

Ecuador's climate targets: A credible entry point to a low-carbon economy?

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ABSTRACT

Long-term credibility is a central pillar of climate policy. This paper assesses whether Ecuador's recently adopted climate targets, policies to decarbonize the power sector, and measures to reduce deforestation constitute a credible basis for a transformation towards a low-carbon economy. Based on the literature on the design of credible climate policy and expert interviews, we argue that even though Ecuador's existing policies may reduce emissions in the short term, they do not yet constitute an entry point for a long-term strategy of economic transformation. We then outline politically and institutionally feasible mitigation measures, which we evaluate from a dynamic policy sequencing perspective according to their potential to prepare the ground for more stringent measures to reduce emission in the future. These measures include inter alia reform of driving restrictions, public transport, vehicle efficiency standards, support for electric cars, and results-based payments to reduce land use emission. Such reforms will need to be phased in gradually and embedded in a broad fiscal reform package. To counter potential adverse distributional effects of higher energy prices, low-income groups could be protected by lowering other taxes, scaling up investment in education, and block-pricing schemes. Furthermore, increased participation of key stakeholders would likely reduce public opposition against energy- and climate-related policies, such as fossil fuel subsidy reform.

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Introduction

Due to the long lifetimes of GHGs in the atmosphere and the inertia of energy capital stock, long-term credibility is crucial for the successful implementation of climate measures (Hovi et al., 2009). Policy credibility, understood as the expectation that existing measures will remain in place, or that additional measures will be adopted to meet targets announced by the government, has a strong influence on the economic behavior of non-government actors, e.g. regarding investment decisions (Nemet et al., 2017). For this reason, this study examines whether existing policies are appropriate to incite a long-term transformation of energy and land use patterns.

In 2008, Ecuador became the first country globally to adopt a constitution that includes inalienable rights of nature (Art. 71) (Asamblea Constituyente, 2008). The constitution also recognizes the government's responsibility to adopt measures to mitigate climate change (Art. 440). These targets are reflected in the national development plan ('Plan Nacional para el Buen Vivir') for the period 2013–2017, which includes environmental sustainability (objective 7) as well as restructuring economic activity towards decreased dependence on extractive industries

and achieving higher shares of renewable energy (objective 10) as important cornerstones for inclusive socio-economic development (Secretaría Nacional de Planificación y Desarrollo, 2013). A pronounced concern for environmental integrity can also be deduced from the most recent World Values Survey (2014), where more than 23% of Ecuadorians named environmental pollution as the 'most serious problem of the world' (compared to less than 6% in Chile and Brazil, roughly 9% in Argentina, and about 18% in Peru).

This perspective seems to be confirmed by the fact that Ecuador's 'Intended Nationally Determined Contribution' (INDC) submitted to the United Nations Framework Convention on Climate Change (UNFCCC) specifies emission reduction targets with respect to a business-as-usual (BAU) projection (Government of Ecuador, 2015a). The INDC is based on the national climate change strategy (Government of Ecuador, 2012) and climate change plan (Government of Ecuador, 2015b) (details on policies are presented in the Energy and climate policies section).

One of the key findings of this paper is that current climate measures might be sufficient to achieve emission reductions in the short- and mid-term, especially in view of economic growth rates well below those projected. However, large-scale decarbonization is likely to be obstructed by rapidly growing emissions from oil consumption in the transport sector, where gasoline and diesel are still heavily subsidized. Based on expert interviews and document analysis, we argue that the

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credibility of efforts to reform these fossil fuel subsidies is undermined by institutional and political barriers, such as the inability to provide compensation for adverse distributional effects and lacking involvement of key stakeholders. We also identify politically and institutionally feasible mitigation options and evaluate these options according to their potential to support economic transformation strategies.

Research design and relation to previous studies

The central research question addressed by this paper is whether Ecuador's climate targets constitute a credible basis for a long-term strategy of economic transformation. Our analysis is based on 14 expert interviews carried out in Quito in April and May 2016 and complemented by an analysis of official documents. As the interviewed experts covered a broad spectrum, ranging from experts for electricity markets to public finance specialists, we deliberately refrained from using a standardized questionnaire and decided to resort to semi-structured interviews instead. Our interviews included experts from key ministries (environment, agriculture, and finance), implementing agencies (Servicio de Rentas Internas, Secretaría Nacional de Planificación y Desarrollo, Instituto Nacional de Energías Renovables), national and international NGOs (Grupo Faro, Centro de Planificación y Estudio Social, Friedrich-Ebert-Stiftung) and bi- as well as multilateral donors (United Nations Development Program and Gesellschaft für Internationale Zusammenarbeit) (see Appendix A for a list of interview partners and Appendix B for an example of interview questions).

The theoretical foundation of this study lies in current advances in the understanding of credibility issues in climate policy formulation. Helm et al. (2003) demonstrate that multiple policy objectives, irreversible energy investments, and the possibility to renege on ex-ante commitments can make announced policies time-inconsistent. That is, even though policy makers have set future targets, they have an incentive to deviate from their plan and impose less stringent policies, for instance as a reaction to strategic underinvestment into abatement technologies by firms who anticipate the government's reaction. Brunner et al. (2012) discuss how legislation of a long term governance framework, delegation to independent authorities, and securitization (i.e. creating financial commitments vis-à-vis investors) can enhance the credibility of long-term climate policies. Aldy (2014) emphasizes the importance of policy surveillance and shows how increasing transparency can strengthen participation in and compliance with international climate agreements.

For the analysis of Ecuador's climate targets, we rely on the framework proposed by Nemet et al. (2017). Based on insights from various policy areas (such as monetary, fiscal and trade policy), this framework identifies four key elements of credible climate policy: the design of rules, transparency and trust, political economy and compensation, as well as robustness (see the *Assessing the credibility of Ecuador's climate policy* section for details). This paper hence contributes to a fast-growing literature on the political economy of climate policy (Helm, 2010; Lachapelle and Paterson, 2013; Fankhauser et al., 2015). In particular, our analysis of factors that undermine the long-term credibility of Ecuador's climate targets is closely related to contributions assessing political and institutional barriers to climate policy implementation (Unruh, 2000; Staub-Kaminski et al., 2014), and our assessment of feasible mitigation policies that might pave the way for more ambitious future targets is conducted from the perspective of the literature on policy sequencing (Meckling et al., 2015). Focusing on the credibility of real-world policies, our analysis applies insights from the theoretical literature on credibility and commitment to assess the role of political and institutional factors for the feasibility of climate policy in Ecuador.

In terms of regional coverage, Latin America has received comparatively little attention in the literature on climate change mitigation so far. Most studies deal with the largest economies in the region, especially Brazil (Lucena et al., 2016; Octaviano et al., 2016), Mexico (Veysey et al., 2016; Rosas-Flores et al., 2017) and Chile (García Benavente, 2016; Sanhueza and de Guevara, 2014). Existing literature on Ecuador has

mostly focused on the proposal to leave oil reserves located in the Yasuní national park unexploited in exchange for compensatory payments from the international community (Finer et al., 2009; Rival, 2010; Vallejo et al., 2015). A notable exception is Escribano (2013), who shows how Ecuador's energy policy aims to achieve contradictory environmental and development targets. In a similar vein, Finer et al. (2008) examine the impacts of oil and gas exploitation on biodiversity and indigenous communities in the Western Amazon, and Bozigar et al. (2016) analyze the effects of oil extraction on indigenous livelihoods in the Northern Ecuadorian Amazon.

To our knowledge, our study is the first to address the political economy of Ecuador's energy policies from the perspective of climate change mitigation. As Ecuador is a comparatively small emitter, accounting for only 0.3% of global GHG emissions, national climate change mitigation policies will have rather minor direct effects on the global climate. Nevertheless, Latin America is frequently regarded as a 'bell-weather' for reconciling socio-economic with environmental goals. Hence, successful steps towards low-carbon development in Latin America could provide a motivation for other regions to strengthen their climate policies (Edwards and Roberts, 2015). In addition, understanding the political impediments for the achievement of long-term climate targets, and how these impediments can be overcome, can yield important insights to inform policy design in other countries (Steinberg, 2015).

Socio-economic development, energy use, and emissions

This section first provides a brief overview of current socio-economic developments in Ecuador. It then discusses the structure and development of the country's energy use patterns and GHG emissions.

Socio-economic situation

Ecuador has a population of slightly above 16 mn. Since 2001 its official currency is the US\$, which was adopted after a serious banking crisis in the late 1990s had resulted in inflation rates of more than 50% (Jácome, 2004). Living conditions have persistently improved throughout the past two decades. For instance, life expectancy increased from 71 years in 1995 to about 76 years in 2015, while during this period infant mortality declined from 35 to 18 per 1,000 live births, and the share of people living below the poverty line of US\$ 1.90 per day (at year 2011 PPP US\$) declined from almost 14% to less than 4% (see Table 1). However, economic inequality remains an important concern. Even though it has persistently declined, the Gini index still exceeds 45, and more than 35% of national income accrues to the richest 10% of the population, whereas the poorest 10% only receive 1.7%. In addition, even though access to electricity is almost universal, more than 13% of the population does not have access to a clean water source, and more than 15% lacks access to decent sanitation facilities.

Table 1

Selected socio-economic indicators for Ecuador for the period 1995–2015.*: Value for 2014.

Source: World Bank (2016).

