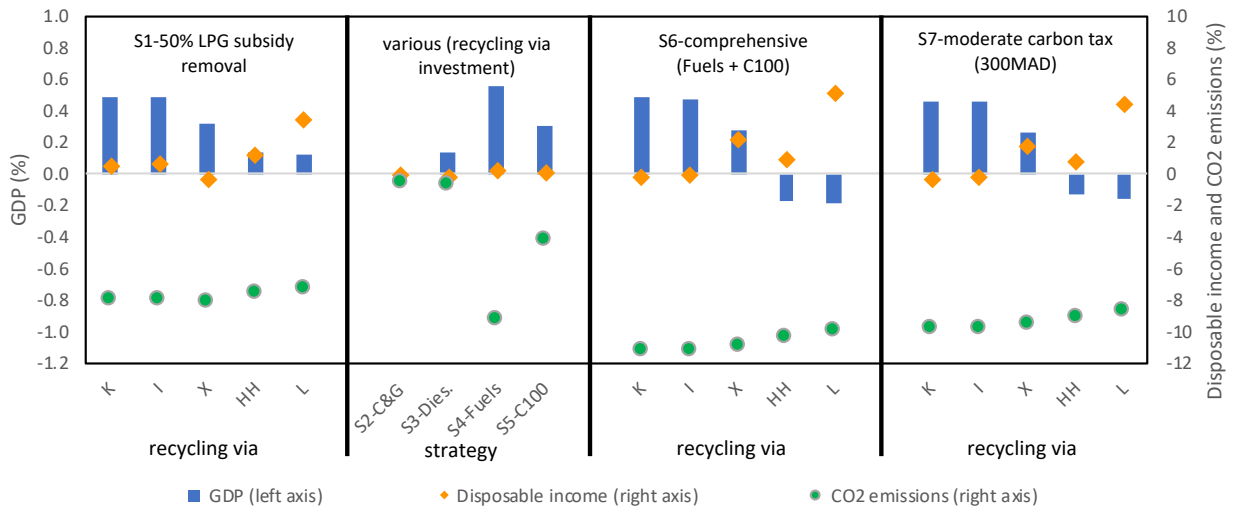
[26] Note, however, that this will vary at the level of sectors (refer to '**Error! Reference source not found.**' below).

H. Discussion of model results

This chapter provides preliminary analysis of options for greening the tax system through environmental fiscal reform in Morocco. The analysis has focused on the estimated effects on output and disposable incomes of EFRs in Morocco, across a range of scenarios and revenue recycling methods (Figure 20). If these effects are the principal determinants of desirability, **overall the CGE model finds**:

- **Removal of the remaining 50% LPG subsidy (Scenario 1) appears to be desirable economically**, irrespective of revenue recycling method;
- **A comprehensive reform** (Scenario 6) - including LPG subsidy removal, adjustments to TIC rates on fuels, and a low carbon tax of MAD100p/tCO_2e - **would have a stronger effect on emissions, without negatively affecting output and disposable income;**
- **A moderate carbon tax (MAD300p/tCO_2e - Scenario 7) has very similar effects** to the comprehensive reform package. Effects vary at lower carbon tax levels.

Figure 20. Summary of effects of scenarios on output, disposable income, and emissions



Source: Ministère de l'Economie et des Finances & authors. K = reduction in capital taxes, I = increased public investment, X = export subsidies, HH = household rebates; L = reduction in labor taxes. LPG = 50% LPG subsidy removal; C&G = 15% TIC on Coal & Gas, Dies. = Diesel TIC 10% higher than Petrol TIC, Fuels = combination of three policies on fuels (50% LPG subsidy removal, 15% TIC on coal and gas, and TIC 10% higher for diesel than petrol), C100 = carbon tax at MAD100p/tCO2e.

In addition to tax policy, expenditure policy (revenue recycling methods) matters. The choice of how to spend revenues has substantial effects on output, emissions, and disposable incomes for almost all of the scenarios. In general, as could be expected:

- Recycling through *increased public investment (I) and reduced capital taxes* (K) generally appears to have the strongest positive effects on GDP;
- Recycling through households, in the form of *reduced labor taxes (L) or lump-sum transfers (HH)*, has the strongest effects on disposable income; and,

- Recycling through *increased export subsidies (X)* has more balanced effects on output and income, but strongly positive effects on the trade balance.

Less significant findings for the scenarios were:

- TIC rate changes - removal of coal and gas exemption (Scenario 2) or raising the TIC rate for diesel above that of gasoline (Scenario 3) - has minor effects on output, income, and emissions;

- General fuel tweaks (Scenario 4) - combining the LPG subsidy with TIC rate changes - has slightly stronger effects on emissions and output than the LPG subsidy removal alone (Scenario 1), but not substantially higher; and,

- A low carbon tax (MAD100p/tCO_2e - Scenario 5) has about half the effect of LPG subsidy removal (Scenario 1) and general fuel tweaks (Scenario 4) on output and emissions.

Overall, according to the outcomes of the modelled scenarios, the government could benefit from giving some consideration to broader policy changes, notably removing the remaining LPG subsidy (S1), implementing a comprehensive reform to fuel taxes (S6), or introducing a moderate carbon tax (S7). These policies would go a long way to greening the tax system, further supporting Morocco's efforts to achieving sustainable development, without substantial economic costs. In addition, using revenues raised to fund a mixture of increased public investment (e.g., in infrastructure) and reduced labor taxes could help maximize economic gains (or minimize economic costs) while also managing distributional effects.

That said, for the scenarios which have less pronounced impact emissions and fuel demand (Scenarios 2-5), they can be very simple to implement and can be implemented quickly. In that vein, they could be seen as important initial steps towards the broader reform packages (such as in Scenarios 6 and 7) and can make an important contribution to further greening Morocco's tax system.

However, there are several important limitations with these findings. Specifically, the following caveats are needed to qualify the results of scenario simulations:

- **The CGE model may be understating the potential positive effects of EFR on economic activity.** Most CGE models of EFR in contexts such as Morocco are limited by exclusion of important economic channels, such as interactions between the informal and formal sector. The impact of these channels on estimates vary with context, but in general they tend to understate the positive effects of EFR on economic activity, such as output and employment. As a result, the EFR designs analyzed here may have more desirable economic effects than the results of the CGE model implies.
- **In addition, though most designs of EFR analyzed in the model appear to result in a slight worsening of the trade balance, there are reasons to suspect that trade effects may not be negative in the long-run.** For instance, by raising energy efficiency among firms and households, economies tend to consume less fossil fuels. As a result, net energy importing countries like Morocco tend to become more energy self-sufficient over time, shielding them from external shocks to global energy prices.
- **Though the CGE model has estimated effects on output across economic sectors, it has not estimated distributional effects on household incomes.** Revenue-recycling methods, for instance, are strong determinants of distributional effects, with reductions in labor taxes and the

funding of household transfers tending to be more progressive than capital tax reductions or export subsidies, for example. In cases where there are undesirable consequences on distributional equity or poverty, supplementary policies may need to be identified and designed to mitigate such effects. Secondary analysis is therefore required to understand the distributional effects of different revenue-usage mixes, as well as the potential for targeted compensation measures. To determine the optimal shares of revenues that could be used for compensation versus budget consolidation, and to determine the optimal type of compensations, further impact assessment is needed.

