Foreword

In November 2016 - at the time of the COP 22, hosted by Morocco - the country will just have undergone one month ago parliamentary elections. The COP 22 is an adequate moment to pause and scrutinize political parties' will and capacity to address the necessary action to deal with the challenges of climate change in their party programs.

According to political theory, a political program is a promise given by a party to the people, providing answers and directions for political action; in the case political actors have been trusted with the voters' confidence - elected and put in a powerful position - they are accountable for their political decisions based on their program.

The challenge in regard to climate change on the political agenda, in Morocco and elsewhere, is the balance to be found between the economic growth paradigm - thought to be inevitable for the wealth of the nation - and the limits posed by the planetary boundaries. Planetary, or ecological, boundaries are global, but experienced locally. Moroccan political actors' decisions are determined by on the one hand the need for development and on the other hand international decisions taken to address climate change.

Green and left parties internationally have addressed these questions since many years. How do Moroccan parties address this challenge? Do they manage to include these considerations in the party programs? And, once in position of power, how do they manage to keep the climate related priorities on top of the political agenda? Are growth promises in political programs realistic and in line with the ecological limits?

The Rabat office of the German Foundation Heinrich Böll Stiftung presents with the study of Zouhair Ait Benhamou a scientific analysis of the achievements and challenges of the inclusion of ecological considerations into political programs in Morocco with a focus on the last two parliamentary elections of 2011 and 2016.

Rabat, 1st of November 2016
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Introduction

There has been a worrying trend in Morocco since the late 1990s, where debates on policy have acquired their own timetable, independent of the electoral process. Political parties used to set terms of debate for a given policy issue, but are now more than willing to take the monarchy's cue on a variety of topics. This behaviour permeates parties' political manifestos, as they care less about putting forward their own ideas, and make a special effort to integrate the monarchy's own policy ideas into their proposals. In short, political parties no longer set terms of debate, they merely go with the flow. There are numerous instances of such a shift: political parties started talking about ecological issues only since 2011. Prior to that, natural resources were mentioned only as an asset to manage for optimal growth opportunities. Natural resources conservation in an environmental setting has been an alien subject to political discourse in Morocco until it was formalised in 2010 with the Charter for the Environment and Sustained Development. In 2011 as well as 2016, electoral manifestos have therefore advertised parties' policy positions on environmental issues. The ecology of their programmes however denotes of a vast consensus and generally an abdication of party-specific policies in favour of previous programmes and charters. As a result there is a *credibility gap* between what a party advocates in terms of environmental policy and what it can actually deliver.

General elections are usually an indicator as to the health of any given representative democracy, and how well it does. The recent 2016 election in Morocco is the ninth since 1963. Yet from 2002 onward, citizen interest in elections, local or national, has flagged. The disaffection culminated in 2007, where only 37% of eligible voters turned out to the polls. In fact, the subsequent government coalition was led by a party whose total number of votes was dwarfed by the number of invalidated ballots, nationwide. Although a majority of Moroccans declare they turned out to vote in past elections, only 2% are registered party members per the Report on Human Development (2006) while 43% are unable to define themselves in partisan terms. This may explain how an overwhelming majority of voters (about 91%) look for soundness and moral rectitude as primary qualities in deciding who they would vote for. No mention is made of the candidate's manifesto or political positions.

Furthermore, political parties do not enjoy a particularly stellar reputation among their constituency: only 13% are satisfied with their performance, the lowest of any given institution, below parliament (21%) and local government (26%). Lack of information is generally attributed to this abysmal approval rating: about half of Moroccans are unable to rate parties and unions in their ability to represent them, and cannot account for what their respective positions on issues are. It therefore makes sense that at election time, candidates and the parties they represent try their best to acquaint the public with their positions as well as their commitments. In short, political parties and unions have failed to represent adequately citizens' aspirations and grievances, with only civil and civic activism to prevent disintegration of society: 7% of Moroccans are active in societies and associations.

The 2011 upheaval that swept North Africa and the Middle East certainly has given a jolt to the body politic in Morocco. All of its institutions where forced to respond to citizens' grievances one way or the other: in order to meet popular demand for change and a more democratic setting, a long-awaited constitutional reform was implemented, the first since 1996. An early general election was called in November the same year,

and the moderate islamist *Parti de Justice et Développement* (PJD), long a pariah in the political spectrum, was swept into office in a *pocket* landslide: the party's caucus was the largest at the house with 107 seats, and distanced its nearest rival by some 40-odd seats out of 395, yet the party was still compelled to form a majority coalition to govern. The 2015 local and regional elections confirmed the PJD's popularity by returning a high number of votes and significant gains in Morocco's largest cities.

Thus the kaleidoscope that is the 2016 general elections: about 15.7 million voters returned their verdict on the incumbent government coalition and its policies. Since 2006, more Moroccan households are connected to the internet, and have quasi-instantenous, unfiltered access to news coverage. There are additional resources for them to decide on which parties to support, and the latter have greatly expanded their internet presence since 2011. If only for positive media coverage, parties in Morocco have paid more attention to presentation and messaging. A byproduct of modern campaigning was hence a focus on credible manifesto design and *road-testing* it before selected audiences.

But in a more general sense, elections also allow citizens to hold their elected officials accountable. During the campaign, candidates go before their constituents to defend their record or try to persuade voters to put them into office. In Morocco's tame political climate, elections exert credible pressure on political parties to actually come up with ideas and commitments to persuade voters and shape a positive image of their organisations. At the very least, there is a discipline constraint on political parties to formulate policies for mass media to translate into an image of credibility and competence.

The 2016 general election has been in many ways anti-climatic compared to 2011, but at the same time sets a new precedent: PJD was the main beneficiary from the 2011 Arab Spring, and was swept into office thanks to an unprecedented 22% share of the popular vote. Its dominant position was further secured in 2016, where the party increased its share of parliament seats from 107 to 126 out of 395 and its share in popular vote to a little under a third of total votes. There was however little interest in those elections, as turnout fell a bit from 45.5% in 2011, to 43% this October. The decline belies however a slight increase in the number of voters who turned out to the polling station, up 600.000 from 6.1 million voters in November 2011. The campaign however was not waged on policy issues: although party manifestos significantly improved in quality compared to 2011 or 2007, the election was pure power politics, in turns a referendum on PJD's time in office and a gambit on part of its rivals to oust it from office. As a result, there was little debate on a vast array of policy issues, ranging from pension reform, budget cuts and freezes, and more relevant to this report, environmental policy with the upcoming Marrakesh COP22 conference.

The institutional peculiarities of Morocco's political system place significant contraints on what parties can or cannot do either as government coalition members or part of the opposition. They do have to contend with double barriers to entry: first, any given electoral manifesto is bound to be discarded if a party joins a coalition in favour of a consensus-based government legislative programme. Second, governing parties themselves engage in a power-sharing scheme with the monarchy, which means they also have to contend with a permanent set of policies. Regardless of which parties form the government of the day, they are bound to execute policies set out beyond the five-year legislature. As a matter of fact, the main parties have more or less explicitly incorporated these policies in their own respective manifestos, which makes it more difficult for the media, civil society and above all, citizens, to figure out which policies are advocated by which party.

Ultimately, there is a great deal of opacity as to who is accountable for which policy item. Collective responsibility, a hallmark of representative democracies, usually breaks down pretty quickly in a ruling coalition when election time draws nearer, and is seldom the norm the rest of the time.

The prevalent policymaking confusion becomes critical when it comes to ecological topics. Such policies usually evolve on a longer time framework, which makes them quite sensitive to changes in government coalitions and policies.

Political parties have been consistent in their priorities, despite different wordings throughout the years, and regardless of their respective political orientations. They all buy into the high growth paradigm, as increased production of goods and services serves many purposes. Some are high-minded, such as improved standards of living for consumers and households. Others are more practical, such as increased tax revenues, which fund spending commitments advocated by each party. The obvious limitations of this framework have been demonstrated in developed economies long before Morocco's policymakers became convinced of choosing a different path. As a result, political parties have tried to integrate environmental-conscious policies, if only in terms of messaging their manifestos. They fail however to integrate these policies within a larger framework, one that does indeed consider ecological issues to be a legitimate part of their constituents' aspirations and speak to topics they care about.

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Methodology and Outline

This report serves a multifarious purpose. First, it provides an overview of Morocco's economic model and its environmental impact. It then documents the stances made by the main political parties in Morocco regarding their environmental policies in 2011 as well as 2016, and the ecological impact of their economic proposals. And finally, it seeks to provide an analytical framework in order to assess policy proposals put forward in electoral manifestos, and convince political parties to explore the implications of their manifesto proposals more carefully in the future. To that effect, we proceed as follows:

1. Data collection: the dataset components used for descriptive statistics as well as the model versions described in this report are compiled on various sources. The World Bank World Development Indicators (WDI) and Global Economic Monitor (GEM) are used primarily for Morocco's economic indicators. We also use the World Bank's country classification to build comparisons with countries of equivalent income - Morocco falls in the Lower Middle Income group, and their indicators are used subsequently as a benchmark. We also look at the data provided in the British Petroleum Annual Statistics Report and various domestic and international agencies for energy expenditure and use.

2. An overview of Morocco's economic structure and its reliance on different sources of energy: the next section is devoted to an array of descriptive statistics to provide as accurate a picture as possible on how growth in Morocco interacts with its demand for energy, particularly electricity consumption, transportation and building, as well as its sources and predominance of fossil energy. The figures shown in this section

try to document as exhaustively as possible the state of energy use in Morocco as well as its environmental impact, both over time and in comparison to the selected benchmark.

3. A structural model is offered to describe the dynamics between GDP growth, energy use, fossil fuel and CO_2 emissions. The estimated results provide a first-hand insight on how the selected indicators would behave with respect to each party's economic proposals. We look at the 2011 and 2016 general elections manifestos to depict the main parties' respective stances on environmental policies and combine their effect with the CO_2 emissions implied in their growth targets to estimate the net impact on CO_2 emissions.

4. A more formal framework is then proposed to test the robustness of the structural results shown in the section above. The proposed model incorporates additional features that allow for a more rigorous appraisal of each party's proposals, their ecological impact in terms of CO_2 emissions, as well as the interactions of the whole economy with respect to their respective environmental policies.

5. A further description calls for the model to be expanded and be implemented for a counter-factual exercise: given its features and its ability to replicate the stylised facts described in sections above, how much does the model require in terms of public policy, and fiscal incentives in particular, as well as investment schedule to neutralise CO_2 emissions in a growth-friendly environment.

6. Our conclusions compile the results described and discussed in the sections above to draw existing contrasts between the electoral manifestos put forward by the main political parties in 2011 and 2016. We also conclude to the need for electoral manifestos to explicitly include in their commitments CO_2 emissions targets, and link them to their broader economic proposals.

A brief history of political manifestos in Morocco

Despite a 50-year old rich tradition of political campaigning and partisan activities, it is only recently that political parties in Morocco came round to the idea of quantifiable commitments to be included in their electoral manifestos. There is also still much to be done about adopting a similar mindset with regards to ecological and environmental goals.

Newspaper media outlets have long been the standard medium for public discourse on government actions and calls for accountability. The profession of journalism in Morocco has been closely identified with political activism: although the earliest newspapers published in Morocco date back to the late 19th century, mass-modern journalism came of age with Mohamed Belhacen Ouazzani and Allal El Fassi, both nationalist leaders, both founded their respective newspapers in 1947 and 1946. Nationalist newspapers were thus primarily a platform for their political parties speaking out against the French-Spanish protectorate. The confrontational and partisan blend of modern Moroccan journalism influenced significantly how political manifestos were written in the next decades following Morocco's independence. It also influenced media reporting on issues of government accountability.

This reluctance also stems from the issues of the day that drew citizens and politicians alike in the early days of independence in 1955. The May 1963 general election to convene Morocco's first elected house of representatives came in the heels of a bitterly contested constitutional referendum in December 1962 (Chambergeat - 1963) the issue of the 1962-1963 elections was one of power-sharing between the monarchy and its allies on the one hand, and the political parties of the national mouvement (*Koutla*) on the other. As a result, the political climate has not been conducive to the kind of discourse that would encourage political parties to think through their commitments to their constituents, and in return for these to hold them to account. This in turns affected the way the information print and media reported on elections. Media attitude to partisan politics therefore defined itself in polar opposites: in the hands of government, the media (radio, newspapers and even television early on) were its mouthpiece, faithfully relaying its propaganda. On the other side, the partisan print press engaged in political brinkmanship and frequently tore into executive policymaking and acted as the official spokesperson of the opposition. As a result, the media structure frequently glanced over notions of objective reporting, and presented a narrative to citizens, instead of attempting to present facts as dispassionately as possible.

Furthermore, the fact that a large number of Moroccans were illiterate meant there was a significant hindrance to modern political campaigning, one that relies on records, written statements and visual cues. It is only with the gradual access to radio and television, and later on internet, that most Moroccan households got access to a reasonable level of media diversity, even as they shun print media.