	1995	2000	2005	2010	2015
GDP/cap (constant 2010 US\$)	3847.5	3678.9	4286.5	4657.3	5366.5
GDP/cap PPP (constant 2011 international US\$)	7726.2	7387.6	8607.8	9352.3	10,776.6
GDP growth (%)	2.3	1.1	5.3	3.5	0.2
Poverty (\$1.90/day, 2011 PPP) (%)	13.8	28.2	13.6	7.1	3.8*
Life expectancy (years)	71.2	72.9	74.1	75.0	75.9*
Infant Mortality (per 1000)	35.2	28.4	24.3	21.3	18.4
Income share highest 10%	40.0	45.9	42.6	38.4	35.2*
Income share lowest 10%	1.0	0.9	0.9	1.4	1.7*
GINI index	51.0	56.4	54.1	49.3	45.4*
Access electricity (%)	–	94.0	–	97.0	–
Access sanitation (%)	63.5	69.7	75.3	80.7	84.7
Access water (%)	76.8	79.7	82.3	84.9	86.9

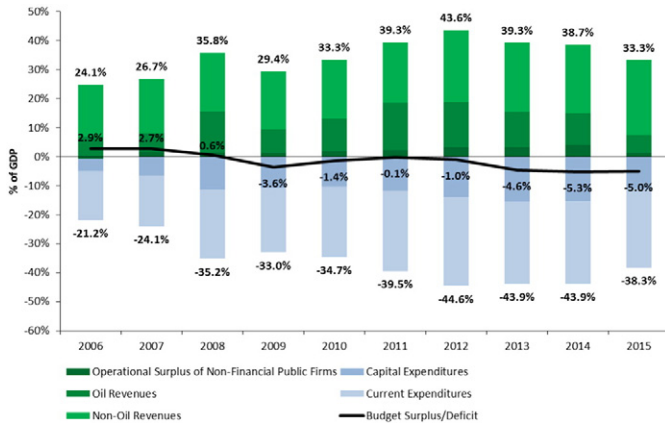


Fig. 1. Total expenditures, revenues, and budget deficit as share of GDP. Own depiction based on data from the Ecuadorian Central Bank (2016).

Per-capita income is roughly US\$ 5,400 at year 2010 US\$ (slightly below US\$ 11,000 at power-purchasing parity). The economy displayed robust economic growth of on average more than 4% per year between 2000 and 2014. As an upper middle income country, official development assistance (ODA) is of relatively minor importance for Ecuador; in 2014, ODA amounted to about 0.2% of GDP (World Bank, 2016).

However, Ecuador's economy, which is highly dependent on oil exports, suffered substantially from the decline of oil prices, such that economic growth in the year 2015 was close to zero. On April 19, 2016, the country was struck by a major earthquake of scale 7.8, causing more than 600 casualties and resulting in economic costs of more than 3% of GDP (New York Times, 2016). As a result, economic activity was forecast to contract by more than 2% in 2016 (IMF, 2016).

Since President Correa assumed office in 2007, public spending as a share of GDP has almost doubled (Fig. 1), which is only partly covered by increasing oil revenues and higher taxes. Even though expenditures have been cut to counter the budgetary impact of declining oil revenues, budget deficits of roughly 5% have persisted since 2013. At 39.6% of GDP, public debt is close to the constitutional limit of 40%; to circumvent this limit, a recent presidential decree has redefined which positions constitute public debt (El Comercio, 2016).

To cover the additional costs of earthquake damages, the government raised the value-added tax (VAT) from 12% to 14% and introduced a special tax on higher earners (The Telegraph, 2016). The need to cover current expenses also led the government to dissolve the stabilization fund that had priorly been available as a mechanism to smooth out oil price volatility (New York Times, 2016). Moreover, the government is increasingly relying on Chinese 'loan-for-oil' contracts, under which credits are repaid in kind (Escrignano, 2013).¹ These arrangements have repeatedly been criticized for their lack of transparency (Santos Saint Romain, 2016).

Energy use and emissions

Producing about 543'000 barrels of oil per day in 2015, i.e. about 0.7% of global production, Ecuador is the smallest OPEC member. Its total recoverable oil reserves are estimated to be 1.2 bn tons, roughly 0.5% of global reserves (BP, 2016). All hydrocarbon resources are owned by the State. Even though the brunt of resource extraction is carried out by state-owned enterprises, some foreign companies operate on the basis of a fixed service fee for exploration and production (EIA, 2015).

Total primary energy consumption has almost doubled since 2000 (Fig. 2a). Oil still makes up about 85% of energy use. Oil products are

mainly used in the transport sector, which accounts for the largest share of energy consumption, as well as for electricity generation. Despite Ecuador's substantial hydropower potential, oil consumption in the power sector has increased, not only in absolute, but also in relative terms: whereas oil-fired power plants accounted for about 28% of power generation in 2000, this number had increased to almost 35% in 2012 (with hydro accounting for roughly 54%, and natural gas for 10%, with a negligible share for other renewable energy sources, such as biomass) (IEA, 2015). As power generation is regarded to be a strategic sector, it is planned and regulated by the government, and participation of the private sector in power generation and transmission is limited to a maximum share of 49%.

Per capita greenhouse gas (GHG) emissions (including non-CO₂ GHGs, such as methane) amount to about 9 tCO₂-eq., considerably above the world average of about 6.6 tCO₂-eq. The main sources of emissions are deforestation and land use change (LULUCF), as depicted in Fig. 2b. However, there is substantial uncertainty regarding land use emissions. Official Ecuadorian sources put land use emissions at 16 MtCO₂-eq. (Government of Ecuador, 2015b), which is less than 20% of the 83 MtCO₂-eq. stated in the CAIT (2014) data. The fastest emission growth has been observed in the power and the transport sector, where emissions have increased by on average 7% and 6% per year since 2000, respectively.

In recent years, the government has been active to devise policies on the international as well as on the national level to slow down the increase in overall emissions and eventually achieve emission reductions. These policies will be discussed in the next section.

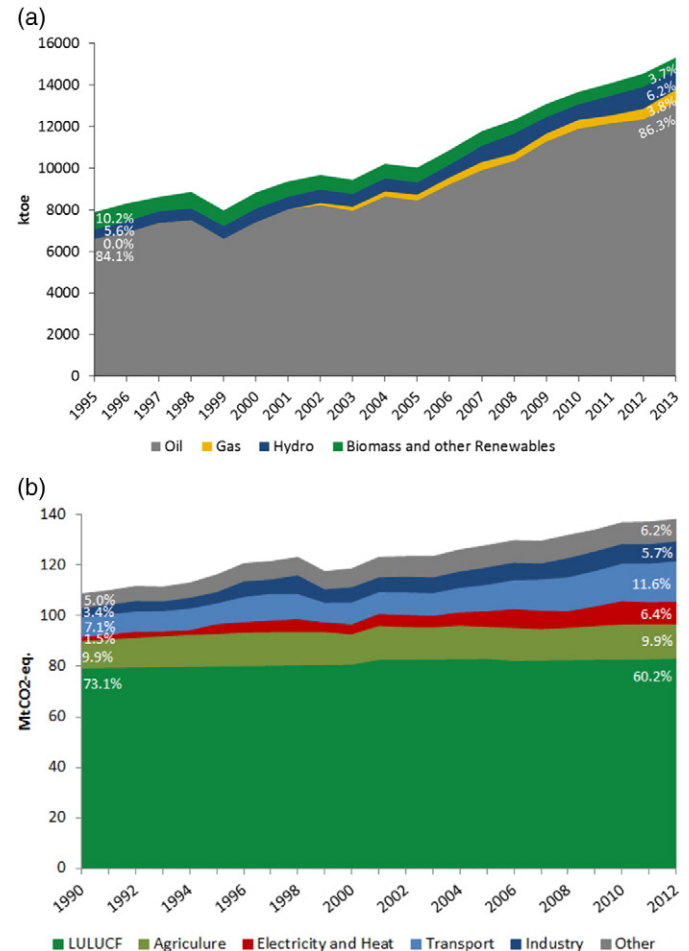


Fig. 2. Energy use by energy carriers (panel a) and emissions by sector (panel b). Own depiction based on data from IEA (2015) and CAIT (2014).

¹ Even though Ecuador had been cut off from the international bond market after defaulting on its foreign debt in 2008, it successfully attracted new loans from foreign lenders in 2015 (Financial Times, 2015).

Energy and climate policies

This section first reviews energy and climate policies that have been enacted on the international and the national level. It then discusses how these policies could be harmonized with respect to the concept of 'net avoided emissions' and implemented by means of carbon pricing.

International position

Ecuador has been a member of the UNFCCC since its inception in 1994 and has provided two national communications (Ministerio del Ambiente, 2000; Ministerio del Ambiente, 2011), which include inventories of emission sources and identify mitigation potentials as well as adaptation needs. The third national communication is currently under preparation and expected to be released soon.