- **Lastly, the model results do not incorporate the crucial impacts of co-benefits.** Co-benefits, such as health gains from reduced local air pollution, are rarely incorporated into standard CGE models, such as that included in this study. But their effects are crucial for understanding the overall desirability of EFR. Further analysis is therefore required to assess the various non-economic, non-greenhouse gas effects in order to fully appraise EFR and carbon pricing in Morocco.

VI. Key conclusions

Overall, the findings of this study suggest that, designed and implemented well, an environmental fiscal reform could be a desirable policy intervention in Morocco. Further work is needed, however, to fully analyze specific reform designs, including a more up-to-date and nuanced view of their effects on economic activity, emissions, international trade, distributional effects across households and firms, distinguishing between the formal and informal sectors, disaggregating the power sector, and quantifying the various development co-benefits. Supported by effective communication and implementation strategies, these reforms could help Morocco accelerate its path towards sustainable development while achieving its NDC objectives efficiently.

Of the two options for EFR, adjusting rates of existing energy taxes and subsidies seems to be the most adequate in present Morocco conditions. Among these adjustments all three pathways considered here deserve attention of policy makers:

- Phasing out tax expenditures on fossil fuels used in electricity generation and better alignment of TIC rates for power and industrial fuels with the social cost of local and global pollution;
- Better alignment of gasoline and diesel TIC rates with local and global pollution costs of transport emissions;
- Phasing-out the remaining butane subsidy;

The initial analysis presented in this note of the potential role that the environmental fiscal reform can play in contributing to Morocco's development objectives allows for the following policy conclusions:

1. EFR can contribute to achieving the energy policy goals

EFR would establish broad price incentives to improve efficiency and reliability of energy systems while reducing poverty and inequality:

- **EFR would contribute to the core energy policy goals through promoting energy efficiency and the level-playing field for domestic renewable producers, who currently face competition from**

implicitly subsidized coal and gas power generation. The efficient pricing of fuels proportional to their social costs of environmental damage can incentivize efficient production and use of energy. It would also encourage long-term switching to cleaner and renewable energy sources thus reducing import-dependency of final energy consumption and reducing the fiscal burden of remaining energy subsidies (butane and CSP).

- **Potential regressive social distributional impact could be fully mitigated by earmarking a portion of additional revenues for targeted transfers to the vulnerable households.** Such transfer would replace current implicit transfers to all users through fossil fuel subsidies. Since the rich consume more energy than the poor, the present energy pricing regime benefits mainly the rich. The affordable tax revenue collected from all (primarily rich) households would be more than enough to fully compensate any income effect on poor households through targeted financial transfers or financing targeted support measures to break poverty traps, such as improved education and access to infrastructure.
- **A remaining portion of additional revenues could also be earmarked towards energy innovation or domestic production of some generation technologies,** such as solar water heaters, to facilitate substitution for butane use in heating and hot water preparation. However, the risk of deforestation due to a switch from butane to fuelwood in rural areas would need to be monitored and managed.
- **The impact on fragile financial position of ONEE would need to be managed.** Phasing out of implicit subsidies to coal, oil and gas used by L'ONEE own plants and IPPs would increase the costs of power generation from thermal power plants and would require complementary measures. These could be either adjustments of consumers' tariffs to enhance ONEE revenues or recycling additional government revenues through explicit fiscal transfers to ONEE under public service contract (e.g. for serving certain vulnerable customers below costs), or escaping high taxes by accelerated switch to renewables, with the support of international climate finance. The need for these compensatory measures to ONEE would gradually disappear, as power grid becomes greener and households' incomes raise.

2. EFR can incentivize structural transformation towards technology and knowledge-based economy

- **Environmental fiscal reform can increase relative competitiveness of labor and knowledge intensive sectors.** Carbon pricing sends a price signal favoring those economic activities, which require more of competitive labor and modern technologies (capital) but are less reliant on energy inputs, in particular energy derived from fossil fuels.
- **Environmental fiscal reform can contribute to grow the formal economy.** Since the informal sector does not pay income taxes, whereas energy taxes are paid by the whole economy, a tax shift from income to energy taxes gives firms and workers the incentive to join the formal sector. This can in turn extend the coverage of the public education and vocational training and social protection network, to say nothing of increased revenue from existing taxes.
- **Environmental fiscal reform can provide continued incentive for innovation and technology progress:** by establishing an explicit price for environmental costs imposed on the society and by applying it to those economic agents who cause this social cost, a EFR encourages them to discover

previously unknown, innovative, and inexpensive means to increase productivity with lower emission intensity.

Potentially negative competitiveness impacts on the most trade-exposed and emissions-intensive industrial and transport sectors will need to be managed. Carbon pricing may increase the costs for energy intensive industries, such as cement, fertilizer production but the impact on their market share will depend on trade exposure, carbon intensity of energy used and the overall production efficiency. Higher diesel prices would also increase the cost of commercial transport. Any adverse competitiveness impacts can be further managed effectively through the design of a tax and expenditure shifts (World Bank, 2015[27]; Ward et al., 2015[28]).

3. EFR can improve efficiency of the fiscal system

- **The removal of implicit and explicit subsidies would help achieve the government goals of narrowing the budget deficit and fiscal consolidation**. This could reduce the pressure to sell state assets when urgently needed to patch current fiscal shortfalls and give more space for more strategic approach to privatization.
- **Proposed tax shifts would reduce the overall burden of the tax system to administration**. Smaller number of taxable units would release some time and resources for tax administrators currently tied up with auditing of the large proportion of Morocco's population whose income and tax returns are very low. The upstream taxation of fuels (through TIC) requires comparatively little administrative capacity, given that is requires the supervision of only a small number of points at which fuel enters the economy. From there, the price signal is passed through the whole economy without a need for tax administrations to directly interact with the much larger number of firms and households who consume emission-intensive fuels. Aligning the excise tax rates with the social cost across different fuels can utilize existing tax administration systems for energy taxes. Upstream fuel taxes are also more difficult to evade by tax-payers than income tax or VAT, so the costs of tax policing would also decline.
- **Proposed EFR could lower cost of tax compliance for taxpayers, therefore increase their acceptability of the tax system.** Additional revenue from fuel taxes and reduced subsidies would allow to reduce or not to increase income taxes or social security contributions. Reduction in the taxation of low-earning workers and SMEs could be made by either reducing nominal tax rates (for example for bottom 40 percent of earners) or by increasing the threshold from which income becomes taxable. The second option has the advantage that it could also help Morocco reduce its tax system's overall burden on society, in particular for the lowest-earning workers and small businesses, for whom the costs for complying with the tax system are disproportionately large. Tax collection