At the executive level, the lack of objective discourse on electoral manifestos generated a certain disconnect between announced targets, their feasibility, and updated reports on their completion. The alienation of policymaking can be illustrated by the fact that for many years, Morocco has relied on central planning to achieve its objectives of output growth and development. The 1960-1964 plan for instance, reports, among other things, the amount of agricultural produce needed to sustain local demand in Northern Morocco (HCP - 1959). In the case of livestock and food consumption, the planning commission uses fiscal aggregate data to estimate available livestock for meat (8.393 tons for 1960) and then arbitrarily assumes it to be underreported and feeds instead 9.000 tons in its projections to come up with a cumulative growth target of 4.000 tons of the next five years. Planning in Morocco has often been a top-down process, local and national officials sought little to no input from local communities. These targets were set with blatant disregard for geographical and meteorological conditions the report itself admits to but offers no remedy to the irrelevance of its own projections. In fact, the 1964 figures nationwide suggest a quasi-stationary production of livestock, even as the overall population increased significantly over the period. The result was a shortage of meat to satisfy local demand, and an average increase in meat-related food prices by 11%.

This particular example illustrates the problem of top-bottom planning that defined policymaking in Morocco since the early days. The planning commission did not lack in sources of information nor technical knowhow to compute its projected targets. Yet because it did not allow for regular appraisals of its targets, and more importantly, did not invite outside opinions either on design or monitoring, it failed to achieve its stated aims. What is true for agriculture is also the case for other sectors. Due to the political climate described earlier, media outlets and perhaps citizens as well, tended from then on to treat government data with skepticism - a healthy and necessary *modus operandi*

to challenge policymakers and hold them to account, but at times the wariness changed into outright rejection of official figures and statistics.

This brief compendium of the historical context into which political campaigns and manifestos burgeoned in Morocco may explain why the latter have lacked in precise, verifiable commitments until recently. In fact, it is worth pointing out that there has been a marked improvement in parties' communication strategies with the last couple of elections. Parties are now much more willing to advance quantified targets, though still hazy about the details or the overall consistency of their proposals. Professional and citizen media are also more willing to go further and actually check the proposed programmes.

The focus on numbers as an essential component of the modern electoral manifesto should not be construed as a fancy device, but a reliable indicator as to how credible the manifesto contents are. Although ballot symbols and colours were in use for many years before, political parties have been very careful about designing their official logos in the run-up to the 2002 general election. The fact that politicians have become aware of the need to create and foster a unique visual identity for citizens to identify with (and hopefully, vote for) was indeed an encouraging sign for things to come.

The essential fact however is that at the core of parliamentary democracy resides accountability: elected representatives run on platforms they advertise to their would-be constituents. The promises they made are then scrutinised during their elected term in office, and by the next election the elected representatives stand before their constituents and defend their record. Numbers in a manifesto make it easier for constituents to reach a decision and therefore can exercise their civic prerogative much more efficiently. But for this principle to run smoothly, voters need to have readily access to documented commitments, which is essentially the role of media, professional or civic-oriented. In fact, a citizen can compile records and hold their elected representative directly to account.

For all its progress and efforts to reach out to voters, the political class in Morocco has not given much thought on the ecological impact of its economic promises, for a long time. Indeed, it has only been recently that a cross-party consensus emerged about the need to integrate environmental and ecological considerations in their respective manifestos, though in broad and noncommittal terms.

The reasons behind it are multifarious: The seminal book *Silent Spring* (1962) by Rachel Carson did not have much of an impact in Morocco - and it is doubtful many read it when it was published or since. And yet the topics Carson touches upon were of the utmost importance to Morocco's agricultural vocation. The book focuses on the effects of extensive use of chemicals on the the environment, the local flora and wildlife. Given the fact that in the early 1960s agriculture made up 30% of Morocco's GDP, and the planner's focus on insuring some degree of food security, it made sense that policymakers heavily invested in land development, extensive use of fertilisers and an overall shift from traditional to large-scale farming.

In a sense, were they aware of it, Moroccan policymakers would have expressed hostility *vis-à-vis* Carson's line of argument. Policymakers as well as political parties would have argued (as sometimes they still do) that the economic benefits of the profound alteration of the balance of nature vastly outweigh any potential drawbacks. And although *Silent Spring* offers a plethora of examples where policy and business decisions resulted in ecological local catastrophes, such a negative externality is automatically discounted.

There is also another aspect linked to agriculture often overlooked, but one with real, long-term impact on the economy and society as a whole. Moroccan policymakers stressed centralised decision-making at the expense of local structures, and tended to consider traditional agriculture as an impediment to development, rather than an opportunity, or at least a basis on which one may improve upon. Between 1960 end 1967, planners were facing a significant challenge: 85% of agricultural farms were at the hands of a motley of small holders, whose productivity was stubbornly low and unsatisfactory with respect to the planners' targets. Policymakers then had the idea of using investment as an incentive to force the vast majority of farmers to adapt to the *modern* framework. The *Office National d'Irrigation* (ONI) took charge of the project, and for a while oversaw large-scale public works projects to remedy low agricultural productivity.

But by doing so, Moroccan policymakers made traditional agriculture even weaker: support and subsidies went primarily to large, mechanised and modern farms, whereas smaller plots with low productivity and over-reliance on rainfall withered away, forcing small farmers to leave their land and emigrate to cities in the hope of making a living. In the couple of decades that followed independence, Morocco's high fertility rate was exacerbated by the large shift in population from rural to urban areas, which compounded the problems Moroccan cities were already facing.

The Ministry for Agriculture conducted a study in 1969 on fertilisers used in Morocco and its patterns of consumption showed high levels of reliance on phosphate and nitrate-based products. In 1965 organic fertilisers accounted for 3% of overall use. By contrast, Phosphate-based products accounted for almost half of fertiliser use.

This digression on agricultural policy has a point: in their minds, policymakers and politicians alike focused on only one set of objectives. Paramount to any other considerations were the need to reach planned targets, provide food security. The 1965-1967 plan explicitly states that Morocco faces a high deficit in meeting domestic demand for wheat, diary product and meat, a worsening deficit in view of expanding demographics. For someone to point out that: **a)** massive support for mechanised farming is likely to push impoverished small farmers to urban centres and lead to the breakdown of rural communities, and **b)** overuse of industrial chemicals to boost productivity and yield is going to exhaust farming lands and compromise the eco-system would have been anathema to many in charge or aspiring to be. The cost of centralised agricultural policy was therefore not only to force farmers to transition brutally from ancestral farming to modern agribusiness but also in the breakdown of agricultural society and communities, and created additional problems in other areas as well.

The *Maximum Growth* mindset that has been the dominant paradigm for the 1960 and 1970 has been challenged with the publication of *The Limits of Growth* authored by Meadows & *al.* (1972) for the Club of Rome. In the section devoted to the limits of exponential growth, the authors ask a simple question: *What will be needed to sustain world economic and population growth until, and perhaps even beyond, the year 2000?*. Such a question has been since updated by Raworth (2012) with regards to the physical constraints to such a problem, but also the social and environmental limits to economic growth. In fact, the Rome Club report poses more than a question of feasibility of exponential growth, it dramatically reframes the issue of development and economic growth: given the levels of demographic growth, the state of production technology and planetary resources, can mankind afford to perpetuate its quest for ever higher growth? The more recent *Doughnut economics* framework boils down the issue to an even simpler question:

can mankind afford sustained high growth when it damages irretrievably the environment?

The Limits to Growth laid out in simple terms the issue at hand: it assumes that global supply of arable land would remain constant, while available land would start to decline gradually. Despite different *scenarii* of increased productivity, exhaustion of global resources is merely postponed in the future. Indeed, the Agriculture value added per worker has increased by a factor of 2.3 between 1980 and 2015, and contrary to predictions made in the Club of Rome report, arable land available for agriculture has been expanded, both good news, but not good enough to sustain the planet and its demand for foodstuff and agricultural produce: increase in productivity may not be enough to sustain global demand, and growth in available arable land has been lagging since the early 1990.

As the earlier example of agricultural policies and their social impact in Morocco, the inner rim of the Doughnut describes other constraints as well. The breaking up of traditional structures in rural Morocco has altered significantly rural communities as well as urban areas. The precise impact of the social upheaval in the years following independence may be difficult to estimate, but it has been heavily influenced by policy choices made at the outset. Given the single-mindedness with which decision-makers pursued large and rapid expansion of GDP as a panacea of sorts, it turned out their policies had unintended social and ecological consequences.

The Imiter mine provides a recent example as to the limitations of maximum growth paradigm: a 140 kilometres east of Ouarzazate, Imiter village is close to a silver mine, one of the largest in Africa. Local communities in the village are opposed to the Managem mining company for a variety of reasons, chiefly because the mining process poisoned underground water streams, and there have been few hiring opportunities at the mine. Mining and silver extraction should be beneficial to the whole economy as well as local communities, but that is not the case. Managem activities have substantially affected the local environment as well as local communities in ways that cannot be offset by any future earnings. It is possible to argue that policymakers, as benevolent social planners have weighed in the pros and cons in such a case, and concluded the benefits outweighed any potential drawbacks. However, estimated costs to environment and society are too often discounted, and those show the limitations of high growth when it does not take into account the toll it takes on the environment as well as society and local communities.

This report does not attempt to tell the history or discuss the economics of policy-making in Morocco in the past half century and its repercussions. The elements delineated above are there to provide the context for what follows. The conjunction of the general election in October 2016, as well as the COP 22 conference in Marrakech a month later offer an opportunity to provide a new framework for electoral and political accountability.

Descriptive statistics - the empirical picture

Global trends in energy expenditure

This section looks at descriptive statistics to derive some general properties and comments regarding the relationship between output growth, energy consumption and the byproducts of both in terms of environmental impact, chiefly CO_2 emissions. In particular, Handrich & *al* (2015) published a paper for hbs that deals with the existence of a trend in decoupling - namely the divergence between output growth, its reliance on fossil

fuel, and CO_2 emissions. They conclude to the existence of a weak global trend in decoupling energy production from fossil fuel, primarily due to the slow transition in China, and contradictory policy choices in India, two major emerging economies with large demand for energy consumption. Their results also show a stronger trend among OECD economies, where there has been a reduction in total energy consumption and emissions while economic growth was observed.

These robust results are noteworthy in view of the global primary energy source: in 2014, fossil energy sources accounted for more than 80% of primary energy consumption in the world. Sub-shares between coal, oil and gas split evenly, and each dwarves renewable energy sources, such as hydraulic, wind and solar power. Although there has been a marked increase in contribution of green and renewable sources of energy: since 1965, all green energy sources (solar, wind, biomass, hydraulic and other renewables) provided on average for 15% of global energy consumption. For the past decade, green and renewable energies doubled their share to 30% and there is a strong upward trend since 2008

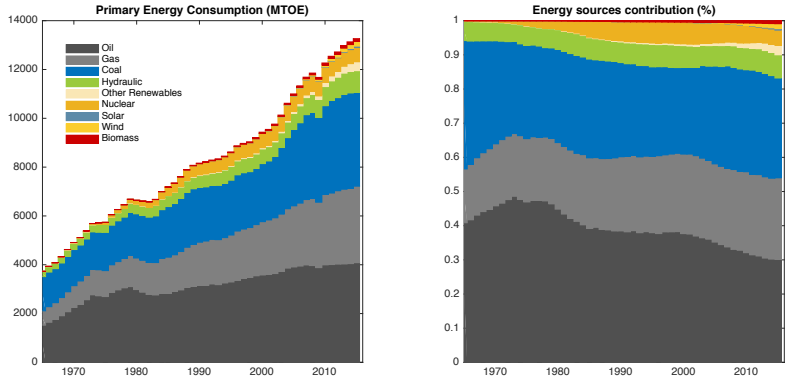

Figure 1: Global energy consumption and its sources - million tons oil-equivalent (MOTE) 1965-2015
Source: BP Statistical Review of World Energy 2015

Although the focus of this document is on Morocco, it is necessary to provide a global perspective to Morocco's own challenges regarding energy consumption, its sources and its relationship to GDP growth. It is therefore relevant to describe Morocco's own indicators of energy consumption with those around the world. Featured data is drawn from the World Bank's Word Development Indicators (2016) for energy and macroeconomic indicators. Morocco is compared against global trends, which are computed as the median of available data for all countries. The income-based benchmark is also drawn from the World Bank and its income groups. Morocco falls within the Lower Middle Income (LMI) category, which means it will be compared to 52 countries whose income per capita fluctuate between $1,026 and $4,035. By comparison, Morocco's real Gross National Income (GNI) per capita for 2014 was $2,480, right in the middle of the LMI category.

This section also makes use of the U.S. Energy Information Agency and its annual outlook and levelised costs for generating technology that may be operating in the medium or long run, as well as its data on energy prices. We finally look also at British Petroleum's

Statistical Review of World Energy for global and regional trend in energy consumption, as well as the data attached to it.