In the international arena, Ecuador has historically been aligned with the Bolivarian Alliance for the Peoples of our America (ALBA) countries. This group, which also includes inter alia Bolivia, Cuba, Nicaragua, and Venezuela, has so far been reluctant to reduce their emissions, emphasizing their right to development and the historical responsibility of industrialized countries. However, the Ecuadorian government is regarded to be the most progressive of the ALBA countries and to gradually assume a more constructive role in international climate policy (Edwards and Roberts, 2015). In the wake of the 21st conference of the parties (COP21) in 2015, which resulted in the Paris Agreement (UNFCCC, 2015), Ecuador presented its INDC. Commitments to reduce emissions are defined relative to a BAU projection (Government of Ecuador, 2015a). In terms of reduction commitments, the INDC states an unconditional reduction target of 20.4% to 25.0% below BAU by 2025, and a more ambitious target of 37.5% to 45.8% below BAU conditional on international assistance. In order to achieve these targets, the share of renewable energy in the power sector is targeted to reach 90% by 2017 (mostly by large hydropower plants with envisaged new capacities of more than 4300 MW in addition to the BAU) and increase even further until 2025. Furthermore, in the unconditional case, 1.5 mn induction stoves shall be introduced and 4.3 mn in the conditional one. Finally, in addition to emission reductions in the energy sector, the INDC also mentions the conditional target of preventing cutting down 2 mn ha of forest until 2025, but does not translate this target into emission reductions.

Interestingly, the document does not reveal the BAU projection against which these reduction targets are defined, making it impossible to assess their stringency. From one interview partner, we were able to obtain projections for energy-related CO₂ emissions (which neither include land use, the largest emission source, nor non-CO₂ GHGs). This projection, displayed in Table 2, is based on the assumption of continued economic growth of about 5% per year. In the BAU, new power generation is assumed to be covered by 50% hydro and 50% oil-fired, resulting in an increase of CO₂ emissions of slightly more than 80% by 2025. The reductions envisaged for energy-related CO₂ emissions fall in the range indicated by the INDC for total emissions (however, it is not clear whether the INDC assumes a comparable BAU increase of total emissions). It should be noted that even the conditional target corresponds to an increase of emissions of almost 10%.

The government's Yasuni-ITT initiative envisaged to leave roughly 850 mn barrels of oil located inside one of the world's most biodiverse regions untapped if half of the foregone revenues, i.e. US\$ 3.5 bn (given the

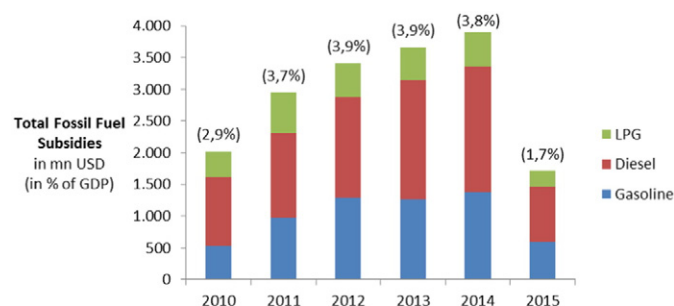


Fig. 3. Fossil fuel subsidies in Ecuador (total amounts and percent of GDP). Own depiction based on data from the Ecuadorian Central Bank (2012, 2015).

oil price at the time the proposal), were covered by the international community (Vallejo et al., 2015). However, this proposal received only lukewarm support by potential donors, who were afraid to create a precedent that would have provided an incentive for other countries to use the threat of destroying their natural reserves to demand financial compensation for not doing so. As a consequence, drilling has begun in 2016 (The Guardian, 2016).

Ecuador is part of the REDD+ early mover program. Under this program, Germany and Norway provide up to US\$ 90 mn per year in the form of results-based payments to reward emission reductions from avoided deforestation with respect to an agreed baseline (at an implied carbon price of US\$ 5 per ton of CO₂). In total, Ecuador has received climate finance of about US\$ 2.2 bn between 2010 and 2013, predominantly in form of loans from the Inter-American Development Bank and the Latin American Development Bank (Peláez and Herrera, 2014).

Finally, Ecuador has also advocated the so-called Daly-Correa tax, which would impose a tax of 3 to 5% on oil exports to industrialized countries and channel the resulting revenues into climate measures in developing countries (The Guardian, 2012).

National policies

The National Climate Change Strategy (Government of Ecuador, 2012) lays down abstract principles, and the more detailed National Climate Change Plan deals with implementation issues in the short and medium term (Government of Ecuador, 2015b). Moreover, the aim to decarbonize the power sector by increasing the share of hydropower is laid down in the National Energy Agenda for the period 2016 to 2040 (Ministerio Coordinador de Sectores Estratégicos, 2016).

Most interviewees stated that the main motivation to expand hydropower does not lie in environmental considerations, but can be explained by the fact that generation costs are well below those of oil-fired power station, which currently account for roughly 35% of power production (see the Energy use and emissions section). In addition, hydropower is believed to be a centerpiece of economic modernization, including plans to increasingly introduce induction stoves and electric cars, and perhaps export electricity to neighboring countries, namely Peru, Colombia and Chile. To this end, nine new hydropower plants with a capacity of 8700 MW are envisaged. The Sopladora plant with a capacity of about 500 MW was inaugurated in August 2016, and the Coca-Codo Sinclair plant went fully online with a capacity of 1500 MW in November 2016 (CELEC, 2016).²

Despite these efforts to decarbonize the power sector, fossil fuels receive substantial subsidies by means of price controls. For instance, at the time of research, super gasoline was sold for US\$ 0.39 per liter (GlobalPetrolPrices.com, 2016). The subsidy which results from the opportunity cost of not selling these fuels at the world market price does not appear in the public budget. Subsidies are most salient for gasoline, diesel, and liquid petroleum gas (LPG). As shown in Fig. 3, in 2014,

Table 2

Projected energy-related CO₂ emissions to achieve Ecuador's INDC (in MtCO₂). Values in brackets indicate reductions relative to the BAU. Emission reductions for the unconditional and conditional reduction targets are within the ranges of reduction target indicated in the INDC for total emissions. Source: personal communication.

	2015	2020	2025
BAU	39.8	60.5	72.5
Unconditional	39.8	46.5 [−23.1%]	56.0 [−22.8%]
Conditional	39.8	41.4 [−31.6%]	43.2 [−40.4%]

² One interviewee mentioned that decreasing water availability might make these plants vulnerable to climate change, and that this concern had not been addressed in the plants' feasibility studies in a satisfactory way.

these subsidies amounted to almost US\$ 4 bn, or 3.8% of GDP. The policy of price controls have remained firmly entrenched (see the [Political economy and distribution section](#)), and fossil fuel use remains indirectly subsidized in the form of block-pricing, under which low-consumption households benefit from a reduced electricity tariff (see the [Political economy and distribution section](#)). Announced fossil fuel subsidy reforms have been restricted to the removal of financial support for jet fuels and diesel consumed by foreign trucks ([El Comercio, 2015](#)). Hence, the decline of fossil fuel subsidies by more than half observed in 2015 can mainly be attributed to the fall in global oil prices.

To reduce emissions from land use and forestry, the National Climate Change Plan includes provisions to promote sustainable livestock farming and foster reforestation ([Government of Ecuador, 2015b](#)). The program Socio Bosque, inaugurated in 2008, provides financial rewards to forest owners for refraining from deforestation. It aims to halve the rate of deforestation and conserve about 4 mn ha of forests (which amounts to about two thirds of those forests that are not included in special protected areas). By December 2015, almost 200,000 people participated in this scheme, resulting in an estimated avoided deforestation of roughly 1.5 mn ha ([Ministerio del Ambiente, 2016](#)).

Linking national and international policies

In the international arena, Ecuador's delegation has repeatedly advanced the concept of 'net avoided emissions', which would provide financial assistance to reward emission reductions from the cessation of fossil fuel exploitation and land conversion below an agreed baseline (as had been intended under the Yasuní proposal) ([Köhler and Michaelowa, 2014](#)). This scheme would impose a 'shadow price' on emissions, as every unit of GHG emissions would entail opportunity cost of foregoing a payment from the international community.

A straightforward way to implement this approach into domestic policy would be an economy-wide carbon price. Carbon pricing would not only be an economically efficient mitigation policy, but could also increase the efficiency of the tax system and yield important co-benefits ([Edenhofer et al., 2015](#)). Ecuador's constitution explicitly mentions pro-environmental conduct as an integral objective of fiscal policy (Art. 300) and 'green' taxes already exist for cars (depending on engine size) and plastic bottles ([Almeida, 2014](#)). However, due to high transaction costs and difficulties related to monitoring, reporting, and verification, carbon pricing seems ill-suited for agriculture, land use, and forestry ([Grosjean et al., 2016](#)), which is the largest source of emissions in Ecuador. In addition, as discussed above, in many areas carbon prices are persistently negative, namely in the form of subsidies for fossil fuels. Experiences of wide-spread protest against rising fuel prices ([Ross et al., 2017](#)), most recently in Mexico, as well as President Correa's decision to exempt fossil fuels from the VAT increase confirm how contentious this topic is. In fact, the large majority of interviewees agreed in their assessment that comprehensive fossil fuel subsidy reform is unlikely in the near future. This is an especially relevant concern for the transport sector. In the absence of incentives to adopt less carbon-intensive mobility patterns, this sector is likely to turn into a 'roadblock for climate change mitigation' ([Creutzig et al., 2015](#)).

Against this background, the following section analyzes the long-term credibility of Ecuador's climate targets as a basis for a long-term strategy of economic reform. The analysis adopts a dynamic perspective that does not primarily focus on short-term emission reductions, but rather on the political feasibility of a long-term transition to a low-carbon economy. For this reason, we pay particular attention to the power and the transport sectors, in which long-lived infrastructure (power plants, roads, etc.) can be expected to result in the highest risk of 'carbon lock-in' ([Erickson et al., 2015](#)).