[27] World Bank. 2015. *The FASTER principles for successful carbon pricing: an approach based on initial experience*. Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/901041467995665361/The-FASTER-principles-for-successful-carbon-pricing-an-approach-based-on-initial-experience

[28] Ward, J.; Sammon, P.; Dundas, G.; Peszko, G.; Kennedy, P.; Wienges, S.; Prytz, N. 2015. *Carbon leakage: theory, evidence, and policy design.* PMR technical note; no. 11. Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/138781468001151104/Carbon-leakage-theory-evidence-and-policy-design.

efforts could instead be focused on the upstream purchasers of fuels, who are large companies which routinely engage in these transactions and can therefore manage the tax compliance at much lower cost. The reform would hence reduce the transaction costs of the tax compliance for exactly that section of the population that suffers most from it and make the fiscal reform work for the poor.

4. EFR can help Morocco achieve its NDC goals and can be designed to also improve air quality

- **Environmental fiscal reform would drive reductions of local and GHG emissions by changing incentives** to firms and consumers towards low-emission behavior and clean technology investments across sectors.
- **Environmental fiscal reform can achieve these results cost-effectively, by leaving firms and consumers the flexibility to decide how emissions can be most easily and cheaply reduced**. Unlike specific technology, the price signals allow firms and households to choose between improving efficiency of resource use, acceleration of innovation and deployment of cutting-edge clean technologies or adjusting habits and behavior.
- **Domestic carbon and local pollution pricing can be introduced in parallel with the use of the international cooperative approaches, including markets mechanisms (Art 6.2 and 6.4 of the Paris Agreement, and non-market mechanisms (Art 6.8 of the Paris Agreement).** These mechanisms have a potential to attract international climate and carbon finance to support implementation of policies and actions that are in national interest and have mitigation & adaptation co-benefits.

Recycling of revenues may need to balance the objectives of economic efficiency and distributional equity. The choices of the allocation of additional revenues can be done on annual basis through regular budget process or can be earmarked for the multi-year expenditure programs established through the specific parliamentary laws.

Overall, EFR can be an important contributor to achieving Morocco's ambitious national development goals, helping it meet its NDC and Sustainable Development Goals (SDG) objectives jointly. The potential for synergy between national development objectives and EFR will depend on the design and implementation, especially how existing taxes would be restructured and how the revenues raised or saved would be used. The economic effects of EFR would also depend on how tax changes would be aligned with industrial and energy policy, public investments in priority sectors, and other environmental reforms. Lastly, any tensions and unintended consequences which could arise would need to be managed. International experience proves that these challenges are indeed manageable and additional government revenue from reduced implicit and explicit subsidies would provide sufficient means for mitigating any unwanted side effects.

Annex 1. Summary of Environmental fiscal reform (EFR)

A. Economic rationale for environmental taxation

There is a strong economic rationale for environmental taxes. Economics has long posited that maximizing welfare requires that all costs of production and consumption be reflected in market prices. However, some activities impose costs on others ('externalities') which are not fully reflected in prices. For instance, the burning of fossil fuels—such as coal for electricity or petroleum for transportation—creates a number of pollutants. These create costs for third parties. Air pollutants like black carbon and PM2.5[29] arising from fossil-fuel combustion are a leading cause of illness and death. Each year, an estimated 9 million people die prematurely due to pollution, of which 92% are from low- and middle-income countries (Lancet Commission 2017).[30] These deaths account for annual welfare losses of USD 4.6 trillion, or 6.2 percent of global GDP (ibid).

For gasoline consumption, for example, externalized costs include the costs pollution on the health of residents, of increased road accidents and congestion due to the over-consumption, and of increased risks of climate change due to the emission of carbon dioxide and other greenhouse gases.

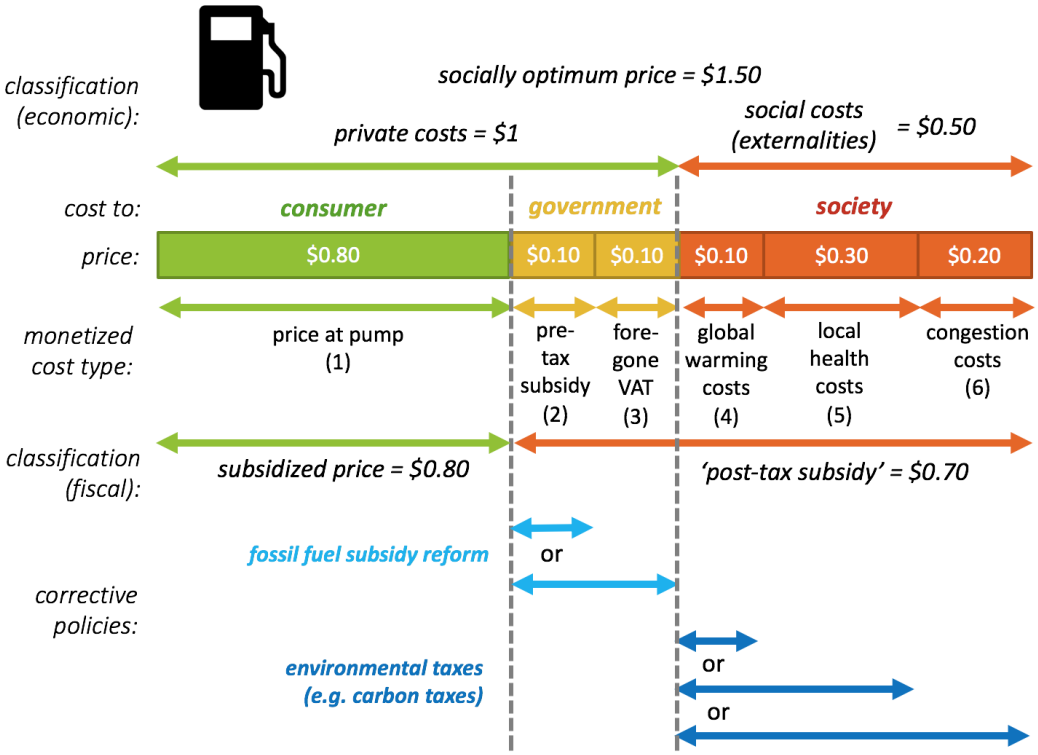
Achieving economic efficiency entails bridging the gap between existing and optimal market prices ('internalizing externalities'). This can be done by estimating costs and implementing corrective policies.