A more interesting result in the hbs study is the statistical evidence of a feedback-relationship between fossil and renewable energies on the one hand, and GDP growth on the other. This suggests both sources of energy can be substituted, a crucial finding with important policy implications. Policymakers can therefore argue that investment in green and renewable energies does not impair growth in the medium run.

Energy consumption in Morocco and elsewhere

This sub-section looks at the evolution of energy use in Morocco and compares it with that of its income benchmark sample set, as well as the global median. Available data for Morocco stretches back to the early 1970, and is plotted in figure 2 below:

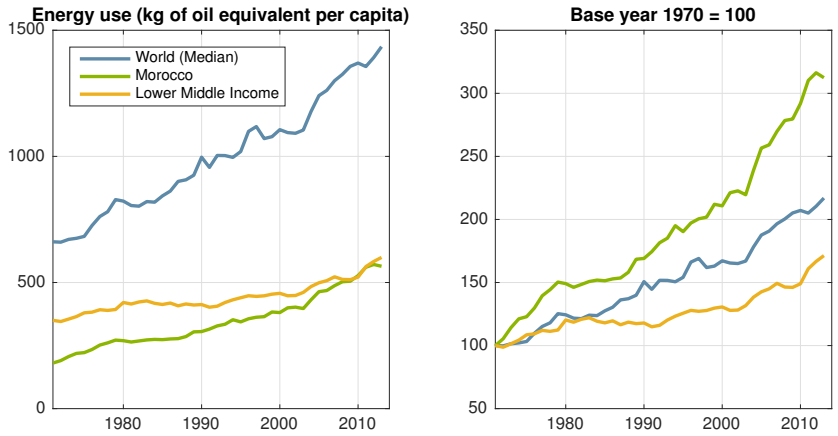

Figure 2: Energy use per capita: Morocco versus global and comparable economies medians: 1971-2013.
Source: World Bank WDI

The Moroccan economy does not rely as much on energy as global indicators, and until the late 2000s, output in its income bracket group was more energy-driven. Discrepancies in values should not belie the fact that Morocco's reliance on energy increased vastly over time. Indeed, Morocco's energy use per capita vastly outpaces the selected benchmark as well as the global median since 1971. Given the fact that Lower Middle Income economies exhibit the same output per capita, it means the Moroccan economy has come to rely more on energy expenditure to generate its growth since the early 1970s. The impact on CO_2 emissions follows similar patterns: Morocco does not emit as much CO_2 as the global median or the LMI benchmark, but relative to their 1970s levels, it outgrows them significantly, as shown in figure 3 below:

Although Morocco outpaces global CO_2 emissions per capita, it has only been the case since the early 2000s. This late tick in increased emissions can be explained by the combined effect of various policies that are seemingly unrelated: rural demand for electricity, fuel subsidies and low energy prices during the so-called *Great Moderation*.

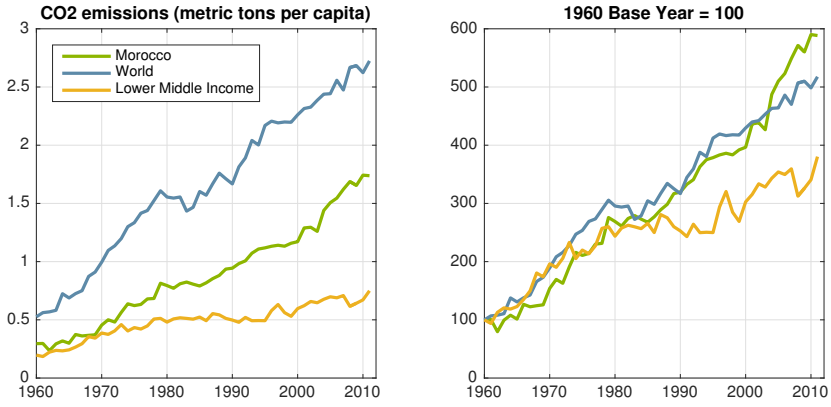

Figure 3: CO_2 emissions - metric tons per capita. 1961-2011
Source: World Bank WDI

Rural Morocco has long been excluded from the national electricity grid. An ambitious programme (*Programme d'Electrification Rurale Global*) was put in place in 1996 in order to connect 80% of rural households, and an average of 1.000 villages per year over 14 years. By 2014, about 40.000 households had access to electricity, to the cost of 23 billion Dirhams, a 53% increase with respect to the initial funding. That meant the agency in charge of producing and distributing electricity through the national grid needed to expand its production capacity, and started to rely more and more on oil and gas to produce the necessary electricity to satisfy the growing rural demand.

The late 1990s were a boon for the Moroccan economy: after a decade of halting growth due to uncertain agricultural production and the crippling effects of the structural adjustment programme it was forced to submit to in the early 1980s, the economy experienced a steady increase in output growth, picking up from a low 2.7% and gaining steadily in the years afterwards. The extended pre-1996 trend in electricity demand means that urban households - by far the largest component of aggregate demand before then - would have experienced stable levels of demand for electricity.

The fact that a new source of demand had to be supplied at a harried pace meant policymakers did not have much choice as to available sources of energy. Whereas Morocco relied for many years on its large dams to generate electricity, it increasingly started to turn to fossil fuel. The latter made up only 34% of total electricity production in the early 1970s, a figure trebled by 1996. By contrast, hydro-electric sources' share declined steadily from 66% in 1971, to 5% in 1995. Part of this decline is due to drought episodes Morocco experienced in the 1980s and 1990s, but since then its share in total electricity production never rose above 15%.

Fossil fuel were indeed the most attractive option given the historical context of low energy prices, and Morocco's long-standing fuel subsidies for a variety of uses, domestic and industrial. The *Office National d'Electricité* only responded to that incentive by shifting its production to fossil energy, in order to meet growing rural demand. Figure 4 shows that energy makeup would have been radically different had the ONE and other policymakers decided on other sources of energy to supply rural communities in Morocco.

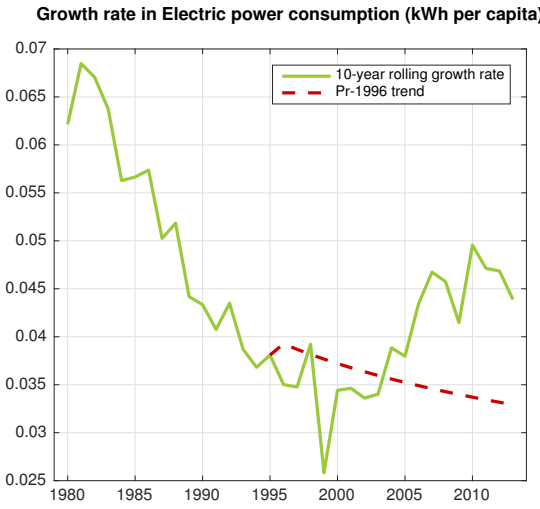

Figure 4: 10-year rolling growth rate, electricity consumption 1980-2013.
Sources: World Bank WDI, ONE

Table 1: Average contribution to CO_2 emissions: 1971-2013
source: World Bank WDI

Periods	1971-2013	1971-1996	1996-2013
Building	24.97%	34.49%	10.34%
Electricity	48.51%	43.64%	57.38%
Manufacturing	7.03%	-4.15%	27.79%
Transportation	-5.64%	-21.06%	24.64%
Others	25.13%	47.08%	-20.14%

The focus on electricity is justified by the fact that energy consumption in Morocco is primarily driven by it. As can be seen from table 1 since the early 1970s, electricity and heat production accounted for about half of total CO_2 emissions over the past 40-odd years. Its contribution increased to almost 60% since 1996, which gives an indication as to how rural electrification and ONE's reliance on fossil fuel brought about a growth model dependent on energy use and one that generates excess levels of CO_2.

Figure 5 below offers an even starker illustration of how much electricity production contributes to CO_2 emissions. This means policymakers keen to protect the environment and engage in meaningful CO_2 reduction levels need to deal with how Morocco produces its electricity.

The figure above points to a broader problem of energy policy and output growth. As Moroccan households grow wealthier, their expenditure moves upwards, and that means higher energy use. Social statuts as well as developing needs may compel the household to acquire additional appliances and/or a car. Such increase in expenditure

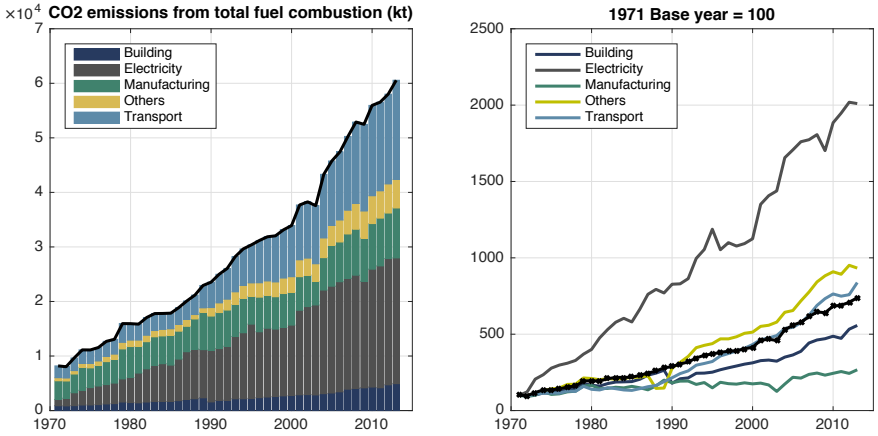

Figure 5: CO_2 emissions from total fuel combustion 1971-2013.
Sources: World Bank WDI, ONE

translates into additional goods and services, and has a positive impact on GDP growth. On the other hand, household consumption becomes thus more energy-intensive, and given the distribution of energy sources in Morocco, it also means more CO_2 emissions. CO_2 emissions from transport in fact grew more or less at the same pace as overall CO_2 emissions, growing by a factor of 7.4 and 8.3 respectively between 1971 and 2013. CO_2 emissions from electricity production on the other hand, have expanded significantly by a factor of 21 over the same period. In addition, output growth fuelled demand for vehicles and thus drove CO_2 emissions from transport to a higher level - average contribution since 1996 is markedly higher than those over a longer time period.

Table 1 and figure 5 also show another important source of CO_2 emissions: buildings have accounted on average for 25% of total CO_2 emissions since 1971. Although its contribution declined over more recent years, it is interesting to note that construction technology has not evolved much over the years in Morocco. Construction materials are basically the same for new and existing buildings alike, and little attention is paid to energy building consumption in architectural design in order to optimise energy consumption.

Transportation is also another significant source of CO_2 emissions. The IAE (2014) report on Morocco accurately describes how greenhouse gas emissions have steadily increased since the 1970s. As mentioned before, electricity consumption increased CO_2 emissions due to Morocco's reliance on fossil fuel. Further energy expenditure has been fuelled by increased acquisition of vehicles, for individual and industrial use. As shown in figure 6 there has been a marked increase in vehicle fleet, one that outpaced vastly demographic growth. Although there is a trend in replacing older models with more efficient, environmentally-friendly vehicles, transportation will continue to contribute significantly to CO_2 emissions in the near future. That is due to the fact that the increase in the number of vehicles per inhabitant vastly outpaces technological gains from newer models, and results in an increase in CO_2 emissions overall.

The number of vehicles per 100.000 inhabitants increased tenfold in less than a decade: there are now 1.000 vehicles for 100.000 inhabitants, which certainly has significant repercussions on a host of issues. Some of them are not necessarily linked to economic policy,

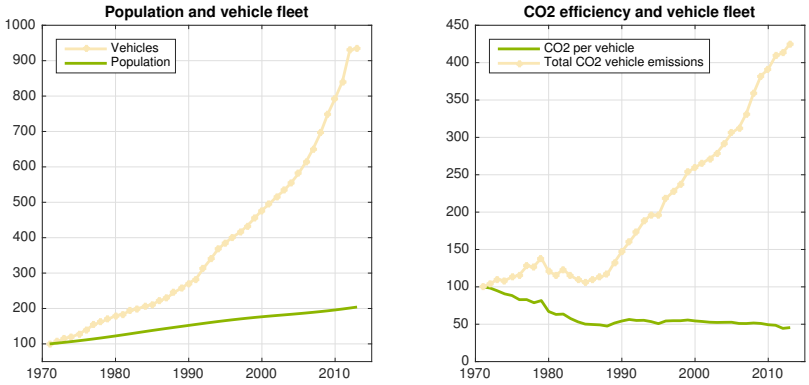

Figure 6: Vehicle fleet per inhabitants, CO_2 efficiency and emissions. 1971 Base Year = 100
Sources: IEA, CNPAC, Transport Ministry, World Bank WDI

but are still relevant to it nonetheless. Consider for instance urban policy: Morocco's sprawling urban centres face a chronic transportation crisis, where public transports are of abysmal quality, or do not satisfy overall or group-specific demands.