Assessing the credibility of Ecuador's climate policy

As Ecuador's INDC and national climate change plan do not specify the BAU trajectory against which reduction targets are defined, it is impossible to make a statement on whether these reductions are likely to be achieved. In view of the current economic downturn, it seems reasonable to expect only moderately increasing, or perhaps even declining, emissions in the near future. However, the crucial question for climate change mitigation is not whether a short-term target can be met, but rather whether policies are appropriate to pave the way for a transition towards a low-carbon economy. Drawing on the framework established by [Nemet et al. \(2017\)](#), this section assesses how credible Ecuador's climate policies are as a basis for a strategy of long-term economic transformation. This framework includes four key components, namely the design of rules, transparency and trust, political economy and distribution as well as robustness. In the following, we will introduce each of these categories and apply them to analyze Ecuador's policies.

Design of rules

A crucial design feature for any long-term policy is to establish rules that are credible while at the same time allowing for a certain degree of flexibility to deal with unexpected events ([Jakob and Brunner, 2014](#)).

Several stipulations that are relevant for Ecuador's energy and climate policy are not spelled out in full detail. This has become apparent for the discussion of the INDC in the [Energy and climate policies section](#), for which the failure to specify the BAU emission trajectory make it impossible to assess how stringent reduction targets are compared to current levels. Another salient example is the law regulating the power sector ('Ley Orgánica del Servicio Público de Energía Eléctrica', [Asamblea Nacional, 2015](#)). This piece of legislation repeatedly points to further regulations of specific details, such as the definition of 'non-conventional renewables'. However, according to one interviewee, these regulations did – at least until the date of the interview – not exist. Such gaps in the regulatory framework make it hard to form long-run expectations and open the door for manipulation to achieve short-term political aims ([Brunner et al., 2012](#)).

The problem of incomplete regulation gets exacerbated by the fact that Ecuador's energy policy is highly politicized and frequently employed as a tool to reward important interest groups. According to one interviewee who has been involved in the formulation of the power sector regulation, attempts to establish an independent regulatory agency were repeatedly thwarted by political interests ("the politicians have won"). This is in stark contrast to the aim of substituting policy makers' discretion by rule-based pricing mechanism, which emerged as one of the key elements of successful energy market reforms ([IMF, 2013](#)). In addition, energy-related policies sometimes follow contradictory goals, such as promoting environmental integrity while at the same time aiming at low energy prices ([Escribano, 2013](#)), which is known to be a major impediment for credible climate policy ([Helm et al., 2003](#)).

Further, for fossil fuel exporters, consumption subsidies that are delivered by means of price controls can be regarded to dispose of a kind of 'automatic stabilizer'. That is, if the public budget suffers because world market prices for, say, oil are low, subsidies (which result from the difference between the fixed domestic and the world market price) will also decline. Hence, subsidy reform is regarded as a less pressing issue in times in which the need to consolidate public finances opens a window of opportunity for fiscal reforms.

Transparency and trust

Transparency is important to provide information and to hold policy makers accountable for their actions ([Aldy, 2014](#)). Even though the government makes a large array of data available online, there is some concern regarding their reliability. For instance, the emission data reported

in the INDC are not in line with other data sources, such as the Climate Analysis Indicator Toolkit (CAIT, 2014), which are regarded as highly trustworthy (see the [National policies](#) section). According to one interviewee, the difference can be explained by the fact that not all industrial sectors were part of the inventory. This interviewee also suggested a political motivation to bias emissions downwards in order to claim some first successes in climate change mitigation (and be eligible for financial assistance, e.g. from the Green Climate Fund).

Civil society has a central role in the process of putting environmental legislation on the political agenda, assisting in its design, and monitoring its implementation (Hochstetler, 2012). The government of Rafael Correa has a long history of restricting the activity of civil society. As succinctly stated by the non-governmental organization [Human Rights Watch](#) (2016), “[t]he administration of President Rafael Correa has expanded state control over media and civil society and abused its power to harass, intimidate, and punish critics”.

Finally, policy-making in Ecuador is marked by frequent reversals. For instance, since Rafael Correa assumed office in 2007, the country has experienced 16 tax reforms. Another example concerns support for renewable energy, which had been subject to rather generous feed-in tariffs (FiTs) of more than US\$ 0.50 per kWh for solar power until 2010, when they were abolished (Jacobs et al., 2013). The same is true for tax breaks for hybrid vehicles, which had led to an increase of the annual sales of hybrids from about 500 to 4500 between 2008 and 2010 (El Comercio, 2014c). According to one interviewee, support for renewables and hybrid cars was mainly withdrawn because of excessive costs to the public budget. Similar issues also have contributed to the lagging adoption of induction stoves. The government had offered financial support for the acquisition of such stoves, with the intention to make the announced reduction of LPG subsidies less painful for affected households. Even though technical problems (related to the voltage commonly used in the residential sector and the one required for the stoves) were also at play, it has been suggested by one interviewee that the population didn't believe that the LPG subsidy reform would really be carried through.

Political economy and distribution

To be politically feasible, climate policies need to be regarded as ensuring equitable outcomes (Markandya, 2011). Despite overwhelming evidence that the lion's share of fossil fuel subsidies is captured by the richest households, low energy prices are still frequently assumed to be a pro-poor policy (Arze del Granado et al., 2012; Sterner, 2011). In theory, political resistance could be addressed by implementing a 'first-best' policy and using the resulting gains in economic efficiency to compensate political losers (Acemoglu, 2003). In reality, however, lump-sum compensation mechanisms may be unavailable to policy makers, such that they resort to less efficient policies to provide benefits to special interest groups (Dixit et al., 1997). Indeed, oil rich countries are found to provide higher fossil fuel subsidies (Cheon et al., 2013), and it has been argued that these subsidies might be an attractive device to distribute natural resource rents, as they are “easier to observe, easier to commit to, easier to deliver, or better targeted at core groups, than other public goods or favors offered by rulers” (Strand, 2013).

This perspective is corroborated by several interview partners, who emphasized that citizens feel a strong sense of entitlement to receive a share of their country's resource wealth (see Segal, 2012; Friedrichs and Inderwildi, 2013). According to the interviewees, most citizens understand that from the low fuel prices they only capture a disproportionately small share of the resource rent. Yet, low trust that the government would use the additional public revenues in a productive way if the subsidies were abolished results in a preference for maintaining them. Providing cash payments in exchange for higher fuel prices has emerged as a promising approach to reform fossil fuel subsidies in other countries (IMF, 2013; Vagliasindi, 2013). However, most interviewees held the view that citizens would not believe that such a transfer would be permanent. Recent issues of corruption and misappropriation

related to the 'bono de desarrollo' scheme, which provides financial assistance to poor households (El Expreso, 2015), are regarded to further undermine the government's credibility in handling cash transfers. An alternative way of compensation might be redirecting fossil fuel subsidies to public investment, e.g. in basic infrastructure (Jakob et al., 2015). Besides the question of whether the government is trusted to be able to undertake well-targeted investments, Ecuador's constitution does not allow for earmarking of revenues (with the exception of few special areas, such as education).

Hence, compensating 'political losers' is costly, and one interview partner noted that past efforts to reform fossil fuel subsidies “have cost more than they have yielded for the government budget”. Likewise, another one described fossil fuel subsidy reform as “the most unpopular measure imaginable”. In this context, it is important to note that to date, no comprehensive studies on the distributional effects of subsidy reform and compensation mechanisms have been undertaken. As a consequence, distributional concerns continue to be a major impediment for the credibility of the announced climate targets.

Robustness

Some authors have pointed out that 'hybrid' and overlapping policies, such as a carbon price in combination with FiTs, can be advantageous to simultaneously address distributional aims and ensure that removing one piece of legislation does not amount to a fundamental policy change (Lockwood, 2015).

Even though Ecuador employs a wide array of different policies to address climate-related targets, many are not so much concrete measures, but rather abstract plans. These plans were often designed independently by the respective ministries, without ensuring a sufficient degree of coordination with other ministries. In fact, several interviewees mentioned that they had problems to keep an overview of recent ideas and proposals discussed in or advanced by relevant government bodies.³ The 'Comité Interinstitucional de Cambio Climático' which has been established in 2009 (Government of Ecuador, 2009) to ensure consistency in the formulation of climate policy, so far does not seem to make a major contribution towards this end. For this reason, several interview partners mentioned fragmentation of policies as one of the most important problems for climate policy, some even speaking of a “regulatory chaos”. In addition, it appears that policies are not always properly sequenced. One interviewee suggested that policy-makers are often “doing the second step before the first”, for instance by approving the construction of new hydropower plants before the associated feasibility studies had been finished. Another example is the termination of the Fondo Ambiental Nacional, which was used to handle payments from the international community for environmental programs, before an alternative mechanism had been established, which resulted in losses of financial assistance.

Entry points for a low-carbon transition

The previous section has pointed out that numerous issues hamper the implementation of climate measures and hence undermine the credibility of Ecuador's climate policy in the long term. This section aims at identifying measures that are politically feasible in the short term and prepare the ground for a transformation of energy and land use patterns (Jakob et al., 2014b; Meckling et al., 2015).