Figure 21 offers an illustrative example of implementing efficient pricing of gasoline through the tax system. A consumer purchases 1 liter of gasoline for $0.80 (item 1). In this example, the government subsidizes fuel directly through $0.10 of financial support ('pre-tax subsidy', item 2) and indirectly by foregoing VAT normally charged on other goods (item 3). The total ($1) is the private cost of gasoline. But there are also social costs (externalities) from gasoline consumption. Burning fossil fuels causes emissions of greenhouse gases, contributing to climate change and raising the economic costs of global warming (derived by estimating the 'social cost of carbon'; $0.10, item 4). Other pollutants like nitrous oxide and sulphur dioxide raise pollution-related deaths and health disorders, costs which can be estimated (e.g. $0.30, item 5). Underpricing fuel also incentivizes inefficient car use, with welfare and efficiency costs from increased congestion ($0.20, item 6).

[29] PM2.5 refers to atmospheric particulate matter (PM) that have a diameter of less than 2.5 micrometers and thereby permeate the lungs. PM2.5 causes asthma, respiratory inflammation, jeopardizes lung functions, lung cancer, even ischemic heart disease, and even strokes (Lancet Commission 2017).

[30] Of these 9 million, 6.5 million accrue to air pollution (4.5 million due to outside air pollution and 3 million inside the household) and 1.8 million to water pollution.

Figure 21. Illustrative example of corrective policies on gasoline prices



Source: World Bank staff. Shows an illustrative example of the potential divergence between private costs for 1 liter of gasoline and socially-optimum prices, due to negative externalities. All estimates are fictional.

In aggregate, private and social costs ($1.50) equal the socially optimum price of fuel. The gap between them ($0.70, also known as the 'post-tax subsidy') can be bridged in part or, ideally, in full through a number of corrective policies. The direct (item 2) or indirect (3) government subsidy can be removed through a fuel subsidy reform. Further, the societal costs (4, 5, and 6) can be internalized through environmental taxes, like carbon taxes.[31]

Carbon taxes represent an attractive option for a number of reasons. First, they are a simple way of implementing socially-efficient pricing. Carbon taxes fix a price on emissions, either directly per unit of

[31] The internalization of external costs can also be achieved through emissions trading systems (ETSs). ETSs are another form of carbon pricing which, like carbon taxes, seek to internalize the external costs of emissions of carbon dioxide. Under an ETS, permits are issued or sold to large emitters of carbon dioxide such as power plants or manufacturing firms. These 'regulated entities' can then purchase or sell permits to each other. In theory, this can result in the same outcome as carbon taxes of cost-effective internalization of various externalities into prices. In practice, ETSs tend to be much more complex to administer than carbon taxes. In addition, they tend to raise a lower proportion of revenues as permits are often freely allocated to regulated entities. Lastly, for Morocco, the concentrated structure of energy market —with the dominant role of ONEE and relatively few large industrial emitters—suggest that the emissions trading system would not deliver its cost saving potential and could be very difficult to regulate, unless it is part of a larger, multi-national emissions trading system. In these circumstances, a carbon tax seems to be the more appropriate option of domestic carbon pricing in short-to medium term. As a result, this note has not sought to assess ETSs in the context of Morocco.

carbon dioxide emitted or indirectly by adjusting fuel taxes according to the carbon content of different fuels. This provides price certainty, allowing firms to incorporate carbon costs into their decision-making and investment choices with confidence and certainty.

Second, carbon taxes can help Morocco cost-effectively achieve its 'Nationally-Determined Contribution' (NDC) under the Paris Agreement. Carbon taxes leave firms and consumers flexibility to decide how emissions can be most easily and cheaply reduced. As a result, then tend to be more cost-effective (less economically distortionary) than direct regulatory policies like performance standards or technology mandates. This can help Morocco achieve its NDC cost-effectively. In addition, the experiences and capacity gained could help Morocco participate in international linkages of carbon pricing schemes allowed for under Article 6 of the Paris Agreement.

Third and finally, carbon taxes can help accelerate low-carbon growth. By providing long-term price signals, these taxes can support development and deployment of cutting-edge clean technologies.

B. Environmental fiscal reform (EFR)

As a result, EFRs, such as those which include carbon pricing, have the potential to raise human welfare, both directly and indirectly. By raising or saving fiscal revenues through tweaks to taxation, allocating revenues effectively, and implementing supplementary policies to mitigate any undesirable consequences, EFR can have a variety of desirable outcomes Figure 22. If reforms are effective, human welfare can increase directly (by reducing climate risks, yielding 'development co-benefits' like clean air and water, or funding public goods) or indirectly (by raising measures of economic activity such as output, employment, and innovation).

As a result, EFR could help Morocco achieve numerous economic, fiscal, environmental, and social objectives simultaneously. An EFR which, for instance, includes reductions in fossil fuel subsidies, changes to fuel TIC rates, or explicit carbon pricing can raise or save fiscal revenues, which could be used to fund investments in infrastructure, health, and education, or returned directly to Moroccans in a lump-sum fashion to reduce inequality. In doing so, EFR has the potential to enhance economic efficiency, foster low-carbon innovation, improve public finances, and cut pollution, thereby raising the welfare of Moroccans directly and indirectly. This can help Morocco implement its Paris Agreement NDC and achieve its Sustainable Development Goals conjointly.

However, design characteristics of EFR, and their effect on economic, political, and administrative metrics need to be carefully considered and assessed (described in more detail in Annex 1). Reforms need to be designed and implemented in a way that is transparent, fair, and effective. Given the broad swathe of Moroccans that an EFR would affect, and the vast number of potential options for tweaks to taxation, expenditure allocation, and supplementary policies, careful ex ante analysis of options is needed.