While it is true that Morocco's main cities, Rabat and Casablanca have been recently equipped with a tramway system, the tramway network serves only as a contrast with the rest of a hopelessly inadequate transportation system. This means individuals are compelled to buy an individual car to move around the city with minimum impediment, which affects their savings and expenditure decision schedule with unintended consequences. This exponential growth in individual cars in turn presents local government with a vast array of issues: road maintenance becomes critical, and there is public pressure to improve city-wide road networks - the proverbial pothole. Drivers may indirectly have a voice in urban planning process, but another group is wholly marginalised: pedestrians in large cities find it even more difficult to move around due to extensive public works needed to accommodate the present vehicle fleet.

There are therefore unintended consequences to misinformed public policy: in their quest to increase Moroccan households' standards of living, policymakers neglected the effects on the environment - through CO_2 emissions, but also quality of living in urban centres that now encompass 60% of total population. An interesting way of looking at those *unintended consequences* is to assume that Moroccans assimilated a certain middle class way of life, one that can be conciliated with overall economic structures only at the cost of inefficient energy expenditure, and one-sided urban policymaking.

CO_2 emissions and GDP growth

As shown before in figures 2 and 3, Morocco ranks pretty high in terms of CO_2 emissions per capita in comparison with to Lower Middle Income (LMI) economies. Figure 6 below shows how the country ranks relative to its peers. Boxplot depiction for each year encompasses all available data points within the 25th and 75th percentiles. The black line

represents Morocco' CO_2 emissions, and shows to be gradually higher than LMI median emissions, and closer to various outliers, as represented in yellow crosses reported on figure 7.

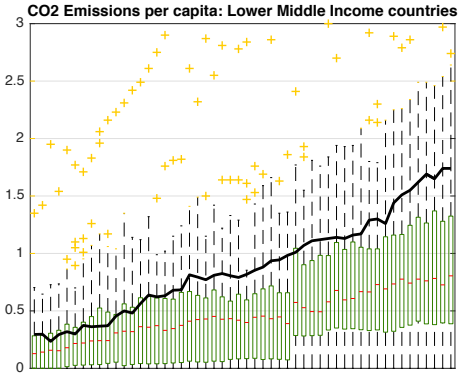

Figure 7: Whiskerplot: CO_2 emissions per capita in Morocco vers Lower Middle Income economies
Sources: IEA, World Bank WDI

During the 1960s Morocco fitted in the upper edge of LMIs whisker plot, and soon breaks away as an outlier of sorts starting from the late 1970s. This may be an indication that following the successive shocks of 1973 and 1979, Morocco did not seriously consider alternative sources of energy to sustain its consumption, and thus came to rely increasingly on fossil fuel, hence the runaway CO_2 emissions. It shows again that Morocco not only consumes more fuel and energy to sustain its growth in comparison to other economies of similar levels of income, its CO_2 emissions are indeed significantly higher in comparison to that group.

Table 2: Growth correlations: 1961-2011
source: World Bank WDI

Variable	GDP	CO_2	Fuel	Elec.	Energy
GDP	1	.063	.156	.106	.231
CO_2	.063	1	.581	**0**	.579
Fuel expenditure	.156	.581	1	.061	.977
Electricity consumption	.106	**0**	.061	1	.065
Energy expenditure	.231	.579	.977	.065	1

We also look at the existence of empirical relationships between variables of interest. The claim made earlier that CO_2 emissions in Morocco are driven by increased reliance on fossil fuel to generate electricity and meet domestic demand assumes therefore that strong correlation should exist between growth, electricity, energy use and fuel on the

one hand, and CO_2 on the other. We should also expect strong correlation between fuel expenditure, energy use and GDP, since increased growth means increased demand of electricity.

Variable comparison is carried out in growth terms to avoid the bais implied by the existence of a common stochastic trend. We look at correlation levels between the variables discussed above, and results are reported in table 2. Results for the dynamics between GDP and energy use variables fall broadly in line with predictions made earlier: GDP correlates most with energy use, since it encompasses sectors other than electricity, and there is some positive correlation with fuel expenditure as well. Nonetheless, the relationship between CO_2 and GDP, while positive is not significant. On the other hand, levels of correlation between energy use and other variables are stronger and worthy of comment: energy use correlates best with fuel expenditure, which only confirms the claim made earlier about Morocco's reliance on fossil fuel to meet energy use. Similarly, the correlation between CO_2 and energy expenditure on the one hand, and fossil fuel expenditure on the other hand, is strong and positive, which further buttresses earlier claims.

The data described in this section provides as exhaustive a picture as it permits. There is a need however to dig deeper; in short, there is a need for a compelling story. Some elements have been provided in the section above. Morocco's over-reliance on fossil fuel can be traced to the PER programme to connect rural areas to the national grid. Increased growth also means increased domestic demand for electricity as households have access to a larger set of appliances. All of these factors mean CO_2 emissions increase as a direct or indirect result of GDP growth. The next section deals with this issue in detail, and provides the reader with additional elements, which in turn can be used to assess the ecological impact of electoral manifestos.

Structural relations: growth and CO_2 emissions

We look at dynamic interactions between the five main variables selected to depict Morocco's dependence on fossil fuel to perpetuate its output growth. A more advanced analysis is needed because correlation levels reported in table 2 do not however provide the whole picture: indeed, there is no way to deduce the causal effect of growth on CO_2, or indeed fuel expenditure and electricity consumption. There are lagged time effects that need to be investigated as well.

Electricity, energy use and CO_2 emissions

Figure 8 below reports the orthogonal dynamic effect of a 1% temporary increase in GDP - what 1 point of GDP growth generates in terms of fuel expenditure, electricity consumption and energy use over a period of twenty years, *Ceteris Paribus*.[1]

Energy use appears to almost match with a one-for-one increase over the first periods, which confirms the assumption made earlier about Morocco's output growth and its dynamics with energy expenditure. Growth entails the production of additional goods and services, and that means additional demand for energy, hence the positive response reported in figure 8 for energy use. A similar result is reported for electricity consumption and fuel expenditure, although at a lower level. What is worth pointing out though is the

[1]For a complete rundown on methods used for these computations, see Hamilton (1994).

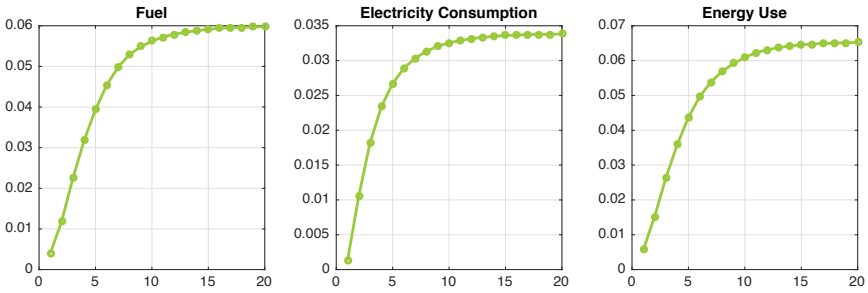

Figure 8: cumulative response to a 1% increase in GDP growth
Sources: World Bank WDI, author's computations.

fact that fuel and electricity react at a similar level, another result that shows electricity production in Morocco to rely heavily on fossil fuel. These results are broadly in line with correlation levels reported in table 2 only now there is a casual effect at hand.

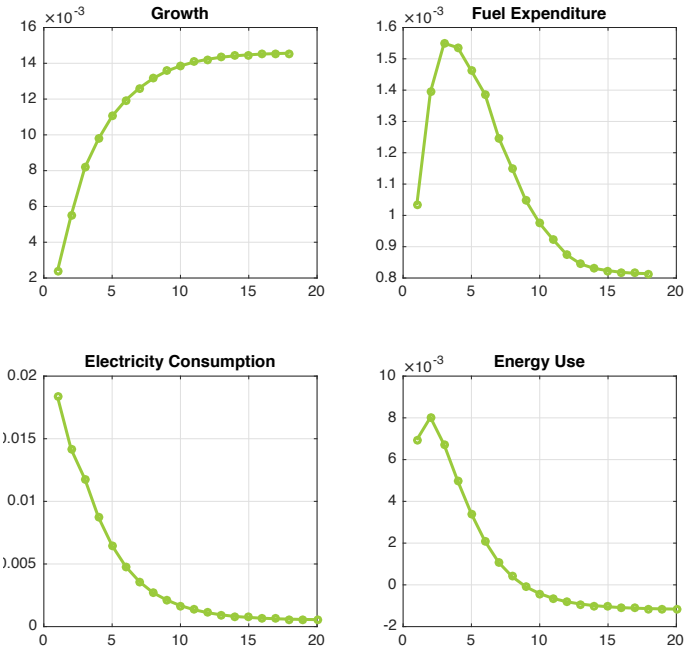

Figure 9: CO_2 emissions cumulative responses
Sources: IEA, World Bank WDI, author's computations.

These predictions are reflected in part when we look at the separate effect of increased demand for energy on CO_2 emissions. The results are reported in figure 9. The hump-shaped responses denote that growth effects increase present GDP, but affect also future decisions: Moroccan households may interpret GDP growth as a sign of increased future flows of income, and decide to increase their demand for consumption good accordingly. This means present growth may affect future demand for electricity, which also means

increased energy use, and as far as the present production structure is concerned, increased reliance on fossil fuel.

Energy indicators' cumulative responses to growth show persistence in energy use and subsequent CO_2 emissions. A focus on GDP growth with no regards to how energy expenditure sustains it not only generates increased CO_2 emissions, but these are persistent overtime. In particular, a sustained increase in GDP growth of 1% generates an additional increase of 1.4% in CO_2 emissions over a period of 20 years. Ultimately, it is output growth itself that has the most significant and persistent impact on CO_2 emissions.

Results from figure 10 report the information available in each variable included in the proposed model. Forecast variance decomposition shows how much each variable contributes to forecast error. In this case the variable of interest is CO_2 emissions. It shows that GDP growth is not only a significant but important factor in explaining future values for CO_2 emissions. The combination of these five variables yields a robust specification - only a small fraction of it is explained by its own dynamics - instead, using only GDP growth can provide a reasonable forecast for how CO_2 emissions would behave in the future. These results, combined with those of a more formal model, will be useful to the core purpose of this document: estimate and assess the environmental impact of Morocco's political manifestos.

These results focus on the broader picture of energy expenditure and electricity consumption, and lend credibility to the assumptions formulated earlier: increased GDP growth generates additional resources for households, which means their demand increases as well for a variety of consumption goods. Among those purchases made by middle class households in Morocco, electric appliances are a particular hit, which means that with output growth comes increased demand for electricity. This is in turn compounded by public policy designed to introduce electricity in rural areas. In the past couple of decades, given the lack of foresight and a friendly global commodities market, Moroccan policymakers relied on fossil fuel to generate energy needed to meet the newly expanding demand for electricity. As a result, CO_2 emissions increase dramatically over the years. Figure 10 shows GDP growth to be an accurate proxy for CO_2 emissions predictions.

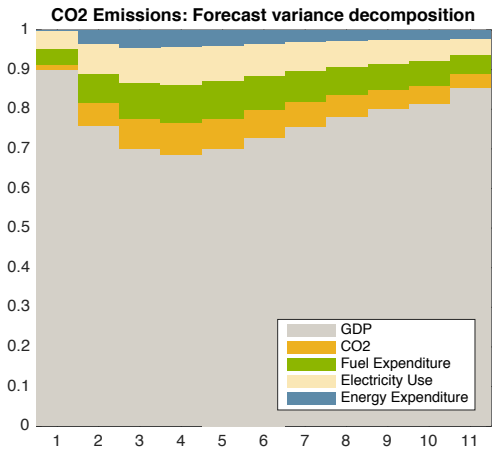

Figure 10: Forecast error variance decomposition: CO_2 Emissions.

The figure above shows GDP is an accurate predictor for CO_2 emissions, about 77% of forecast error variance can be attributed to it. This vindicates the observation made earlier about the disconnect between parties' growth targets for output production on the one hand, and environmental policies on the other. It also shows these have not been thought through. Output targets specified in electoral manifestos fail to take into account the environmental feedback of additional GDP growth, with what it entails in terms of electricity consumption, energy use and increased reliance on fossil fuel.

Transportation, vehicle fleet, fuel efficiency and CO_2 emissions

There is also the matter of transportation, which this document also attempts to describe in structural terms. We focus in particular on the impact of increased urbanisation and vehicle fleet on the one hand, CO_2 efficiency and overall CO_2 emissions on the other. As mentioned before in figure 6 Morocco has continuously updated its vehicle fleet, a trend captured by the decline in CO_2 emissions per vehicle. These efficiency gains have not been large enough to offset the vast expansion in the number of cars, trucks and other vehicles over the years - yet does not provide an accurate picture as to how much total transport CO_2 emissions outpaces efficiency gains. Results described below in figure 11 provide a stark picture as to how urban growth and the expanding vehicle fleet actually contribute to CO_2 emissions. It shows for instance that there are marginal gains from CO_2 efficiency in large urban areas, and additional vehicle purchases do not translate necessarily in energy-friendly new vehicles, even less increase fuel efficiency at a level high enough to mitigate the effects of increased transportation CO_2 emissions.