³ These include Ministry of Electricity and Renewable Energy (MEER), Ministry of the Environment (MEA), Ministry of Hydrocarbons (MH), Ministry of Production, Employment, and Competition (MPEC), Ministry of Transport (MT), Ministry of Energy and Mines (MEM), Ministry of Coordination of Strategic Sectors (MICSE), National Secretary for Planning and Development (SENPLADES), in addition to several Secretarías acting as implementing agencies.

Design of rules

The impression from our interviews that administrative capacity is, at least in some instances, not sufficient to implement effective climate policy is backed up by the World Bank's World Governance Indicators (WGI, 2016), where Ecuador figures in the lowest 12 and 14% for the indicators for the quality of government and the rule of law, respectively. Even though institutions are known to be 'sticky' and institutional change is a slowly moving gradual process (Nunn, 2008), capacity building by the international community can make an important contribution to enhance the capabilities of public sector actors to develop and implement environmental legislation (VanDeveer and Dabelko, 2001). To come to fruition, this kind of support needs to ensure national 'ownership' i.e. support activities that arise from considerations of national self-interest rather than being donor-driven (Zimmer et al., 2015). Heeding this insight is likely to be especially important for the case of Ecuador, where policy makers are wary of outside interference and the notion of neo-colonialism is prevalent in the public discussion.

Results-based payments constitute a promising mechanism to support climate change mitigation policies, while at the same time guaranteeing ownership (Steckel et al., 2017). This approach has been used under the REDD + early mover program (see Section 4.1). Using similar schemes for other economic sectors, such as industry, transport, or resource extraction, would be in line with the net avoided emissions approach discussed in Section 4 and could help to build up trust and the institutional framework required for a long-term transformation of Ecuador's energy and land use systems.

Independent from international cooperation, the credibility of climate policies could be significantly strengthened by emphasizing links with other policy objectives, such as reduced local air pollution and congestion, conservation of biodiversity, and increased energy security (Jakob et al., 2014b). Even though these arguments have found to be important in national discourses on climate policy in other countries (see e.g. Dubash, 2013 for India; Zimmer et al., 2015 for Vietnam), they do not seem to play a major role in Ecuador.

Transparency and trust

Capacity building can not only support the drafting and implementation of legislation, but also the collection and verification of data. This is especially important for climate finance in order to ensure that disbursed funds achieve actual emission reductions without negatively impacting other dimensions of sustainable development (Jakob et al., 2014a).

In addition, climate finance can act as an important commitment device. From this perspective, national and international policies can be regarded to interact in a 'two-level game' (Putnam, 1988). That is, the threat of losing funds from donors would strengthen the government's position vis-à-vis politically powerful interest groups lobbying for a repeal or a less stringent interpretation of existing climate targets (Jakob and Hilaire, 2015).

Finally, given the history of repression against civil society, it appears unlikely that a fundamental shift in government policy towards an open dialog (such as in Chile, where more than 250 consultations were held in preparation of the country's INDC) will occur in the near future. Nevertheless, the government might have at least some narrowly defined self-interest to use existing stakeholder mechanisms. In the preparatory stages for certain policies, so-called 'mesas rondas' are required, but, according to information from the conducted interviews, these round tables are either not used, or selectively stacked with stakeholders that are in favor of the government's proposals. Involving critical positions at this stage of the policy cycle would help to anticipate the most serious controversies and avoid wide-spread protest, which occur on a regular basis to voice discontent with planned policy measures.

Political economy and distribution

Given the problems related to earmarking and productive investment of public revenues, probably the most straightforward way to protect adverse impacts of energy price increases would be lowering other taxes, for instance the VAT. In addition, some interview partners suggested that channeling additional public revenues from fossil fuel subsidy reform or carbon pricing into the education system might constitute a popular measure, as unequal access to education is widely regarded to be one of the fundamental causes perpetuating social and economic inequality (The Economist, 2016).

The 'tarifa dignidad' block-pricing scheme, which provides electricity at a lower rate for households that are low consumers,⁴ would protect these households from the adverse effects of higher energy prices. One can expect comparatively low economic distortions for such schemes, at least as long as they are designed to only cover basic electricity needs, which would also be demanded at a higher price. In this case, inelastic demand means that a price that lies below the social costs of electricity production does not have a major influence on economic behavior, but approximates the characteristics of a pure transfer. In order to ensure that only low-income households benefit from this support, categorical means-testing is a central issue (Borenstein, 2012), which could help to make the current scheme more efficient. Some interview partners also suggested to expand this logic to transport fuels, allowing poor people to acquire a certain amount of gasoline or diesel at a low price, whereas others would be charged approximately the world market price. Clearly, this proposal would suffer from fungibility, as fuels could be bought at the subsidized rate and resold at the normal rate. Yet, it would still be more efficient than the current approach of handing out subsidies indiscriminately. Furthermore, it would be in line with the step-wise approach to instigate subsidy reform mandated in the literature (IMF, 2013).

In any case, carrying out studies to assess the potential distributional impacts of different policy proposals would contribute to a deeper understanding of how different social groups would be affected, and would allow devising appropriate compensation schemes. This kind of analysis has been undertaken for numerous countries, either on the basis of computable general equilibrium models (e.g. Coxhead et al., 2013 for Vietnam) or household data in combination with input-output analysis (e.g. Grainger and Kolstad, 2010 for the US). Our interviews indicate that the required data would either be already available, or could be obtained without incurring major problems.

Robustness

A salient example of a policy that is relevant for climate change mitigation is the so-called 'pico placa' scheme, which imposes driving restrictions on cars with certain number plates on certain days, aiming to reduce congestion and local air pollution. However, there is robust evidence from other cities that this kind of scheme is unlikely to achieve its goal and might even result in exacerbating the problem it intends to address, as more old, inefficient cars remain in the vehicle fleet in order to be able to circumvent the driving restriction (Davis, 2008; Gallego et al., 2013). Recent evidence suggests that driving restrictions can work if modern, efficient cars are exempted from the restriction, thus providing an incentive to accelerate the turn-over of the vehicle fleet (Barahona et al., 2015). Importantly, increasing the share of efficient cars would not only reduce emissions, but would also alter the underlying political economy, as owners of efficient cars would be less affected

⁴ Under the tarifa dignidad, households consuming less than 110 kWh per month in the Sierra region, and less than 130 kWh per month in the Costa region, are charged 4 US\$/kWh, instead of the normal rate of 9.33 US\$/kWh. Out of 4.1 mn households, 2.5 mn (accounting for 20% of electricity use) benefit from the tarifa dignidad (El Comercio, 2014b).

by future fuel price increase and hence less likely to oppose reforms (Vagliasindi, 2013).

From this perspective, introducing fuel efficiency standards for new cars could be an important first step to prepare the ground for future fossil fuel subsidy reform (Meckling et al., 2015). Even though efficiency standards can be cost-efficient for moderate emissions reductions (Goulder et al., 2016), their costs are well above those of market-based instruments for more stringent reduction targets (Parry et al., 2014). The increased economic costs associated with fuel efficiency standards may well exceed their advantages in terms of political feasibility related to the distribution and visibility of costs. For this reason, efficiency standards are unlikely to be sufficient for ambitious climate change mitigation, especially in the presence of substantial subsidies for gasoline and diesel, but they can provide an entry point for the implementation of additional measures in the future.

As stated by one interviewee, in Ecuador the most common approach to deal with a distortionary subsidy is not to remove it, but to introduce a countervailing subsidy. An example of such a 'hybrid policy' (Lockwood, 2015) would be subsidizing electric vehicles, e.g. by exempting them from import tariffs. Even though this idea has been mentioned by several interviewees, it should be noted that the associated loss of public revenues could be a powerful counter-argument, especially in the current economically difficult situation. The withdrawal of subsidies for hybrid vehicles and FiTs for renewable energy (see the [Transparency and trust section](#)) suggests that this approach can be expected to be fraught with difficulties. A hybrid strategy combining fossil subsidy reform with financial support for a substitute could increase political feasibility while at the same time minimizing pressures on the public budget (Matsuo and Schmidt, 2017). Expanding public transport could support the transition to sustainable mobility. In this regard, the adoption of a bus-rapid-transit system in Quito is judged to be a success, whereas the construction of a metro line, initially scheduled to be operational by 2016, is plagued by delays and cost over-runs (El Comercio, 2014a).

Conclusions

This paper has argued that even though Ecuador's climate targets are an important signal, they do not yet constitute a credible entry point for a long-term strategy of economic transformation. This is especially salient for the transport sector, which has displayed rapid emission growth in recent years, mostly due to sizable subsidies for gasoline and diesel.

The major barriers to credible climate policies as well as politically feasible entry points are summarized in Table 3. The characteristic feature of these climate change mitigation options is not that they achieve emission reductions in the short term, but first and foremost their potential to relax the underlying political economy constraints to prepare the ground for more stringent climate measures in the future. Pragmatic policies, such as reforming driving restrictions, increasing the supply of public transport, introducing vehicle efficiency standards and providing support for electric vehicles could support the transition towards a low-carbon economy. The distributional consequences of such policies will

be of crucial importance for their viability. Effective compensation schemes to protect low-income groups could be devised by lowering other taxes, scaling up investment in education, and increasingly relying on block-pricing schemes. Results-based payments could be a promising option to provide financial incentives for emissions reductions and pave the way for carbon pricing on the national level. In order to ensure that these payments incentivize those activities that are most desirable from a social perspective, their interrelation with other policy objectives (such as local air quality and energy security) needs to be accounted for. The international community can play a role in supporting the build-up of administrative capacities to carry out monitoring, reporting and verification to ensure transparency and hence raise policy credibility. In addition, increased participation of key stakeholders, e.g. by means of prior consultations, seems necessary to anticipate public opposition against climate-related policies and increase the buy-in of the affected population.