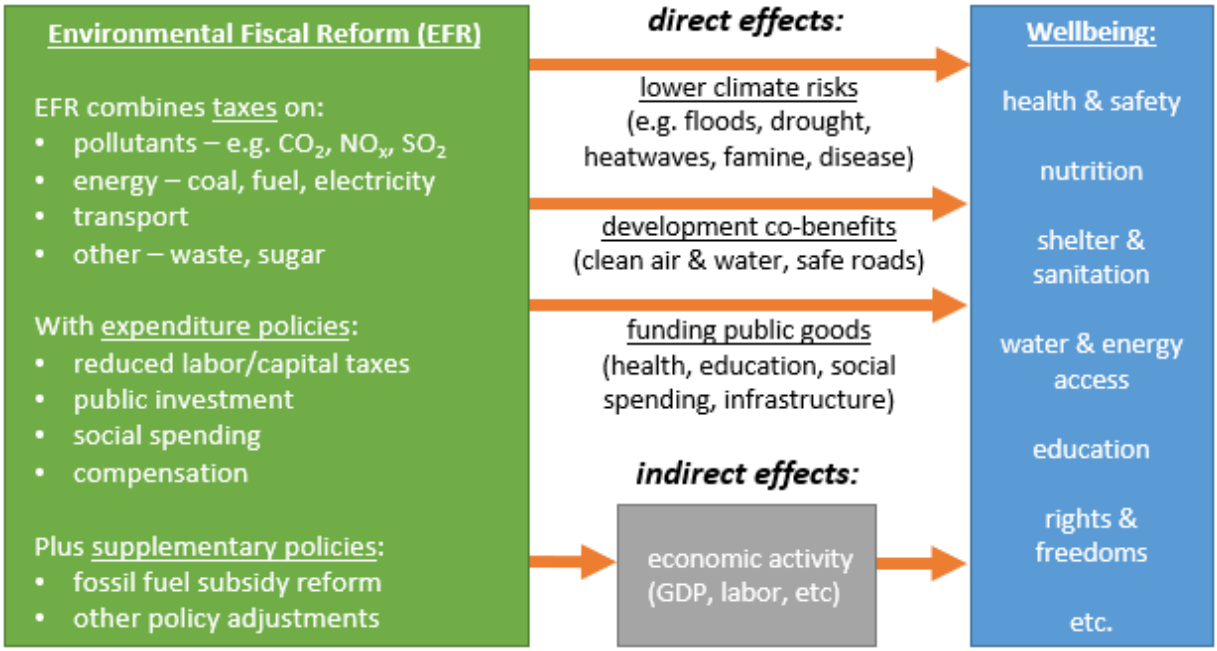
In addition to their effects on prices, fossil fuel subsidy reforms and environmental taxes like carbon taxes also raise government revenues. These can be used in a number of ways. For instance, the government can compensate households or firms for the increased costs of energy through direct transfers, through reductions in taxes (e.g. labor and capital taxes), or by subsidizing economically desirable activities (e.g. research and development). Alternatively, revenues could help fund public goods,

like health, education, infrastructure, and social spending, or be used to improve the fiscal position by cutting the deficit and government debt.

'Environmental fiscal reform' (EFR) combines fossil fuel subsidy reforms and/or environmental taxes with expenditure policies and various supplementary policies (Figure 22). As well as helping achieve socially-efficient market pricing, EFR can help raise human wellbeing. It does so by raising wellbeing directly (reducing climate risks, yielding 'development co-benefits' like clean air and water, or funding public goods) or indirectly (by affecting economic activity measures like output, employment, and innovation).

As a result, EFR could help the government of Morocco achieve numerous economic, fiscal, environmental, and social objectives simultaneously. However, design characteristics, and their effect on economic, political, and administrative metrics need to be carefully considered and assessed.

Figure 22. Environmental fiscal reform can help raise wellbeing directly and indirectly



Source: World Bank staff. EFR can affect human welfare directly (by reducing climate externalities, generating 'development co-benefits', and funding public goods) and indirectly (through changes in economic activity).

C. Policy pathways for EFR

There are three main policy pathways through which EFR could be implemented. These include (1) fossil fuel subsidies reforms; (2) fossil fuel taxes reforms; (3) explicit carbon taxes or emissions trading schemes. These can be implemented in sequence or in parallel depending on the existing national circumstances, including the main policy objectives, and the level of stakeholder acceptance.

(1) **Fossil fuel subsidy reforms:** Phasing-out fossil fuel subsidies is the natural starting point for carbon pricing. Subsidy removal can contribute to reducing budget and current account deficits, improve energy security, and encourage industrial efficiency. The subsidies can either be removed entirely or replaced by a more cost-efficient system that supports the outputs of industries instead of their fuel inputs. Subsidy reforms can also contribute to the socio-economic development objectives, e.g. when the fuel subsidies for households are replaced by targeted transfers or increased financing for poverty-critical state services such as education or minimum incomes. On the other hand, removal of energy subsidies may have unintended social and local environmental consequences, which need to be carefully managed.

(2) **Fossil fuel tax reforms:** A simple and effective way to introduce carbon pricing is through the reform of existing fuel taxes. Most fuel taxes worldwide do not reflect the cost of carbon and local environmental emissions. Fuels that contain more carbon per unit of final energy consumption are often taxed less than less carbon-intensive fuels. These price signals encourage firms and households to use more carbon-intensive fuels – often in contradiction to national objectives for energy security and energy transitions. Aligning the excise tax rates better with the social cost across different fuels can utilize existing tax administration systems for energy taxes. Revenues would furthermore be more easily collected than most other taxes, because there are fewer taxable units to surveil if the tax is imposed "upstream" when fuels are imported or produced at refinery gate. For instance, fuel taxes can be collected at the small number of points where the fuel enters the economy (pipelines, ports, mine mouths, or at the refinery level). From there, the price signal is passed through the whole economy without a need for tax administrations to directly interact with the much larger number of firms and households who consume carbon-emitting fuels.

(3) **Carbon taxation or emissions trading:** Carbon taxes fix a price on emissions, either directly per unit of carbon dioxide emitted or indirectly by adjusting fuel taxes according to the carbon content of different fuels (similarly to above). Carbon taxes represent an attractive option for many policy-makers due to their simplicity relative to emissions trading. They also have the advantage of providing price certainty, allowing firms to incorporate carbon costs into their decision-making and investment choices with confidence and certainty, although are subject to political risk of policy reversal. Emissions trading schemes (ETS) set a limit on emissions, allowing the price of carbon to change according to the supply and demand of emissions allowances which can be traded between firms. Because of the quantitative cap on emissions they provide more certainty about overall emission outcomes. If well-designed, the trading aspect can achieve emissions reductions at least-cost: allowances will end up in the hands of those that value them the most, whilst those firms that can reduce emissions within their own operations more cheaply will do so enjoying additional revenues by selling allowances they do not need. Trading schemes can only operate effectively under competitive market conditions. Thus, the relative attractiveness of carbon taxes versus emissions trading depends upon a country's national circumstances.

Crediting instruments are another type of carbon pricing approach that attribute a carbon price to the reductions of GHG emissions ("credit") against a pre-established threshold (baseline) which can then be used to compensate for, or to offset, emissions made elsewhere. Crediting instrument can be used at the international level (as part of the international cooperative approaches established by the Article 6 of the Paris Agreement) or at the domestic level. Crediting is most often used to provide additional flexibility to

the emitters covered by the carbon tax or ETS to meet their emission liabilities. In the context of a national climate change strategy, the government may decide to implement and seek to (partially) finance mitigation in one or more target areas, e.g., identified in the NDC, through an international crediting approaches.

D. Design characteristics

EFR can incorporate a large number of varying tax, expenditure, and supplementary policies. As a result, no two EFRs are identical, and one reform that works in one context may not be as effective in another. Designing an environmental fiscal reform therefore needs to consider the diverse nature of Morocco, with analysis of the various.