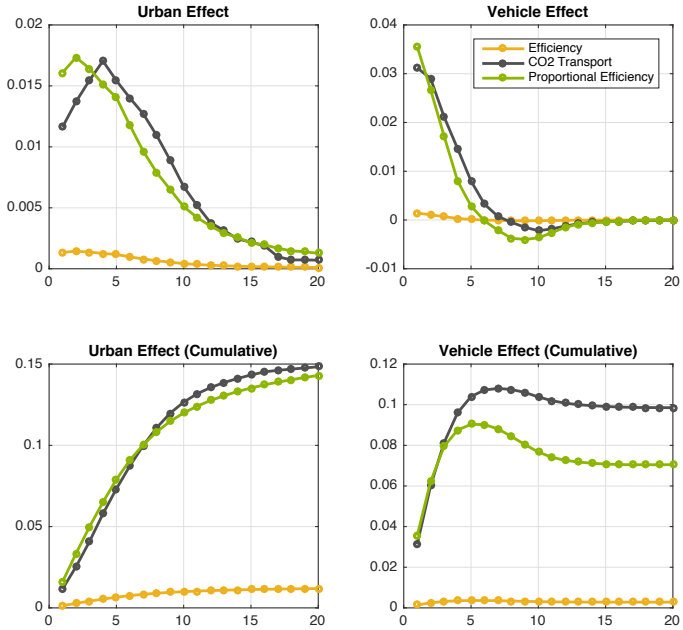

Figure 11: CO_2 emissions and efficiency - Transportation. response to urban growth and vehicle purchase.
Sources: IEA, World Bank WDI, author's computations.

Poor public transportation thus has a definite impact on CO_2 emissions: it compels households to buy cars for their individual needs. And although there is an upward trend in newer car models, their fuel efficiency is vastly outpaced by the physical increase in transport CO_2. Figure 11 shows for instance that CO_2 efficiency needs to expand by a factor of 25 for newer vehicle models to catch up with CO_2 emissions *per se* and a factor of 12 to catch-up with the increasing urban population. Thus the illustration of the impact of extensive urbanisation on CO_2 emissions, but also on expanding vehicle fleet. In order to match both effects, efficiency has to be increased by a substantial factor, which present technology simply cannot match. Table 3 shows the differential in CO_2 emissions between a standard car model against that of a hybrid or green car is simply not enough to make up in efficiency for the number of cars driving around in Morocco's largest urban centres.

Technology limitations ensure the only way transport CO_2 emissions can be reduced in urban areas is increased investment in public transportation. Tramway, underground and inter-city trains can in fact increase CO_2 efficiency *per capita* high enough to offset CO_2 emissions. This would also mean a reduction in the size of vehicle fleet - which means fiscal instruments have to be devised, and be precise enough to penalise purchases of used cars, promote green car purchases, and at the same time raise resources to fund public transportation infrastructure investments. Such a conundrum is bound to upset a large number of households, whose idea of progress and improved standards of living implies car ownership. On the other hand, policymakers face a public choice constraint: given budget resources, which infrastructure should they promote? Should they expand roads and avenues to accommodate individual cars, or instead build special lanes for tramways, dig tunnels for the underground, or expand railroad networks to connect adjacent cities?

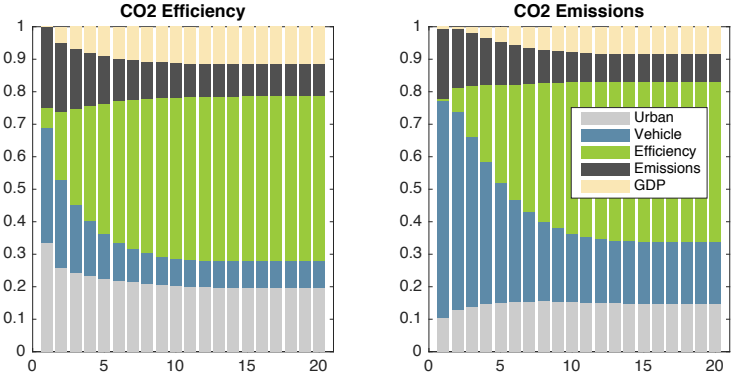

Figure 12: CO_2 emissions and efficiency - Transportation. Forecast variance decomposition.
Sources: IEA, World Bank WDI, author's computations.

Results from figure12 show that there are few available alternative to reduce transport CO_2 emissions: policymakers cannot expect future vehicle purchases to affect aggregate efficiency in the long run. While it shows that new vehicles may affect significantly efficiency in the first couple of years, that contribution wanes over time, and contributes only marginally to predicted efficiency. Similarly, increased urban and GDP growth do not compel a substantial change in the selected indicator, as shown on the first panel. In efficiency as well as total CO_2 emissions, the latter is key to project future values for both

indicators. This may present policymakers with a substantial challenge: if their objectif is to reduce - or at least contain- CO_2 emissions from transportations, how can they plan for CO_2 efficiency?

The short answer is that they cannot. A more elaborate answer is to look at CO_2 emissions *per capita* and substitute individual vehicles for public transportation. This need not be focused on households and individual cars. A significant reduction in transport CO_2 implies a stagnant vehicle fleet, and increased reliance on tramways, underground lines and inter-city trains, instead of individual cars, and even buses. For nationwide transport, effective transport CO_2 reduction means logistics have to rely more on railroad networks, and when available, fluvial transport as well. An illustration as to how public transport can reduce substantially CO_2 emissions is to compare effective CO_2 emissions per kilometre per passenger in Europe's largest cities: Paris, London, Brussels and Berlin.

Although there are significant differences between these European cities and Morocco's metropoles, the figures shown on table 3 provide the scale of CO_2 efficiencies urban centres in Morocco may benefit from investing in public transport infrastructures. Policies implemented for the pat 20-odd years, though contradict any move in that direction. Morocco has expanded a great deal of resources in building highways, and more recently in extending avenues and large streets in most of its cities. Policymakers have made their choices many years ago, and switching to public transport investment is likely to clash with previously set programmes.

In light of the elements presents in the sections above, we look at the carbon-effect of the electoral manifestos put forward by the main political parties during the November 2011 general election. In particular, we are interested in measuring the implied CO_2 emissions of their GDP growth targets, as well as the expected dampening effect of proposals made out to protect the environment.

Table 3: Average CO_2 emissions: individual cars vs public transports.

g CO_2/km	Paris	Brussels	London	Berlin
Car	162	142	242	202
Green Car (Hybrid)	89	89	89	89
Electric Car	38	38	38	38
Bus	96	97	135	86
Intercity Train	6	-	7	7
Train	4	3	6	-
Underground	4	3	8	3
Tramway	3	4	7	3
Ratio Car/Public transport	7	5	7	8

Sources: RATP, TFL, DEFRA, MIVB, UBA & BVG

We focus on those parties with a national representation. Prior to the November 2011 elections, eight political parties sought to form an electoral alliance, and put forth a common manifesto. The others have released their own separately and will be treated accordingly.

As mentioned in the introduction, political parties tend to observe *signals*: the monarchy's policy priorities are internalised by parties as their own, or they react to those, but

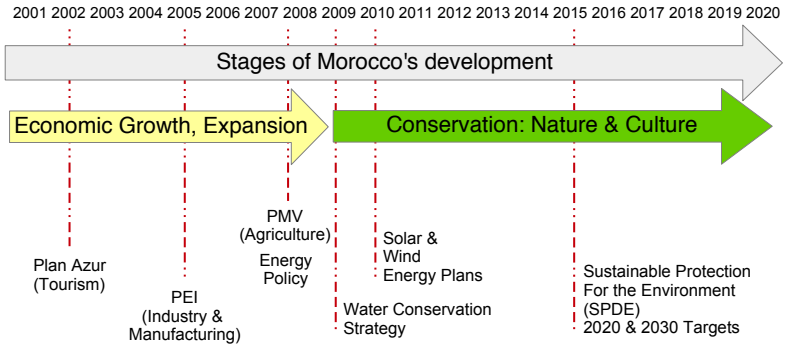

Figure 13: CNEDD-SPDE Timetable
Source: environnement.gov.ma

in any case terms of the policy debate are set outside the partisan sphere. Instead, political parties align themselves with pre-established government plans, and endorse them as an integral part of their own political manifestos. The purpose of such a coopting strategy is to project an image of competence, one where a party tries to convince voters and the monarchy alike that they are aware of long-run priorities, and can execute them competently.

A case in point for environmental policies is the fact that all the main parties refer to the National Charter for Environment and Sustained Development (*Charte Nationale de l'Environnement et du Développement Durable*) and propose some policies to implement it. In effect, their environmental policies are variations on its framework - an accurate illustration to the coexistence of partisan policies, specific to each party, and a more permanent component they may find themselves in charge of, regardless of their respective ideological preferences.

Enacted in 2010, the charter is the embodiment of a sweeping framework that encompasses a host of topics, ranging from damaged eco-systems rehabilitation, water and forest conservation, to local development policies and protection of historical landmarks. The Charter indeed has been designed as a complement of the other projects, so-called *Grands Chantiers* or grand schemes intended to boost Morocco's economy and growth.

A parsimonious model for CO_2 emissions and energy use

Brief description

The *toy model* aspect of this analysis allows us to focus on the policy implications of public choices on energy expenditure and CO_2 emissions, and isolate other exogenous factors. The proposed specification seeks to provide a more comprehensive narrative than the structural relations depicted in the section above, in particular those depicted in figures 8

to 10. Finn (1991) proposed a general equilibrium model that incorporates energy price shocks and capacity utilisation to account for the effects of energy prices on the business cycle in the United States. We expand this framework by incorporating elements of CO_2 emissions in the fashion of Nordhaus (1991) Grodecka & Kuralbayeva (2015) and Heutel (2015). However, instead of considering the adverse impact of CO_2 emissions as a loss of output, we look instead at the impact of CO_2 emissions on consumers' welfare, and assume they take it explicitly into account. All detailed aspects of model versions are referred to in the appendix.

The model describes a simple economy where output combines capital and energy, both dependent on a capacity utilisation index. The more the economy consumes capital, the higher capital depreciation is, and the more reliant it is on energy use. Energy expenditure in turn generates CO_2 emissions. Contrary to the literature, CO_2 emissions impact is not integrated as a fraction of lost output. Instead, we look at its effects on consumer utility. The model is interested in how pollution affects consumer choices, and how those in turn affect the whole economy. The public sector levies a tax on consumption and energy use to fund its expenditure and other policy instruments to be defined later on.

In this first iteration of the model, the government does not intervene to regulate CO_2 emissions and/or energy use. The purpose of these results it to describe how the economy reacts to exogenous shocks, and in particular how energy per capital use and CO_2 emissions behave when there is an increase in productivity, a rise in government expenditure or prices of fossil fuel.

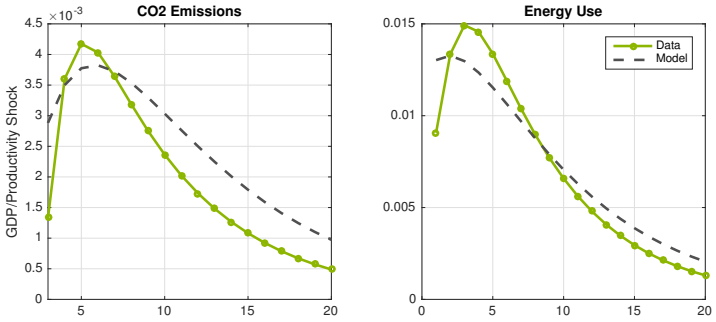

Figure 14: Impulse response to growth generated by productivity: CO_2 emissions & Energy use. Model *versus* data

Figure 14 compares the model's predictions against those described in the structural relations reported earlier. The model predicts a relative over-smoothing CO_2 response to growth after a productivity shock, though accurately replicates the hump-shaped response reported from the data. The model also replicates the effects of growth on energy use, though at a comparatively higher accuracy. Both results are a testimony to the robustness of the model's ability to mimic fluctuations in macroeconomic variables and their impact on CO_2 emissions, and the soundness of its incorporated hypotheses. *Ceteris paribus* model predictions are in line with the economic mechanisms described earlier with a robust narrative to sustain it: with increased productivity the economy produces more goods and consumers spend more. This increase in goods and services means that the economy relies

more on energy and increases capacity utilisation for capital. Subsequently the additional economic activity increases capital replacement - due to increased depreciation- as well as consumption demand. Energy consumption per unit of capital goes up as well, hence additional CO_2 emissions.

Per model and data results, expected emissions from various GDP growth targets can thus be summarised in the table below:

Table 4: Growth Targets and implied CO_2 emissions: 2011-2016.