On April 2, 2017, Lenin Moreno from the ruling party Alianza País clinched a tight victory to become Ecuador's next president in a runoff with Guillermo Lasso of the center-right conservative Creo party. What stance the incoming government will take on climate and energy issues remains to be seen. Regardless of the outcome of the election, economic circumstances will crucially determine the new government's policy space. On the one hand, it can be argued that the recent economic downturn increases the pressure to enact economic reforms. On the other hand, in the face of economic hardship such reforms may face fiercer opposition from the population. Case study evidence suggests that the large majority of fossil fuel subsidy reforms were undertaken in times of economic growth (IMF, 2013). In any case, as indicated by several interviewees, reform of energy policies, especially fossil fuel subsidies, will need to be phased in gradually and embedded in a broad fiscal reform package that ensures that energy price increases do not result in adverse impacts on the poorest segments of society and yield visible benefits for a broad majority of the population.

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Appendix A. List of interview partners

Unless otherwise noted, the interviews were carried out in April and May 2016 in Quito in Spanish on a face-to-face basis. Quotes provided in the main text of the paper were translated into English by the author. We carried out semi-structured interviews of 45–60 min with stakeholders from government, civil society, academia, and the private sector. Interview partners were selected to get a sufficiently broad set of different perspectives and expertise (e.g. related to energy, climate change, public

Table 3
Summary of entry points for long-term climate policy and feasible mitigation options.

Category	Barriers	Entry points
Design of rules	Lack of legislation Politicized energy policy Automatic stabilizers for subsidies	Link with other policy objectives Capacity building, ownership Results-based payments
Transparency and trust	Inaccurate data Frequent policy reversals	Capacity building Climate finance
Political economy and distribution	Lack of civil society involvement Insufficient information on impacts Cash transfers	Existing stakeholder mechanisms Carry out distributional studies Lower taxes, Invest in education
Robustness	Provisions against earmarking Fragmented policies Contradictory goals Sequencing of policies	Block-pricing schemes Reform of driving restrictions Efficiency standards Subsidies for electric cars

finance and development issues). For each interview, a set of questions was prepared in accordance with the interviewee's professional background. For this reason, different interview partners were in general asked different questions. As a consequence, the interviews are not amenable to coding and quantitative analysis, but should rather be regarded as a qualitative device to gather expert knowledge and their assessment of key issues related to climate and energy policy. The interview questions are described in the supplementary online material.

Table A 1

List of interview partners. *: Interview carried out in Berlin. ‡: Interview carried out in German. #: Interview carried out via telephone.

Interviewee	Affiliation	Date
José Jurado *, ‡	Ambassador of Ecuador in Berlin, Germany (at time of interview)	November 12, 2015
Fabian Englert, Nadia Manasfi ‡	Gesellschaft für international Zusammenarbeit (GIZ)	April 7, 2016
Freddy Moreno, Cesar Vaca	Instituto Nacional de Energías Renovables (INER)	April 8, 2016
Maria Dolores Almeida	Former Vice Minister of Finance	April 9, 2016
Rabea Weis ‡	Gesellschaft für international Zusammenarbeit (GIZ)	April 12, 2016
Daniel Zabula	Secretaría Nacional de Planificación y Desarrollo (SENPLADES)	April 13, 2016
Ana Maria Nuñez	United Nations Development Program (UNDP)	April 14, 2016
Christian Parra	Ministerio del Ambiente (MEA)	April 14, 2016
Nicolás Oliva, Pilar Reyes, Maria Eugenia Andrade	Servicio de Rentas Internas (SRI)	April 14, 2016
Gustavo Endera	Friedrich-Ebert-Stiftung (ILDIS)	April 15, 2016
Alfredo Mena	Cooperación para la Investigación Energética (CIE)	April 18, 2016
Lore Velazco, Juan José Herrera	Grupo Faro	April 20, 2016
Melani Pelaez ‡, #	University of Freiburg, Germany	April 23, 2016
Liseth Moreira	Ministerio de Agricultura (MAGAP)	April 27, 2016
Sebastián Cárdenas Medina	Centro de Planificación y Estudio Social (CEPLAES)	May 6, 2016

Appendix B. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.esd.2017.04.005>.

References

- Acemoglu Daron. Why not a political Coase theorem? Social conflict, commitment, and politics. *J Comp Econ* 2003;31(4):620–52.
- Aldy Joseph E. The crucial role of policy surveillance in international climate policy. *Clim Change* 2014;126(3–4):279–92. <http://dx.doi.org/10.1007/s10584-014-1238-5>.
- Almeida María Dolores. Política Fscal En Favor Del Medio Ambiente En El Ecuador. http://repositorio.cepal.org/bitstream/handle/11362/37433/S1420714_es.pdf, 2014.
- Arze del Granado Francisco Javier, Coady David, Gillingham Robert. The unequal benefits of fuel subsidies: a review of evidence for developing countries. *World Dev* 2012;40(11):2234–48. <http://dx.doi.org/10.1016/j.worlddev.2012.05.005>.
- Asamblea Constituyente. Constitución de La República Del Ecuador. http://www.asambleanacional.gov.ec/documentos/constitucion_de_bolsillo.pdf, 2008.
- Asamblea Nacional. Ley Orgánica Del Servicio Público de Energía Eléctrica. http://laradio.asambleanacional.gov.ec/system/files/registro_oficial_n_418_ley_organica_del_servicio_publico_de_energia_electrica.pdf, 2015.
- Barahona Hernán, Gallego Francisco, Montero Juan-Pablo. Adopting a cleaner technology: the effect of driving restrictions on fleet turnover. https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=ITEACAS2016&paper_id=2, 2015.
- Borenstein Severin. The redistributional impact of nonlinear electricity pricing. *Am Econ J Econ Pol* 2012;4(3):56–90. <http://dx.doi.org/10.1257/pol.4.3.56>.
- Bozgar Matthew, Gray Clark L, Bilsborrow Richard E. Oil extraction and indigenous livelihoods in the northern Ecuadorian Amazon. *World Dev* 2016;78:125–35. <http://dx.doi.org/10.1016/j.worlddev.2015.10.035>.
- BP. Statistical review of world energy. <https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2016/bp-statistical-review-of-world-energy-2016-full-report.pdf>, 2016.
- Brunner Steffen, Flachsland Christian, Marschinski Robert. Credible commitment in carbon policy. *Clim Pol* 2012;12(2):255–71. <http://dx.doi.org/10.1080/14693062.2011.582327>.