The two principal design decisions for EFR are tax bases and expenditure policies. These two design components most significantly determine overall economic, environmental, and other effects. Which bases to implement environmental taxes on (or, equivalently, to revoke subsidies from) and the rate of taxation affects relative prices. For instance, imposing a uniform carbon tax would disproportionately affect the price of coal compared with gas in electricity production, given the higher carbon-intensity of coal.

In addition, an even more importantly, the allocation revenues raised strongly affects the economic, environmental, and social consequences of EFR as a whole. For instance, using taxes raised in a revenue-neutral manner ('revenue recycling') to reduce capital taxes may have strong positive effects on output, but also strong regressive effects on distribution of incomes. As a result, different methods of EFR revenue use (revenue-neutral or raising) and allocation (e.g. on reduced labor taxes or deficit reduction), have varying strengths across measures of economic efficiency, political feasibility, and ease of implementation (Table 3).

Table 3. Attributes of alternative uses of environmental tax revenues.

Type of use	Recycling or expenditure method	Economic efficiency	Political support: Industry	Political support: House-holds	Ease of implementatio n
Revenue-neutral recycling	Labor taxes (wage and social security contributions)	High	Low	High	High
	Capital taxes (profits and capital gains)	High	High	Low	High
	Lump sum transfers to households	Low	Low	High	Medium
	Output-based rebates to industry	Low	High	Low	Medium
Increased expenditure	Public infrastructure	Medium	Medium	Medium	Medium

	investments (energy, transport)				
	Basic services (education, health, sanitation)	**Medium**	**Low**	**High**	**Medium**
	Social protection programs (social assistance, insurance, labor market programs)	**Medium**	**Low**	**High**	**Medium**
	National debt reduction (for heavily indebted country)	**High**	**Medium**	**Low**	**High**

Note: Table shows approximate relative attributes of different revenue-neutral recycling (reducing other taxes) and revenue-raising methods (raising overall tax-to-GDP ratios to spend on specific expenditures). Many complexities are not shown by the table—for example, import-competing firms may have different preferences across revenues than exporting or nontrading firms. As such, this is a rough approximation.

As a result, understanding and contrasting the differing effects of designs with varying tax bases and expenditure policies are crucial for assessing options for EFR. **Using a computable general equilibrium (CGE) model constructed by the MoF of Morocco, this note analyzes and compares a number of scenarios based on tax base and expenditure policies.**

Annex 2. International experiences – brief case studies

E. Chile: carbon taxation (US$5/ton of CO_2)

Motivation for the reform: Like Morocco, Chile is highly dependent on fuel imports which account for 60% of its energy consumption. Equally like Morocco the country has ambitious NDC commitments, seeking to reduce its emissions intensity by 30% until 2030 from 2007 levels. To reach these targets in the most cost-effective manner, stimulate green growth, as well as to enhance energy security, and decrease the reliance on imported fuels, Chile is introducing a carbon tax from 2017 onwards.

Size, coverage and phase-In: The carbon tax was passed into law as part of a major tax reform package in 2014, which overall aimed at increasing efficiency and competitiveness. Further objectives of the tax package are to reduce national income inequality and fight tax avoidance. The carbon tax rate was set at a low level (US$ 5per ton of CO_2), and it limited to industry sectors with little trade exposure. This design has allowed introducing the tax with relatively little opposition.

The small scope at the start of this tax is seen as an initial step which will help the country develop national capacity in the measurement, reporting and verification (MRV) of emissions and the readiness of firms to adapt to carbon pricing. Other forms of carbon pricing have been considered for potential later development, but emissions trading was seen as unfeasible for the current situation of Chile.

Use of revenues: The carbon tax revenues are envisioned to be used for financing the attainment of a series of national objectives for socio-economic policy.

Preparation: Chile undertook extensive impact assessment studies prior to introducing the tax, including through three studies supported by the PMR, which included (i) modelling of tax impacts upon greenhouse gas emissions and the economy for different price levels, (ii) opportunities for tax alignment with other national energy policies, and (iii) detailed entity/site arrangements. The studies indicated that carbon taxation provides an important basis for realizing cost-effective GHG-reductions in Chile, even though short-term environmental impacts may be limited at the low tax rate of US$5, but that there is already evidence of carbon pricing having an effect on behavior (as an expectation effect even prior to introduction) by being factored into new electricity bidding contracts. The studies also recommended several improvements to optimize the effectiveness of the tax, mainly around strengthening the price signal. The PMR studies are undergoing a second phase, considering further carbon pricing options and crediting. The whole preparatory process for the introduction of carbon pricing in Chile has been carried out in close coordination of all relevant government entities, including the Ministries of Energy, Environment, Treasury and the Tax Office.

F. South Africa: carbon taxation (US$12 per ton of CO_2e)

South Africa is also undertaking a carbon tax reform which supports the implementation of its NDC commitment to stabilize GHG emissions between 398 and 614 MtCO2e by the period 2025-2030 (from 518 MtCO2e in 2010).

Motivation for the reform: South Africa has a large reliance on fossil fuels (coal in the power sector and industry; oil for transport) and the country's carbon pricing efforts are motivated by a strategy to develop a clean energy sector, which is seen as a key step to socio-economic development. This transition is to be fulfilled while safeguarding the security of energy supply.

Policy package: Carbon pricing is being prepared as part of a reform package that also involves several fiscal measures (including tax credits and rebates) to increase the provision of renewable energy (mainly wind and solar) and increase energy efficiency.

Size, coverage and phase-In: The tax rate is envisioned at R120 (US$12 per ton of CO_2e) in 2016 (not yet enacted), with annual increases of 10% until 2019/2020. The tax base is to include most GHG-emitting sectors. To address concerns for the impact of selected sectors, South Africa has introduced tax free allowances. There is a basic tax-free threshold which covers 60% of pre-existing emissions, additional 10% for process emissions, 10% for trade-exposed sectors and 10% for companies that opted-in for voluntary emissions budgets. These allowances are to be gradually phased out. At the start of the policy, these allowances are going to provide a 90% exemption to some industries such as cement and make for a comparatively complex system.

Use of revenues: South Africa undertook detailed impact assessments of alternative compensation methods. The tax is designed as revenue-neutral during the first few years after it is introduced. One option of revenue recycling considered is to decrease the existing electricity levy to neutralize the impact on electricity prices.

Preparation: The assessment process preparing the tax was led by the National Treasury in collaboration with other ministries. It involved significant consultation of stakeholders; a wide range of economic modelling studies were undertaken.

G. Mexico: explicit carbon taxation (US$ 3.5 per ton of CO_2)

In 2012, Mexico was the first developing country to introduce a General Law on Climate Change and was equally the first developing country to submit an INDC, committing the country to reduce GHG emissions by 22% relative to BAU levels by 2030. To implement these commitments, Mexico is relying in part on the carbon tax which it enacted in 2014.