		Kt emissions	
Party	GDP	Total	Average
Istiqlal	5%	72,061.5	3,104.7
G8 Coalition	6%	86,473.8	5.987.2
PPS	6%	86,473.8	5,987.2
USFP	7%	10,0886.1	8,869.7
PJD	7%	10,0886.1	8,869.7

Table 4 compares each party's (or coalition of parties) own GDP growth target for 2011-2016 against the implied CO_2 emissions computed in the model presented above. The first column reports total emissions by the end of the legislature, *i.e.* 2016, while the second one reports average annual emissions, both expressed in kilotons.

Differences in implied CO_2 emissions are significant enough to point to the limits of maximum growth as implicitly advocated in each party's GDP respective targets. In fact, given the literature's stance on how CO_2 affects the environment, it is quite unlikely that high GDP growth can make up for the damage to the environment - Morocco's economy cannot sustain high growth over the medium run, whereas CO_2 absorption in the atmosphere and upper and deep oceans is comparatively slow.

As specified in their 2011 respective electoral manifestos, parties in Morocco have advocated a policy-mix of fiscal incentives to shift energy expenditure away from fossil fuel to more sustainable sources of energy, and/or subsidies to replace production capacity with greener, more environmental-friendly capital.

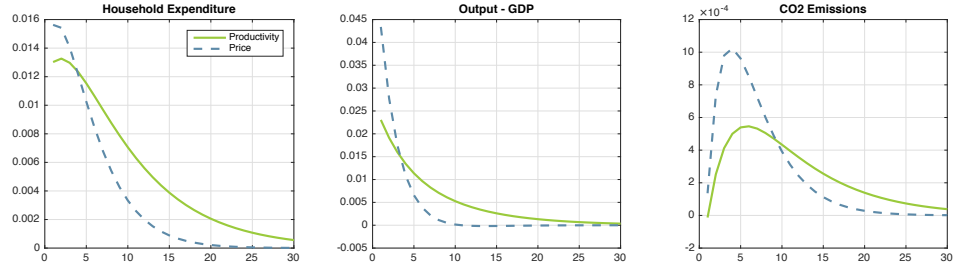

Figure 15: Impulse response to growth and energy price (in absolute value)

Given the model's explicit definition of energy prices as an input, we look at the effects of an increase in fossil fuel prices on consumption, GDP and CO_2 emissions. The impulse

behaviour for all three variables allows us then to simulate the effects of an optimal policy. We also surmise the kind of fiscal policies needed to offset the excess CO_2 emissions derived from high growth targets. To that effect, we look at the effect of an increase in energy prices against that of increased productivity. All three variables react negatively to an increase in energy prices as expected - figure 15 reports these results in absolute value, so as to better illustrate how a given aggregate reacts to both shocks, and whether a productivity shock offsets the adverse effect of a negative price shock.

An increase in fuel prices has a tremendous effect on GDP - energy becomes more expensive, and firms reduce their production as a consequence. For households, energy use declines as well as the price spike affects their budgeting. The decline in CO_2 emissions is therefore due to the decline in economic activity, and not energy per capital unit. In order to understand the scale of output contraction due to more expensive energy prices, the model predicts productivity needs to increase 1.88 point for each point increase in fuel prices, a feat the Moroccan economy is unlikely to match given that productivity is very persistent and stable across time, whereas energy prices are more volatile. On can surmise from the discrepancies between consumption and output that capital accumulation (and thus investment) is likely to react sharply to increases in fuel prices.

Over time, the impact of reduction in CO_2 emissions due to output decline may be beneficial, as the economy reduces its reliance on fossil, regardless of temporary increases in productivity as well. On the other hand, while households do not necessarily experience a significant decrease in their consumption due to an increase in fossil fuel energy prices, they need to experience a relatively higher order of productivity boost to make up for the shortfall - an increase of 1% in fuel prices should be matched with a 1.2% increase in productivity to offset the adverse effect of the former. But the welfare impact of energy transition on the sole impact of energy price spike is too high not to explore alternative methods. We look therefore at two policies: a subsidy to replace capital with energy-efficient units, and a carbon tax firms pay for CO_2 emissions per unit of energy expenditure.

Policy instruments: green abatement and Carbon tax.

The purpose of the previous section was to delineate the stylised facts that define the dynamics between energy expenditure, electricity consumption and GDP growth. The model is then developed to match these properties and succeeds in doing so. It can therefore adequately describe the dynamics of CO_2 emissions, and predict how indicators of interest may behave when a policy instrument is introduced. An environmentally-friendly fiscal policy designed to reduce CO_2 emissions may seek to reduce the cost of capital depreciation with a subsidy for *green* capital. We use Hayashi's (1982) cost of capital adjustment model as expanded in Wang & Wen (2011) to introduce a new fiscal instrument: an abatement for capital replacement. The public sector subsidies firms that decide to replace their old, fuel-reliant capital with green investment, and reduce at the same time CO_2 emissions.

How does one go about implementing CO_2 emissions reduction via green abatement? Productivity shocks cut both ways: on the one hand, they increase reliance on energy and capacity utilisation to generate growth but also CO_2. On the other hand, capacity utilisation ensures capital depreciates rapidly, which makes it cheaper to replace capital, in this case with green investment. Growth is therefore sustained from an aggregate

demand perspective, while capital accumulation is not hampered.

Results shown in figure 16 compare productivity shocks to a temporary increase in capital depreciation abatement. The discrepancy is of no particular concern, since it merely depicts *replaced* capital. Given Morocco's long-run investment-to-capital ratio of 4% to 5% as reported in HCP (2005) the effects of green abatement should be multiplied by 20 to 25 over time. Morocco's growth properties in the past couple of years fits well with this policy: as it relied heavily on capital accumulation, as reported in HCP (2016) to sustain its growth. Capital *per capita* grew on average 5% a year between 2001 and 2014, whereas output increased by 4.4% over the same period, and the Solow Residual (Total Factor Productivity) grew at a slower pace, 1.7%. A reasonable policy would be to continue capital accumulation with a focus on green capital replacement. As growth picks up, capital depreciation increases, which makes it easier to replace it with more eco-friendly investment.

On the other hand, if the economy gradually moves away from physical capital accumulation to productivity gains (*e.g.* increased Solow Residual growth) then capital becomes more efficient, and each additional unit of capital increases in value. There is a strong incentive for investors to replace it with newer, greener capital units. The differences in terms of policy implementation are to be found in the public sector's budget constraints: capital replacement is costly and dramatically increases the government's debt, whereas productivity boosts growth and increases output production, and can self-finance a sizeable fraction of public subsidies to capital replacement. The best government policy remains thus a combination of productivity increases and re-investment of increased tax returns into green capital.

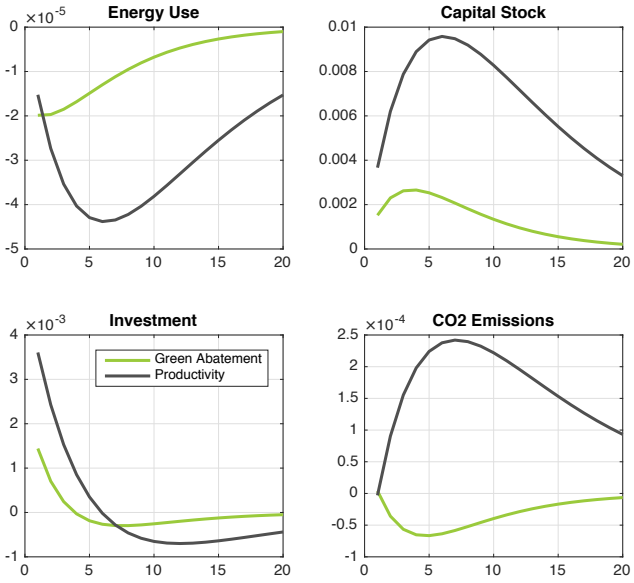

Figure 16: Productivity shocks and green abatement: impulse responses

Green abatement does not temper with capital accumulation *per se*. It merely replaces energy-intensive capital units with more energy efficient ones. Energy to capital unit ratio

decreases, which means production relies less on energy to produce output and its CO_2 byproduct. Hence the results in the fourth panel on the right bottom figure 16. Apart from this particular aspect, green abatement functions essentially like a productivity shock: capital units become more productive - and generate less CO_2.

An alternative route to curb CO_2 emissions is to impose a carbon tax. The government levies an additional tax indirectly on energy use, where emissions from fossil fuels are taxed and paid back to households, or used to fund green abatements. The second option is more desirable: the carbon tax is a suitable instrument in that is reallocates resources to greener energy by making it more expensive to keep energy-intensive capital. Both instruments are complements as well. The government can use carbon tax proceeds to fund green abatement, thus presenting the case for deficit-neutral (or near neutral) policy with tremendous positive impact on CO_2 emissions.

Under a green abatement regime, productivity shocks work the way they are supposed to, *i.e.* increase capital instalments and consumption expenditure, while at the same time, reduce energy use and thus CO_2 emissions. Table 5 reports the amount of green investment needed to neutralise CO_2 emissions from each additional point in GDP growth - it means for instance that a target growth rate of 6% implies an average investment of 12 billion Dirhams (in 2011 value) to curb emissions. Similarly, the government needs to institute a carbon tax equivalent to 5.4% of kilotons of CO_2 per unit of capital to offset the cost of green abatement for the budget.

Morocco's target of 42% share of renewables in electricity production by 2020 may be construed as an extension of the green capital subsidy or abatement - but instead of replacing depreciated capital, the 2020 target actually installs new capital capacity, whose effects on CO_2 emissions are likely to be more significant and persistent. It is however unlikely the expected installed capacity could cope with the increase in electricity demand derived from high output growth. Morocco has generated an average GDP growth of 4.3% in the past 15 years. A long-run performance along this growth rate may be accommodated by energy sources with 42% renewables. An increase in GDP beyond 4% may put additional strain on installed capacity, and force policymakers to rely more on fossil fuel, thus defeating the double purpose of energy independence, as well as C02 reduction targets.

Table 5: Growth targets and CO_2 suppression instruments: 2011-2016.

		CO_2 neutral 5 years	
Growth	CO_2 (Kt)	Green Capital	Carbone Tax
4.00%	2,071	6.28	2.88%
5.00%	2,589	7.85	3.61%
6.00%	3,884	11.78	5.41%
7.00%	6,797	20.62	9.46%

Figure 17 reports the effects of a temporary increase in productivity and compares those with or without carbon taxes. The latter does not seem to affect capital accumulation - in fact, the carbon tax component acts as an incentive for firms to replace their capital at a faster rate, hence the more sensitive effect depicted in the top left panel. The

same effect accounts for the sharper decline in energy use, since new capital relies less on energy, and as it increases in productivity, energy use falls accordingly. Finally, there are significant effects on CO_2 emissions thanks to the carbon tax scheme.

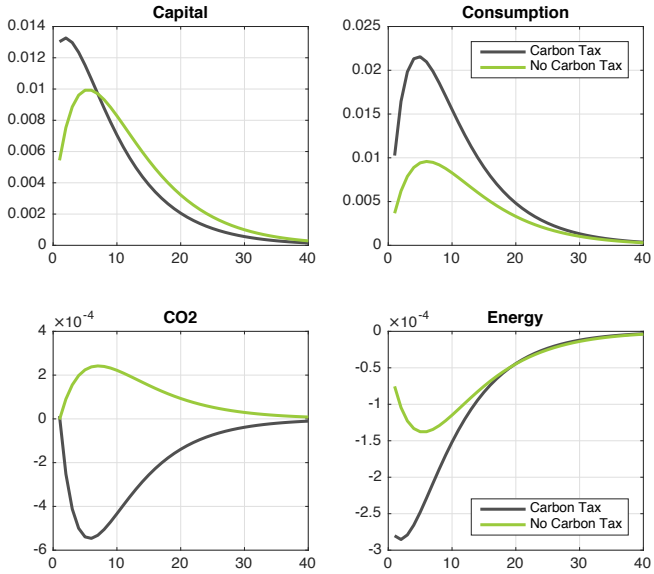

Figure 17: Productivity shocks, green abatement and carbon tax: impulse responses

Table 6 establishes the effects of GDP growth on demand for electricity, energy use and the subsequent addition of CO_2 emissions. It also reports the needed increases in the share of renewables in electricity production to alleviates excess CO_2 emissions. As one can see, high growth entails large energy consumption, which means *ceteris paribus* electricity providers need to rely more on fossil fuel to meet the new demand. As a result, the 43% target needs to be revised up to meet excess demand for electricity.

Table 6: Growth targets and energy expenditure: 2011-2026.