- CAIT. Climate analysis indicators tool: WRI's climate data explorer. <http://www.wri.org/resources/data-sets/cait-country-greenhouse-gas-emissions-data>, 2014.
- CELEC. Proyectos Hidráulicos. <https://www.celec.gob.ec/generacion/hidraulicos.html>, 2016.
- Cheon Andrew, Urpelainen Johannes, Lackner Maureen. Why do governments subsidize gasoline consumption? An empirical analysis of global gasoline prices, 2002–2009. *Energy Policy* 2013;56(May):382–90. <http://dx.doi.org/10.1016/j.enpol.2012.12.075>.
- Coxhead Ian, Wattanakuljaras Anan, Nguyen Chan V. Are carbon taxes good for the poor? A general equilibrium analysis for Vietnam. *World Dev* 2013;51(0):119–31. <http://dx.doi.org/10.1016/j.worlddev.2013.05.013>.
- Creutzig Felix, Jochem Patrick, Edelenbosch Oreane Y, Mattauch Linus, van Vuuren Detlef P, McCollum David, et al. Transport: a roadblock to climate change mitigation? *Science* 2015;350(6263):911–2. <http://dx.doi.org/10.1126/science.1258033>.
- Davis Lucas W. The effect of driving restrictions on air quality in Mexico City. *J Polit Econ* 2008;116(1):38–81. <http://dx.doi.org/10.1086/529398>.
- Dixit Avinash, Grossman Gene M, Helpman Elhanan. Common agency and coordination: general theory and application to government policy making. *J Polit Econ* 1997;105(4):752–69. <http://dx.doi.org/10.1086/262092>.
- Dubash Navroz K. The politics of climate change in India: narratives of equity and cobenefits. *Wiley Interdiscip Rev Clim Chang* 2013;4(3):191–201. <http://dx.doi.org/10.1002/wcc.210>.
- Ecuadorian Central Bank. Reporte Del Sector Petrolero. <https://contenido.bce.fin.ec/documentos/Estadisticas/Hidrocarburos/ASP201212.pdf>, 2012.
- Ecuadorian Central Bank. Reporte Del Sector Petrolero. <https://contenido.bce.fin.ec/documentos/Estadisticas/Hidrocarburos/ASP201512.pdf>, 2015.
- Ecuadorian Central Bank. Operaciones Del Sector Público No Financiero-SPNF- Porcentaje Del PIB (Mensual). https://contenido.bce.fin.ec/documentos/Estadisticas/SectorFiscal/OperacionesSPNF/OperSPNF_PIB.xlsx, 2016.
- Edenhofer Ottmar, Jakob Michael, Creutzig Felix, Flachsland Christian, Fuss Sabine, Kowarsch Martin, et al. Closing the emission price gap. *Glob Environ Chang* 2015;31:132–43. <http://dx.doi.org/10.1016/j.gloenvcha.2015.01.003>.
- Edwards Guy, Roberts J Timmons. A fragmented continent. *Latin America and the global politics of climate change*. MIT Press; 2015.
- EIA. Ecuador. http://www.eiee.es/Galerias/fichero/OtrasPublicaciones/Internacional/2015/EIA_Countries_Ecuador.pdf, 2015.
- El Comercio. 10 Meses de Retraso En La Construcción Del Metro. <http://www.elcomercio.com/actualidad/meses-retraso-construccion-metro-quito.html>, 2014.
- El Comercio. Alza de Tarifas Eléctricas Busca Bajar El Subsidio. <http://www.elcomercio.com/actualidad/negocios/alza-de-tarifas-electricas-busca.html>, 2014.
- El Comercio. Las Cuotas En La Importación Afectaron La Oferta de Híbridos. <http://www.elcomercio.com/actualidad/cuotas-importacion-afectaron-oferta-hibridos.html>, 2014.
- El Comercio. Decreto Suprime Subsidios Al Combustible de Avión Y Al Diésel Para Camiones Extranjeros. <http://www.elcomercio.com/actualidad/subsidios-combustible-diesel-avion-camiones.html>, 2015.
- El Comercio. Deuda Cerró En 26 792 Millones. <http://www.elcomercio.com/actualidad/deuda-ecuador-finanzas-economia.html>, 2016.
- El Expreso. Así Están Los Beneficiarios Del Bono de Desarrollo Humano. [August 30] http://expreso.ec/actualidad/asi-están-los-beneficiarios-del-bono-de-desar-GPGR_8321964, 2015.
- Erickson Peter, Kartha Sivan, Lazarus Michael, Tempest Kevin. Assessing carbon lock-in. *Environ Res Lett* 2015;10(8), 084023. <http://dx.doi.org/10.1088/1748-9326/10/8/084023>.
- Escribano Gonzalo. Ecuador's energy policy mix: development versus conservation and nationalism with Chinese loans. *Energy Policy* 2013;57(June):152–9. <http://dx.doi.org/10.1016/j.enpol.2013.01.022>.
- Fankhauser Sam, Gennaioli Caterina, Collins Murray. The political economy of passing climate change legislation: evidence from a survey. *Glob Environ Chang* 2015;35(November):52–61. <http://dx.doi.org/10.1016/j.gloenvcha.2015.08.008>.
- Financial Times. Ecuador returning to bond market after 2008 default. <https://www.ft.com/content/3fead266-f300-11e3-85cd-00144feabdc0>, 2015.
- Finer Matt, Jenkins Clinton N, Pimm Stuart L, Keane Brian, Ross Carl. “Oil and gas projects in the Western Amazon: threats to wilderness, biodiversity, and indigenous peoples.” Edited by Dennis Marinus Hansen. *PLoS One* 2008;3(8):e2932. <http://dx.doi.org/10.1371/journal.pone.0002932>.
- Finer Matt, Vijay Varsha, Ponce Fernando, Jenkins Clinton N, Kahn Ted R. Ecuador's Yasuni biosphere reserve: a brief modern history and conservation challenges. *Environ Res Lett* 2009;4(3):034005. <http://dx.doi.org/10.1088/1748-9326/4/3/034005>.
- Friedrichs Jörg, Inderwildi Oliver R. The carbon curse: are fuel rich countries doomed to high CO₂ intensities? *Energy Policy* 2013;62(November):1356–65. <http://dx.doi.org/10.1016/j.enpol.2013.07.076>.
- Gallego Francisco, Montero Juan-Pablo, Salas Christian. The effect of transport policies on car use: evidence from Latin American cities. *J Public Econ* 2013;107:47–62. <http://dx.doi.org/10.1016/j.jpubeco.2013.08.007>.
- García Benavente José Miguel. Impact of a carbon tax on the Chilean economy: a computable general equilibrium analysis. *Energy Econ* 2016;57(June):106–27. <http://dx.doi.org/10.1016/j.eneco.2016.04.014>.
- GlobalPetrolPrices.com. Ecuador gasoline prices, liter. http://www.globalpetrolprices.com/Ecuador/gasoline_prices/, 2016.
- Goulder Lawrence H, Hafstead Marc AC, Williams Roberton C. General equilibrium impacts of a federal clean energy standard. *Am Econ J Econ Pol* 2016;8(2):186–218. <http://dx.doi.org/10.1257/pol.20140011>.
- Government of Ecuador. Decreto N° 495. <http://clima-lac.org/doc/Componente%202/Ecuador/Decreto%20N495.pdf>, 2009.
- Government of Ecuador. Estrategia Nacional de Cambio Climático Del Ecuador. <http://faolex.fao.org/docs/pdf/ecu140074.pdf>, 2012.
- Government of Ecuador. Ecuador's Intended Nationally Determined Contribution (INDC). <http://www4.unfccc.int/submissions/INDC/Published%20Documents/Ecuador/1/Ecuador%20INDC%2001-10-2015%20-%20english%20unofficial%20translation.pdf>, 2015.
- Government of Ecuador. Plan Nacional de Cambio Climático. <https://info.undp.org/docs/pdc/Documents/ECU/PLAN%20NACIONAL%20DE%20CAMBIO%20CLIM%C3%81TICO.pdf>, 2015.