Motivation for the reform: Also, Mexico is highly reliant on fossil fuels, with thermal power plants making up 75% of the electricity sector. Mexico plans to diversify this energy supply and expands it energy grid while keeping the increase of electricity demand in check. Further objectives of the tax are to create awareness of CO2 emissions and to promote the use of cleaner fuels.

Size, coverage and phase-In: The tax is implemented upstream, covering fossil fuel sales and imports by manufacturers, producers and importers. The tax is linked to the carbon content of fuels relative to natural gas, which tax rate is set to zero (see Table 4). This exemption of natural gas from carbon taxation was introduced as part of parliamentary negotiations in the passing of the law. The tax rate is set at a low level of 10-50 Mexican pesos depending on the fuel, averaging approximately US$ 3.5per ton of CO_2. The tax rate is furthermore capped at 3% of the sales price of the fuel, such that the incentive price signal is small. Firms are allowed to pay the carbon tax with credits from CDM projects developed in Mexico. Nonetheless the tax generates approximately US$1Billion in government revenue.

Preparation: The preparation of the tax was undertaken in close collaboration of the government with a Mexican think tank. The modelling of the think tank used a higher tax rate than the one eventually enacted, finding no competitiveness impact and indicating potential to drive forward uptake in wind energy investment. In subsequent consultations with industry, the tax, however, faced significant resistance. These led to the reduction of the tax rate and the creation of the exemption for natural gas. Emissions trading was considered as an option for carbon pricing but not considered at this stage due to the larger complexity.

Table 4. Carbon tax rates in Mexico

Fossil fuel	General formula	Carbon content in Mexico*	Tax		Difference (%)
			Initial proposal	Final proposal (LIEPS)	
Natural Gas	CH_4	0.526 kgC/m^3	11.94 c/m^3	0	
Propane	C_3H_8	0.458 kgC/m^3	10.50 c/l	5.91 c/l	43.7
Butane	C_4H_{10}	0.458 kgC/m^3	12.86 c/l	7.76 c/l	39.7
Gas (Regular and Premium)	Mix_{prom} C_8H_{18}	0.619 kgC/m^3	16.21 c/l	10.38 c/l	36.0
Jet fuel	Mix_{alta} C_8H_{18}	0.690 kgC/m^3	16.21 c/l	10.38 c/l	36.0
Turbosine and other kerosene	Mix_{baja} $C_{12}H_{26}$	0.710 kgC/m^3	18.71 c/l	12.40 c/l	33.7
Diesel	$C_{12}H_{26}$ - $C_{15}H_{32}$	0.722 kgC/m^3	19.17 c/l	12.59 c/l	34.3
Fuel oil (heavy and regular 15)	$C_{20}H_m$ – $C_{70}H_m$	0.813 kgC/m^3	20.74 c/l	13.45 c/l	35.1
Oil coke	$>C_{70}H_m$	0.900 kgC/m^3	189.85 $/ton	15.60 $/ton	91.8
Mineral carbon	$C_{137}H_{97}$ – $C_{240}H_{90}$	0.825 kgC/m^3	178.33 $/ton	27.54 $/ton	84.6

Source: Secretari de Medio Ambiente Y Recursos Naturales (Semarnat), Carbon Tax in Mexico, Presentation at PMR, May 2014.

H. Islamic Republic of Iran: fuel subsidies reform

Since 2011, the Islamic Republic of Iran has engaged in a fuel subsidies reform of unprecedented scale. The organization of the reform itself, its design features, its economic and social outcomes all provide major lessons learned.

Size and phase-in: Most countries which removed fuel subsidies or introduced environmental taxes used a phased approach. Fuel prices were increased gradually, starting off from minor adjustments that built up over the course of years, and often covering only individual fuels. Iran, by contrast, increased prices across the different fuels by approximately 2000% over the course of one week.

The price increases were carried out during the time of the year with the lowest energy use (November-December), just after the harvest to buffer impact of diesel price increases on agricultural output, and just after fuel users had received their quota allocations of subsidized fuel under the preceding price system, to buffer their transition during the first weeks.

Use of revenues: Half of the freed-up revenues from phasing out the subsidies were used to compensate households. The compensation took the form of equal lump-sum transfers per person. Iranians were asked to apply for the compensation long before the price increases, and the compensation was paid out more than one month before. The funds were paid into special bank accounts created for each household head, with the payment multiplied by the number of household members up to 6. To make this organization of compensation possible, the government had to extend the coverage of bank services in rural regions. Close to all Iranians applied and received the compensation payments, making it effectively an Unconditional Basic Income. From autumn 2013, the compensation was targeted to households earning less than a threshold income that exempts the richest 20-30%.

Whereas the beneficiaries' accounts were debited with the compensation payments long before the price increases, any withdrawals were blocked up to the date of the price increases. In this way, the government created an expectation with citizens to look forward to the price increases as their start would unlock the compensation funds.

The compensation payments were large relative to the income of the poor. The government's rhetoric emphasized that the fuel price increases would benefit the poor, as their share in fuel consumption was low compared to higher income classes. Conversely, **the compensation payments would be a larger proportion of poor households' income.** This information campaign started more than a year before the price increases and involved frequent declarations by both officials and publicly known personalities from social and religious life. The pay-out process was organized such that each day in the month preceding the price increases citizens in two regions would receive the payment. This way the government was able to persistently generate news about the compensation over a prolonged time period. Another transparency instrument was a website on which households could check whether they had received the payment yet. **Subsequent to the reform, inequality fell from a Gini coefficient of 0.42 to 0.34.**

Besides the compensation provided to households, companies were provided 30% of the saved revenues, targeted to sectors that were identified as vulnerable. The remaining 20% were allocated to public sector units to buffer the impact of some of their own increased fuel costs. To increase the stakeholders' trust in the disbursement of the compensation, the revenue-neutrality of the reform was written into the legal conditions from Parliament to the Executive that governed the reform.

Macroeconomic Impacts: Coinciding with the fuel price reforms, inflation increased significantly. During the same period, Iran was subject to an increase in UN sanctions which may equally account for some of the inflation impact. Nevertheless, the dramatic increase in fuel prices certainly accounted for an important share of the inflation. To counter hoarding and panic buying, the authorities stockpiled essential goods and published that they would be ready to distribute these goods directly to the population in case of large price increases, to mitigate those increases.

Rebating the saved subsidies to consumers boosted domestic demand in non-oil industries, diversifying the economy. However, the policy also incentivized imports as the price of domestic produce rose relative to the price of overseas products.

Political economy: Increasing fuel prices is routinely seen as a risk for the popular support of governments. In the Iranian case, the reform included several design features to improve this Political Economy problem.