Indicator	4.00%	5.00%	6.00%	7.00%
Energy use (Equivalent Kt per capita)	815.30	1,019.12	1,222.95	1,426.77
Electricity (kWh per capita)	1,167.54	1,459.42	1,751.31	2,043.19
CO_2 (1000 Kt)	68.09	85.11	127.66	223.41
CO_2 Reduction target	53.01	66.26	99.39	173.93
Share of Renewables	43.00%	53.75%	64.50%	75.25%

As established before, growth in Morocco is heavily reliant on energy expenditure. This means growth targets put forward by political parties in their respective manifestos are likely to generate additional demand for electricity, which existing and projected installed capacity is unlikely to meet.

This section presented the salient properties of the benchmark model, which turned out to be an accurate description of dynamic interactions between GDP on the one hand, and standard energy and fuel indicators. The next section provides an overview of Morocco's main parties' environmental commitments in their 2011 electoral manifestos, and estimate their cost, as well as their impact on CO_2 emissions when applicable.

Case study: 2011 electoral manifestos

The proposed model in its iterations thus provide elements to assess the impact of each party's economic proposals in terms of energy expenditure and thus CO_2 emissions. The 2011 manifestos are indeed peppered with declaration of environment protection, and in the case of Istiqlal, detailed targets for water conservation and energy independence. However these do not articulate well with their own growth target.

As mentioned before, Moroccan parties regardless of their partisan bend tend to embrace the maximum growth paradigm. Parties do set out ambitious growth targets in order to make their other macroeconomic indicators stick: high growth delivers usually generates additional tax revenues and thus makes it easier to announce a credible budget deficit. Steady growth also increases income per capita, and given enough time it can increase job creation. The downside of increased growth is also increased consumption and demand for energy sources, which, given Morocco's reliance on fossil fuel, generates additional CO_2 emissions.

The combined effects of a carbon tax and green abatement on CO_2 emissions have shown to be a desirable instrument for policy-makers. There are however limitations to an *all-green* growth model. As mentioned earlier in figure 6 vehicles in Morocco are getting more fuel-efficient, and their average CO_2 emissions have consistently decline since the early 1990s. Yet because domestic demand for vehicles (and particularly for individual cars) has soared beyond demographic growth, transport CO_2 emissions increased dramatically, thus erasing any fuel-efficiency gains in newer vehicle models.

The fact that many Moroccans in urban areas resort to buying a car is only the symptom of chaotic urban policy and lack of proper public transportation network in Morocco's largest cities. The fact also that policymakers devoted large resources to build an expansive highways system across the country also reveals subtle policy choice contradictions. Transportation policy has been explicitly biased in favour of motor vehicle transport which directly contradicts the stated goal of renewable energy use and reduced CO_2 emissions.

This caveat does not however call into question the results derived from the model presented earlier. In fact, the model restricts its predictions to the variables it seeks to explain. The implied CO_2 emissions for instance are focused on energy and electricity production, as well as the fixed capital used to produce it. Policy proposals set out in electoral manifestos are not detailed enough to comprehensively assess their respective implications. However, the model is exhaustive enough to provide a cost estimate, as well as the implied CO_2 emissions in their growth target. We now look at the 2011 electoral manifestos, and enumerate instances where environmental objectives are stated, and/or policy instruments are suggested to achieve their stated goals. Above are some of the main parties' commitments on environmental policies.

Political parties with high GDP growth targets are the most likely to face high costs to fund projected expenditure for environmental policies. Their spending commitments

Table 7: Main policies set out in 2011 electoral manifestos.

Party	Policy proposals.
G8	• Institute carbon taxes and green financial funds to encourage developing green industries. • Offer fiscal incentives to induce energy transition. • Set target for 42% share of renewables in electricity generation.
PPS	• Encourage eco-friendly tourism in the rural and mountain hinterlands. • Subject large-scale tourist complex projects to environmental norms.
USFP	• Offer fiscal incentives to stimulate green investment.
PJD	• Institute environment norms for business and investors to abide by. • Implement environmental-friendly framework for natural resources extraction. • Create incentives for green investment.
Istiqlal	• Reduce dependency on foreign sources of energy by 4 points • Create incentives for energy-efficient lightbulbs use • Build water treatment facilities to recycle 17% of used waterfall. • Generalise use of gasoil 10PPM sulfur-free over the period 2013-2016

usually dwarf carbon tax revenues, which suggests the ecology of their economic proposals has not been thought through within a a comprehensive framework. More detailed economic proposals are incorporated in electoral manifestos, but come often at odds with those environmental policies parties seek to publicise. Budget and growth targets are presented to give a glimpse as to how a given party funds its spending commitments. The environmental impact of high growth policy is neglected, and some green commitments are thrown together in the manifesto to make a good impression.

Table 8: Cost estimates for CO_2-related proposals: 2011-2016. (In billion 2011 Dirhams)

Party	GDP	Renewables	Abat.	Total Cost	Carbon Tax	% Shortfall
Istiqlal	5.00%	10.75	7.85	93.02	52.89	43.14%
G8	6.00%	21.50	9.43	154.63	63.50	58.95%
PPS	6.00%	21.50	9.43	154.63	63.47	58.95%
PJD	7.00%	32.25	11.00	216.23	74.05	65.75%
USFP	7.00%	32.25	11.00	216.23	74.05	65.75%

There are several issues with each party's electoral manifesto commitments: in addition to environmental policies, political parties in Morocco have recently taken it upon themselves to announce budget targets for their fiscal policies. In particular, many of them announced targets of budget deficit and/or government debt. The purpose of these commitments is to bolster the party's manifesto credibility, but it also binds them in terms of tax revenues and expenditure - particularly so when announced policies do not always square with budget targets. As shown above, high growth targets imply increased CO_2 emissions and corresponding measures needed to restreint those. This means particular items in electoral manifestos are put together separately with little or no regard for overall coherence. As a result, political parties often come up short in funding for their ecological programmes, as shown in tables 8 and 9.

As it turned out, the economy has experienced a significant decline in growth figures since 2011 - with an average GDP growth rate of 3.3% a full percentage point lower in comparison to the past legislature for 2007-2011 as shown in figure 19.

Table 9: Target estimates for CO_2-related proposals: 2011-2016. (In billion 2011 Dirhams)

Party	CO_2 Emissions Implied	42% Target Initial Scenario	Match Target Scenario 1	C.Tax Only Scenario 2
Istiqlal	15,524	23,100	0	0
G8	29,936	23,100	20.82	14.49
PPS	29,936	23,100	20.82	14.49
PJD	44,349	23,100	68.12	35.48
USFP	44,349	23,100	68.12	35.48

There has been a slight decline in CO_2 emissions as of 2013, but is readily more attributable to decline in GDP growth than anything else. This can be proved by looking at energy use per capita, whose five-year rolling growth rate average declined from 3.5% to 2.3% from 2012 to 2013, due to a sharp drop in the later year. The same can be said for electricity consumption, which dropped 1% between 2012 and 2013. Both factors can account for the slight decline in CO_2 emissions for the latest available years, 2012 and 2013. So far investment in renewable energy has not increased.

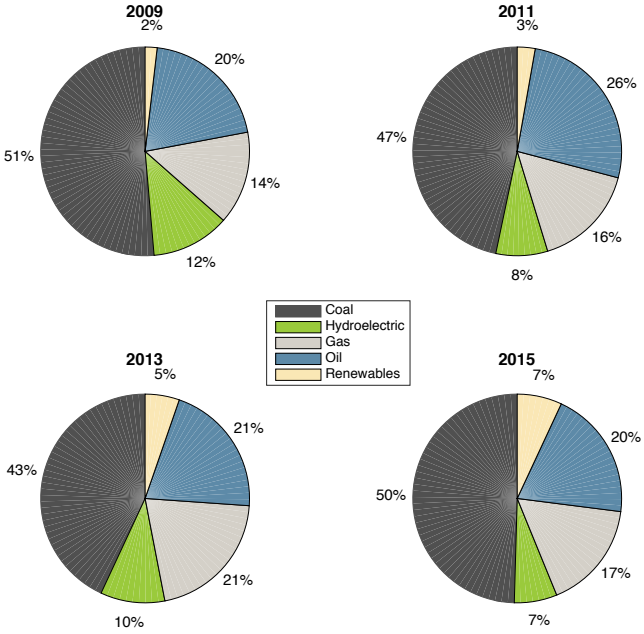

Figure 18: Electricity production from energy sources: 2009-2015

By late 2016, it was clear that the Moroccan economy was significantly below parties projections as well as the government's own plan. Growth is a full 2.2 points below target, and the same can be said for an array of macroeconomic indicators. There is also concern about how CO_2 emissions behaved - the decline in the past couple of years can be solely attributed to growth deceleration, which may put into question the effects of green policies advocated since 2009, and sets a dangerous precedent for parties to continue to ignore the environmental costs to pollution and fossil fuel-driven output growth. Political parties may conclude the only way to reduce or slow down CO_2 emissions is to slow down growth, and would henceforth barely pay attention to environmental policies.

We argue instead that there is a way to sustain respectable levels of growth for the Moroccan economy, while transitioning away from inefficiency or fossil fuel-dependent technology. A credible, sustainable growth model cannot be formulated in parts, as it would defeat its overarching aims - this means a fundamental change in households' consumption habits and preferences may need to be changed substantially, and with it comes a raft of potentially unpopular policies. In the long run however, sound economic policy will have a virtuous effect on society as well, with Moroccan households and businesses more aware of the environmental impact of their habits and production choices.

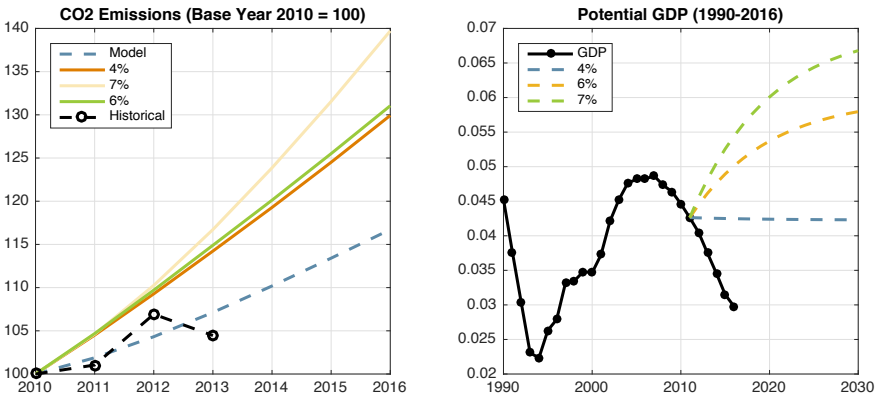

Figure 19: GDP growth targets, CO_2 emissions versus actual results and projections.

The 2016 Elections: an alternative view to manifestos

Morocco's main political parties have released their electoral manifestos by late September 2016. Although there has been a marked improvement in the level of details provided for policy commitments, there are still gaps that remain to be filled in order to lend their manifestos a modicum of credibility. To that effect, we look at a selected set of policies advocated in manifestos published in the run-up to the 2016 election. Not all parties had clear environmental policies and/or environmentally-friendly programmes: *Union Constitutionnelle* (UC) for instance offered a figure-free list of commitments rather than a fully-fledged manifesto. *Rassemblement National des Indépendants* (RNI) skipped the particulars of its own environmental manifesto and declared it would abide by COP22 targets. On the other end of the spectrum, Istiqlal provides - as it did in 2011- a rather comprehensive set of commitments particularly focused on water conservation and waste disposal recycling. Table 10 offers each party's major announcements for their respective ecological policies. In many ways, parties rely increasingly on pre-implemented policies to give their manifestos some gravitas. As mentioned before, the National Charter for the Environment and Sustained Development is a framework most political parties refer to in their policy proposals, which means that there is a vast consensus around how to implement environmental policies.

Another oddity on the ecological impact of energy policy, *Fédération de la Gauche Démocratique* (FGD) puts forward a fairly comprehensive policy designed to transition the economy to a cleaner energy use, but in its quest to diversify Morocco's energy sources, calls for extraction of shale gas, which is usually done using fracking, a wasteful technology in terms of water use, deeply damaging to the environment and does not reduce Morocco's reliance on fossil fuel, only its reliance on imported fuel. Overall, most parties do not attempt to link their respective economic plans with their ecological impact.

Such a consensus paradoxically hollows out the debate, as it transfers policy ideas away from partisan politics and squarely into the technocratic sphere. Besides, another policy consensus threatens to produce an environmental policy devoid of any meaningful

Table 10: Main policies advocated in the 2016 electoral manifestos

Party	CO_2-related emission targets	Environmental regulations	Support green investment	Energy conservation targets
PJD	Target 42% renewables electricity by 2020.	Anti-pollution watchdog for industrial waste	Tax credits for renewable investment.	-
PAM	Target 42% renewables electricity by 2020, and institute taxes on pollution.	Environmental targets in public and government procurement contracts.	Subsidies for private purchase of solar panels.	-
Istiqlal	Target 42% renewables electricity by 2020.	Incorporate environmental targets in all PPP programmes	-	Water conservation and recycling.
RNI	Policies for greener public transport	Commitment to implement COP22 targets.		
MP	Agency for waste management and recycling	Environmental quality controls	-	Water conservations
USFP	Target 42% renewables electricity by 2020.	-	Attract green FDI + increase green investment to 3% of GDP.	15% increase in energy efficiency by 2021
PPS	-	nation-wide strategy for solid waste management & recycling.	-	Forestry and water conservation
FGD	Enact national charter for for the environment and sustained development + 20% renewables in energy production.	Green spaces for urban centres + integrate environmental impact in government plans/strategies.	-	Shale gas prospection + water conservation.

effect: most, if not all parties in Morocco have assented to IMF guidelines as set out in its August report[2].