- Grainger Corbett, Kolstad Charles. Who pays a price on carbon? *Environ Resource Econ* 2010;46(3):359–76.
- Grosjean Godefroy, Fuss Sabine, Koch Nicolas, Bodirsky Benjamin L, De Cara Stéphane, Acworth William. Options to overcome the barriers to pricing European agricultural emissions. *Clim Pol* 2016(December):1–19. <http://dx.doi.org/10.1080/14693062.2016.1258630>.
- Helm D. Government failure, rent-seeking, and capture: the design of climate change policy. *Oxf Rev Econ Policy* 2010;26(2):182–96. <http://dx.doi.org/10.1093/oxrep/grq006>.
- Helm D, Hepburn Cameron, Mash Richard. Credible carbon policy. *Oxf Rev Econ Policy* 2003;19(3):438–50. <http://dx.doi.org/10.1093/oxrep/19.3.438>.
- Hochstetler Kathryn. Democracy and the environment in Latin America and Eastern Europe. Comparative environmental politics. Theory, practice, and prospects MIT Press; 2012. p. 199–230. [<http://www.jstor.org/stable/j.ctt5vj57f.13>].
- Hovi Jon, Sprinz Detlef F, Underdal Arild. Implementing long-term climate policy: time inconsistency, domestic politics, international anarchy. *Glob Environ Polit* 2009;9(3):20–39.
- Human Rights Watch. Ecuador. <https://www.hrw.org/americas/ecuador>, 2016.
- IEA. Energy balances of non-OECD countries (DVD-ROM); 2015.
- IMF. Energy subsidy reform: lessons and implications. <http://www.imf.org/external/npp/ppeng/2013/012813.pdf>, 2013.
- IMF. Ecuador gets \$364 million IMF loan to tackle earthquake reconstruction. <https://www.imf.org/en/News/Articles/2016/07/21/18/20/NA070816-Ecuador-Gets-364-Million-IMF-Loan-to-Tackle-Earthquake-Reconstruction>, 2016.
- Jacobs David, Marzolf Natacha, Paredes Juan Roberto, Rickerson Wilson, Flynn Hilary, Becker-Birck Christina, et al. Analysis of renewable energy incentives in the Latin America and Caribbean region: the feed-in tariff case. *Energy Policy* 2013;60(September):601–10. <http://dx.doi.org/10.1016/j.enpol.2012.09.024>.
- Jacome Luis Ignacio. The late 1990's financial crisis in Ecuador: institutional weaknesses, fiscal rigidities, and financial dollarization at work. *IMF Work Pap* 2004;04(12):1. <http://dx.doi.org/10.5089/9781451842937.001>.
- Jakob Michael, Brunner Steffen. Optimal commitment under uncertainty: adjustment rules for climate policy. *Strateg Behav Environ* 2014;4(3):291–310. <http://dx.doi.org/10.1561/102.00000047>.
- Jakob Michael, Hilaire Jérôme. Using importers' windfall savings from oil subsidy reform to enhance international cooperation on climate policies. *Clim Change* 2015. [http://link.springer.com/article/10.1007/s10584-015-1406-2?sa_campaign=email/event/articleAuthor/onlineFirst].
- Jakob Michael, Steckel Jan Christoph, Flachsland Christian, Baumstark Lavinia. Climate finance for developing country mitigation: blessing or curse? *Clim Dev* 2014a(August):1–15. <http://dx.doi.org/10.1080/17565529.2014.934768>.
- Jakob Michael, Steckel Jan Christoph, Klasen Stephan, Jay Lann, Grunewald Nicole, Martínez-Zarzoso Inmaculada, et al. Feasible mitigation actions in developing countries. *Nat Clim Chang* 2014b;4(11):961–8.
- Jakob Michael, Chen Claudine, Fuss Sabine, Marxen Annika, Edenhofer Ottmar. Development incentives for fossil fuel subsidy reform. *Nat Clim Chang* 2015;5(8):709–12.
- Köhler Michael, Michaelowa Axel. Limiting climate change by fostering net avoided emissions. 2014;8(1):55–64.
- Lachapelle Erick, Paterson Matthew. Drivers of national climate policy. *Clim Pol* 2013;13(5):547–71. <http://dx.doi.org/10.1080/14693062.2013.811333>.
- Lockwood Matthew. Fossil fuel subsidy reform, rent management and political fragmentation in developing countries. *New Polit Econ* 2015;20(4):475–94. <http://dx.doi.org/10.1080/13563467.2014.923826>.
- Lucena André PP, Clarke Leon, Schaeffer Roberto, Szklo Alexandre, Rochedo Pedro RR, Nogueira Larissa PP, et al. Climate policy scenarios in Brazil: a multi-model comparison for energy. *Energy Econ* 2016;56(May):564–74. <http://dx.doi.org/10.1016/j.eneco.2015.02.005>.
- Markandya Anil. Equity and distributional Implications of climate change. *World Dev* 2011;39(6):1051–60. <http://dx.doi.org/10.1016/j.worlddev.2010.01.005>.
- Matsuo Tyeel, Schmidt Tobias S. Hybridizing low-carbon technology deployment policy and fossil fuel subsidy reform: a climate finance perspective. *Environ Res Lett* 2017;12(1), 014002. <http://dx.doi.org/10.1088/1748-9326/aa5384>.
- Meckling J, Kelsey N, Biber E, Zysman J. Winning coalitions for climate policy. *Science* 2015;349(6253):1170–1. <http://dx.doi.org/10.1126/science.aab1336>.
- Ministerio Coordinador de Sectores Estratégicos. Agenda Nacional de Energía. <http://www.sectoresestrategicos.gob.ec/wp-content/uploads/downloads/2016/10/AGENDA-DE-ENERGIA-2016-2040-vf.pdf>, 2016.
- Ministerio del Ambiente. Comunicación Nacional Cambio Climático. <http://unfccc.int/resource/docs/natc/ecunc1s.pdf>, 2000.
- Ministerio del Ambiente. Segunda Comunicación Nacional Sobre Cambio Climático. <http://unfccc.int/resource/docs/natc/ecunc2.pdf>, 2011.
- Ministerio del Ambiente. Programa Socio Bosque. <http://www.ambiente.gob.ec/programa-socio-bosque/>, 2016.
- Nemet Gregory F, Jakob Michael, Steckel Jan Christoph, Edenhofer Ottmar. Addressing policy credibility problems for low-carbon investment. *Glob Environ Chang* 2017;42(January):47–57. <http://dx.doi.org/10.1016/j.gloenvcha.2016.12.004>.
- New York Times. In Ecuador, political aftershocks. [April 21] https://www.nytimes.com/2016/04/23/opinion/in-ecuador-political-aftershocks.html?_r=1, 2016.
- Nunn Nathan. The long-term effects of Africa's slave trades. *Q J Econ* 2008;123(1):139–76. <http://dx.doi.org/10.1162/qjec.2008.123.1.139>.
- Octaviano Claudia, Paltsev Sergey, Gurgel Angelo Costa. Climate change policy in Brazil and Mexico: results from the MIT EPPA model. *Energy Econ* 2016;56(May):600–14. <http://dx.doi.org/10.1016/j.eneco.2015.04.007>.
- Parry Ian WH, Evans David, Oates Wallace E. Are energy efficiency standards justified? *J Environ Econ Manag* 2014;67(2):104–25.
- Peláez Melani, Herrera Juan José. Financiamiento Internacional Para El Cambio Climático En Ecuador. <http://gflac.org/pdf/faro.pdf>, 2014.
- Putnam Robert D. Diplomacy and domestic politics: the logic of two-level games. *Int Organ* 1988;42(03):427–60. <http://dx.doi.org/10.1017/S0020818300027697>.
- Rival Laura. Ecuador's Yasuni-ITT initiative: the old and new values of petroleum. *Ecol Econ* 2010;70(2):358–65. <http://dx.doi.org/10.1016/j.ecolecon.2010.09.007>.
- Rosas-Flores Jorge Alberto, Bakhat Mohcine, Rosas-Flores Dionicio, Zayas José Luis Fernández. Distributional effects of subsidy removal and implementation of carbon taxes in Mexican households. *Energy Econ* 2017;61(January):21–8. <http://dx.doi.org/10.1016/j.eneco.2016.10.021>.
- Ross Michael L, Hazlett Chad, Mahdavi Paasha. Global progress and backsliding on gasoline taxes and subsidies. *Nat Energy* 2017;2(January):16201.
- Sanhueza José Eduardo, de Guevara Ladron Felipe Andrés. A case study of Chilean mitigation actions. *Clim Dev* 2014;6(sup1):34–42. <http://dx.doi.org/10.1080/17565529.2013.844675>.
- Santos Saint Romain Carlos Eduardo. Las Ventajas Y Problemas de Los Préstamos Chinos. <http://gkillcity.com/articulos/el-mirador-politico/las-ventajas-y-problemas-los-prestamos-chinos>, 2016.
- Secretaría Nacional de Planificación y Desarrollo. Plan Nacional de Desarrollo/Plan Nacional Para El Buen Vivir 2013–2017. <http://www.buenvivir.gob.ec/>, 2013.
- Segal Paul. How to spend it: resource wealth and the distribution of resource rents. *Energy Policy* 2012;51(December):340–8. <http://dx.doi.org/10.1016/j.enpol.2012.08.029>.
- Staub-Kaminski Iris, Zimmer Anne, Jakob Michael, Marschinski Robert. Climate policy in practice: a typology of obstacles and implications for integrated assessment modeling. *Clim Chang Econ* 2014;5(1). [<http://www.worldscientific.com/doi/abs/10.1142/S201007814400041?src=recsys&>].
- Steckel Jan Christoph, Jakob Michael, Flachsland Christian, Kornek Ulrike, Lessmann Kai, Edenhofer Ottmar. From climate finance toward sustainable development finance: from climate finance toward sustainable development finance. *Wiley Interdiscip Rev Clim Chang* 2017;8(1), e437. <http://dx.doi.org/10.1002/wcc.437>.
- Steinberg Paul F. Can we generalize from case studies? *Glob Environ Polit* 2015;15(3):152–75. http://dx.doi.org/10.1162/GLEP_a.00316.
- Stern Thomas, editor. Fuel taxes and the poor: the distributional effects of gasoline taxation and their implications for climate policy. Johns Hopkins University Press; 2011.
- Strand Jon. Political economy aspects of fuel subsidies: a conceptual framework. Policy research working paper series 6392. The World Bank; 2013. [<http://ideas.repec.org/p/wbk/wbrwps/6392.html>].
- The Economist. Academic arguments. [October 16] <http://www.economist.com/news/americas/21697009-government-has-built-up-higher-education-and-weighted-it-down-academic-arguments?zid=305&ah=417bd5664cd76da5d98af4f7a640fd8a>, 2016.
- The Guardian. Oil nations asked to consider carbon tax on exports. <https://www.theguardian.com/environment/2012/nov/21/oil-nations-carbon-tax-climate-talks>, 2012.
- The Guardian. Ecuador drills for oil on edge of pristine rainforest in Yasuni. <https://www.theguardian.com/environment/2016/apr/04/ecuador-drills-for-oil-on-edge-of-pristine-rainforest-in-yasuni>, 2016.
- The Telegraph. Ecuador to tax rich to pay for earthquake damage. [April 21] <http://www.telegraph.co.uk/news/2016/04/21/ecuador-to-tax-rich-to-pay-for-earthquake-damage/>, 2016.
- UNFCCC. Draft decision —/CP.21 adoption of the Paris agreement. <http://unfccc.int/resource/docs/2015/cop21/eng/109r01.pdf>, 2015.
- Unruh Gregory C. Understanding carbon lock-in. *Energy Policy* 2000;28:817–30.
- Vagliasindi Maria. Implementing energy subsidy reforms: evidence from developing countries; 2013. <http://dx.doi.org/10.1596/978-0-8213-9561-5>.
- Vallejo María Cristina, Burbano Rafael, Falconi Fander, Larrea Carlos. Leaving oil underground in Ecuador: the Yasuni-ITT initiative from a multi-criteria perspective. *Ecol Econ* 2015;109(January):175–85. <http://dx.doi.org/10.1016/j.ecolecon.2014.11.013>.
- VanDeveer Stacy D, Dabelko Geoffrey D. It's capacity, stupid: international assistance and national implementation. *Glob Environ Polit* 2001;1(2):18–29. <http://dx.doi.org/10.1162/152638001750336569>.
- Veysey Jason, Octaviano Claudia, Calvin Katherine, Martinez Sara Herreras, Kitous Alban, McFarland James, et al. Pathways to Mexico's climate change mitigation targets: a multi-model analysis. *Energy Econ* 2016;56(May):587–99. <http://dx.doi.org/10.1016/j.eneco.2015.04.011>.
- WGI. Worldwide governance indicators. <http://info.worldbank.org/governance/wgi/index.aspx#home>, 2016.
- World Bank. World development indicators. <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>, 2016.
- World Values Survey. World values survey wave 6 2010–2014 official aggregate v. 20150418. www.worldvaluessurvey.org, 2014.
- Zimmer Anne, Jakob Michael, Steckel Jan Christoph. What motivates Vietnam to strive for a low-carbon economy? — on the drivers of climate policy in a developing country. *Energy Sustain Dev* 2015;24(0):19–32. <http://dx.doi.org/10.1016/j.esd.2014.10.003>.