Behavioral Economics identifies that most people demand much more compensation for giving up an asset than they are willing to pay for obtaining it. As a result, revenue-neutral reforms in which one tax is increased and another tax is decreased often attract the ire of losers much more than the approval of winners. Even if the average citizens win more in compensation than they lose in fuel price increases, fuel price reforms risk common disapproval. Iran dealt with these problems by **paying out the compensation before the price increases,** and by committing that the accounts holding these compensation payments would only be unlocked in the moment of the fuel price increases. This is a use of endowment effects: letting citizens see the compensation payments in accounts on their name for extended periods instills a sense of entitlement. A politician from the opposition who may demand the removal of the fuel price reform plans would threaten that entitlement. Through this setup, public ownership of the reform increased and citizens became clear what they would lose if the reform did not go through.

This sense of entitlement was important also because the adjustment in fuel prices was large, enabling compensation payments to be recognizably large, representing a tangible sum to fight for. This large signal was also enabled by introducing the price changes in one large adjustment rather than gradually.

The poverty effects of fuel price reform are another routine critique that fuel price reforms would endanger the re-electability of incumbents. The Iranian case was the contrary. Due to the compensatory payments, the reform was regarded as so pro-poor that the Iranian parliament initially withheld approval for the reform on the basis that the government was buying mass support from poor voters. The expected Political Economy impact was hence the opposite of the standard textbook story.

For the general public, tax shifts are generally more complex to understand than other fiscal policies that involve only one variable changing. Communicating the rationale of such policies to the public is hence difficult. Besides the government's long-term information campaign, Iran used utilities bills as an information tool. The utility bills of households showed the "true cost" of energy alongside the charged cost well before the price increases, so consumers knew to what extent energy was being subsidized.

I. Turkey: fuel tax reform

Even though Turkey's major fuel tax reforms date back to the early and late 2000s, the country still provides important lessons to be learned, showing a non-environmental motivation for high fuel taxation.

Turkey increased fuel taxes as a response to its financial crisis from 1999-2001. The objective was strictly to increase tax revenues, not to improve environmental outcomes. Under a series of IMF programs from 2000-2004, fuel was found to be one of the best sources of additional tax revenue. This is because the elasticity of demand for fuel was found to be low (Ramsey efficiency), and fuel taxation had much lower requirements for data and administrative capacity than alternative taxes. Compared to other taxes, fuel taxes were also particularly hard to evade. This robustness of fuel taxes against evasion held true despite the fact that some of Turkey's neighboring countries had much lower fuel taxes. The proportion of tax avoidance through border traffic was not sufficiently high to endanger tax revenues.

Like Morocco, Turkey is mostly import-dependent for its fuel needs (74%), and the taxation of fuel also contributes to controlling the effect that rising incomes have on the current account through increased

energy demand. **Turkey hence increased its taxes for gasoline, diesel and heating oil, making it the OECD country with the greatest fuel taxes**. Not only the level size of fuel taxes, also the rate of change in fuel taxes was the highest observed till-date in any OECD country. Alleviating fears that fuel tax increases slow down economic growth, the Turkish economy rapidly expanded over the same period.

Also, after Turkey successfully implemented its budget consolidation in the first half of the 2000s, the political interest in fuel taxes did not cede and the country further increased the share of fuel taxes in its overall public revenues to 15% in 2008, compared to just 3-4% in many OECD countries.

Turkey's fuel tax reform is generally seen as pro-poor because car ownership in Turkey is concentrated in upper income groups. Turkey is also the country with the lowest car ownership rate in the OECD and the fuel taxes are credited for having controlled the increase in car ownership during the rapid economic growth of the last 15 years. Besides the fuel tax, also vehicle registration taxes were implemented. These were scheduled such that larger vehicles are taxed at much higher rates, again to lower inequality. As the objectives for fuel tax reform were purely fiscal, the excise taxes were not earmarked for special purposes but instead contributed to the general budget, just with a rule that revenues are shared with regional governments, a rule that generally applies to a wide range of taxes in Turkey.

Bibliography

Croitoru, Lelia, and Maria Sarraf. 2017. "Estimating the Health Cost of Air Pollution: The Case of Morocco." *Journal of Environmental Protection* 08 (September): 1087. https://doi.org/10.4236/jep.2017.810069, also Le Cout de la Dégradation de l'Environnement au Maroc. Groupe de la Banque Mondiale. Available at : http://documents.banquemondiale.org/curated/fr/521351468773978229/pdf/259920public0version.pdf.

Dinan, Terry. 2015. "Offsetting a Carbon Tax's Burden on Low-Income Households." In *Implementing a US Carbon Tax*. Abingdon: Routledge.

Goulder, Lawrence, and Ian Parry. 2008. "Instrument Choice in Environmental Policy." *Review of Environmental Economics and Policy* 2 (2): 152–74.

Ian Parry, Chandara Veung, and Dirk Heine. 2014. "How Much Carbon Pricing Is in Countries' Own Interests? The Critical Role of Co-Benefits." https://www.imf.org/external/pubs/cat/longres.aspx?sk=41924.0.

Ian Parry, Dirk Heine. 2014. "How Should Different Countries Tax Fuels to Correct Environmental Externalities?" *Economics of Energy & Environmental Policy* Volume 3 (Number 2). https://ideas.repec.org/a/aen/eeepjl/eeep3_2_05parry.html.

IMF. 2017. "Morocco : Selected Issues." Washington, DC: International Monetary Fund. Middle East and Central Asia Dept. https://www.imf.org/en/Publications/CR/Issues/2018/03/12/Morocco-Selected-Issues-45714.

———. 2018a. "World Economic Outlook Database April 2018." https://www.imf.org/en/Publications/WEO/Issues/2018/03/20/world-economic-outlook-april-2018.

———. 2018b. "Morocco: 2017 Article IV Consultation." Washington, DC: International Monetary Fund. https://www.imf.org/en/Publications/CR/Issues/2018/03/12/Morocco-2017-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-45713.

OECD. 2006. *The Political Economy of Environmentally Related Taxes*. *The Political Economy of Environmentally Related Taxes*. Vol. 53. Paris: OECD Publishing. https://doi.org/10.1177/0022146512469014.

Parry, Ian, Victor Mylonas, and Nate Vernon. 2017. "Reforming Energy Policy in India: Assessing the Options." Washington DC. https://doi.org/10.5089/9781475595734.001.

Taylor, Lance. 2016. "CGE Applications in Development Economics." *Journal of Policy Modeling* 38 (3): 495–514. https://doi.org/10.1016/j.jpolmod.2016.02.010.

Vivid Economics. 2012. "Carbon Taxation and Fiscal Consolidation: The Potential of Carbon Pricing to Reduce Europe's Fiscal Deficits." Brussels.

World Bank. , forthcoming. "Fiscal Policies for Development and Climate Action."

———. 2018. "Kingdom of Morocco Systematic Country Diagnostic : Governing Towards Efficiency, Equity, Education and Endurance." Washington, DC: World Bank. http://hdl.handle.net/10986/29929.