These call for strict budget and public debt targets, which put a significant strain on public finances. The fact that Morocco is now bound to reach a 2% budget deficit by 2020 and a corresponding 60% debt to GDP ratio means the focus now for the next government is all about fiscal consolidation. Political parties have tried to soften the blow of such a fiscal stance by promising a higher growth rate, but in doing so they implicitly accept their environmental policy proposals do not hold up to scrutiny.

Table 11: IMF forecast for selected indicators: 2016-2020.
Source:IMF country report no.16/265

Indicator	2016	2017	2018	2019	2020
GDP Growth (%)	1.7	4.2	4.4	4.6	4.7
Investment (% GDP)	34.5	35.5	36.5	37.1	37.6
Import Growth rate (%)	4.5	8	7.5	7.9	8.7
Imports of energy products (Bn)	6.7	7.5	8.1	8.7	9.1

While it is quite difficult to sustain output growth around 5-6% on average over a five-year legislature in a fiscal austerity setting, it becomes wholly implausible for a party to promise environmental targets while public funding is scarce and growth models remain unchanged. Instead, we look at what Morocco's political parties should have proposed to meet CO_2 targets and accelerate the country's energy decoupling.

IMF forecast for the next five-year period suggest sluggish investment in 2016, but its share in GDP increases steadily to reach its 2009 peak at 39% of GDP. An increase in investment boosts output growth in two ways: first as it increases aggregate demand - like household consumption or government expenditure. Second, and more importantly, it increases capital stock and thus creates more means for production of goods and services. Morocco came to rely quite a bit on investment and capital accumulation to generate its GDP growth. Between 1999 and 2014, gross capital formation (investment) contributed a quarter of real GDP growth, not an insignificant amount given the fact that household expenditure, the largest component of aggregate demand, accounted for around 60% output growth over the same time period. Figure 20 shows GDP and capital stock react positively to a temporary increase in investment, while the cumulative effect of capital stock creates an additional 1.2 additional point of GDP growth over a five-year period - and then declines over time due to depreciation.

Figure 22 shows Morocco's main energy provider ONE caters essentially to household energy consumption, as it makes a little over 40% of its supply in 2015. Industry comes second at 24%, of which 80% is expressed demand from energy-intensive sectors: cement, mining, steel and chemical industries. These results suggest that Morocco can improve it growth prospects while transitioning away from a fossil-fueled energy expenditure framework. The proposed *green* growth model calls for an accelerated depreciation of a vast

[2]Morocco : Request for an Arrangement Under the Precautionary and Liquidity Line and Cancellation of the Current Arrangement-Press Release; Staff Report; and Statement by the Executive Director for Morocco - IMF Country Report No. 16/265

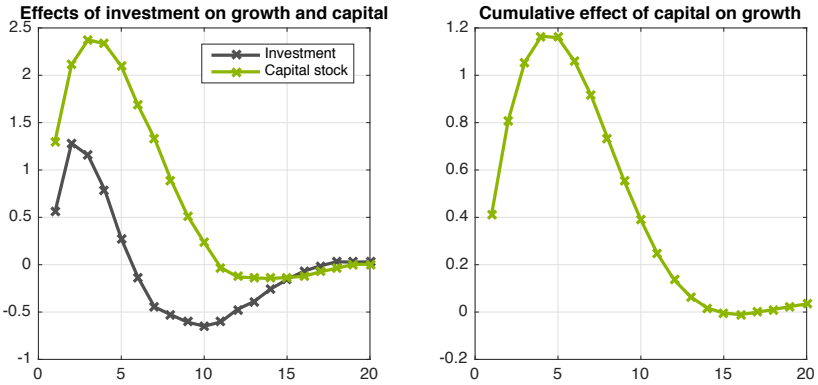

Figure 20: Investment dynamics: effects of capital formation and capital stock accumulation on growth.

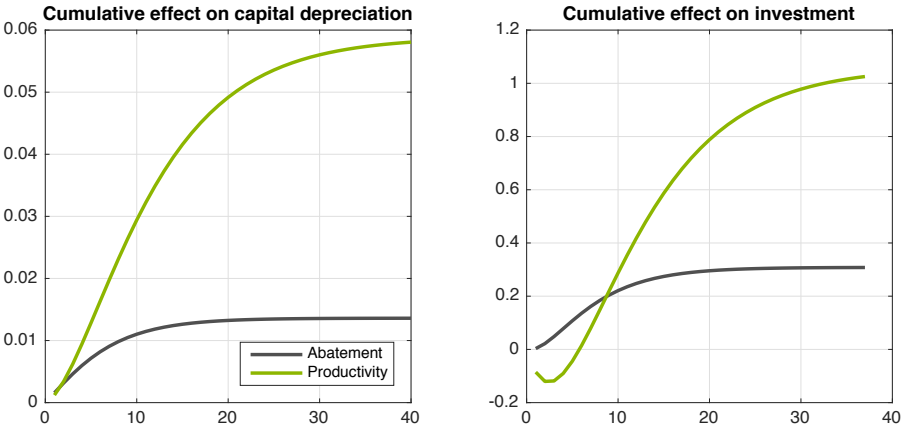

Figure 21: Cumulative effect of capital replacement: productivity and green abatement.

array of capital units, ranging from energy-efficient appliances - a measure advocated in 2011 by Istiqlal- to new processes in industrial plants. Capital replacement creates additional demand in the short run, while new capital stock increases growth potential. Although Morocco has spent significant resources for investment in the last couple of years, it has essentially focused real estate - hence the large share of cement industries in ONE electricity demand.

The country has invested little in energy conservation building technology, and continues to rely on traditional material to meet domestic demand for housing and other real estate development projects. Before 2010, construction sector accounted for half of gross capital formation expenditure - since then, investment has been short 200 billion Dirhams, which can more than meet the proposed renewal of Morocco's capital stock.

Results described in figure 21 are then used to update FMI forecast for the next five years and reported in table 12 above. The table shows it is quite possible to reinvigorate growth via increased capital accumulation - or in this case, capital replacement- in the

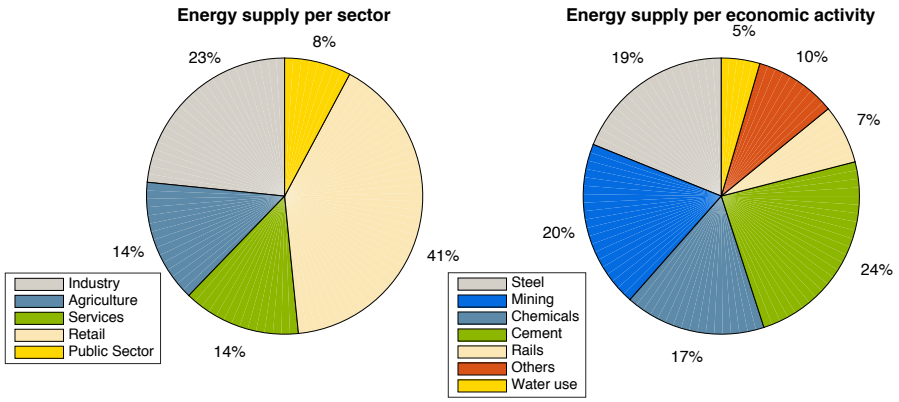

Figure 22: Electricity distribution - industry sectors and economic activity.
Source: ONE 2015 annual report.

medium run. The least expensive policy instrument in this case is green abatement, where government subsidies the phasing out of old, energy-expensive capital, and replace it with environmentally-friendly investment. The cost to government is likely to be low, it can always close any loophole in the 30-odd billion Dirhams in lost tax revenues. Companies and business can be further incentivised by offering a capital depletion allowance, *i.e.* they can deduct green abatement from their corporate earnings.

Table 12: IMF forecast: green-growth adjusted

Indicator	2016	2017	2018	2019	2020
GDP Growth	1.7	4.2	4.4	4.6	4.7
Green Growth	0.41	0.81	1.06	1.17	1.17
Total GDP Growth	2.11	5.01	5.46	5.77	5.87
Investment (% GDP)	34.5%	35.5%	36.5%	37.1%	37.6%
Green Investment	3.00%	2.80%	2.53%	2.24%	1.94%
Total Investment (% GDP)	37.50%	38.30%	39.03%	39.34%	39.54%

Conclusions

The politics of ecology in Morocco is full of contradictions: political manifestos early in Morocco's electoral history may profess an implicit hostility to environmental issues because of their perceived restraint on maximum growth. An environment-conscious economic policy is likely to give priority to community well-being, natural resources conservation, instead of full use utilisation of said resources. And even if a given political party declares its support for say, water conservation, the proposed policy is developed within the narrow scope of efficient use, and not for larger environmental considerations.

Paradoxically the 2010 Charter absolved political parties from adopting an ecological stance: that charter created a consensus that stifles debate, and gives Morocco's parties

the perfect excuse not to develop their manifesto ideas. Yet, as time goes by, the importance of environmental issues imposes itself on Morocco's policymakers, and the country's political parties will eventually clarify their respective stances. Ideological differences have been blurred in the past couple of years, so there is no clear dividing line between parties who genuinely support environmentally-friendly policies, while others oppose them for different reasons. To these contradictions one must add those more general to electoral manifestos in Morocco, namely the lack of faith in their relevance within the present political discourse. In the run-up to the October election, UC party leader Mohammed Sajid justified the lack of content in his own party's manifesto by stating the obvious: no one party can rule parliament on its own, so any majority coalition is bound to make manifestos look irrelevant or obsolete. Mr Sajid however forgets that coalitions routinely adopt a government programme, which is a blend of each coalition member's own manifesto. Regardless, he makes a good point: Morocco's political parties publish manifestos for media consumption, and not expert scrutiny. The lack of substantial content is compounded by the fact that for a host of issues, parties will refer to ongoing programme, thus the signal that they are jockeying for a position in government to implement policies over which they had little to no input. The only way out of the stifling consensus remains in the hands of civil society and citizen media.

If a large enough number of Moroccans voice their concerns as to environmental issues, either because their care about ecology and/or their lives are affected by it, policymakers are forced to pay attention and cater to these demands. To illustrate this is to restate that an increasing number of Moroccan citizens are wise to the consequences of reckless natural resources use, and the limitations of Morocco's growth model. For many local communities, the repercussions are all too real, and they are legitimately hostile to development projets that alter significantly their livelihoods with no fair compensation. Increasing reliance on social media to advertise local causes pays off regularly: thanks to social media Moroccans around the country are now aware of Imiter village and its silver mining problems, its repercussions on the local eco-system as well as rural communities. In large cities, individuals voice their concern for quality of life due to poor waste disposal, or excess vehicle traffic, or indeed the lack of green spaces.

Although local government is in charge of such matters, civil society and media can take these issues to the national stage since they are common to different places all around the country. Constituents can therefore pressure their elected officials into making policy announcements, or if those are not interested in given them fair hearing, voters keen for change can always present their own candidates to challenge incumbents and carry out their policies. The electoral process as well as the policy debate start at relatively trivial topics: waste disposal and air quality control transform into integrated urban policy and environmental regulations. The political class can go only so far without demonstrating a modicum of goodwill to their constituents, and elected officials self-interest resides in delivering for electorate in order to stay in office.

Environmental policy can always be devised at the highest spheres of government, and this document has shown that CO_2 emissions can be curbed without impairing growth perspectives. Ordinary citizens however can and should organise and shape the particulars of said policies.

Bibliography

[1] Behrens. W, Randers. J, Meadows. D & Meadows. D *The Limits of Growth* Club of Rome **1962**

[2] British Petroleum *Statistical Review of World Energy* **2016**

[3] Carson, Rachel *Silent Spring* Houghton Mifflin Company (Anniversary edition 2002) **1962**

[4] Chambergeat. P *Le référendum constitutionnel du 7 décembre 1962* Annuaire d'Afrique du Nord 01-22 **1962**

[5] Collective *Rapport sur les Valeurs* Rapport du Cinquantenaire - RDH 50 **2006**

[6] Finn, Mary G. *Energy Price Shocks, Capacity Utilization and Business Cycle Fluctuations* Federal Reserve Bank of Minneapolis Discussion Paper 50 **1991**

[7] Grodecka. A & Kuralbayeva. K *The Price vs Quantity debate: Climate Policy and the Role of Business Cycles* **2015**

[8] Hamilton. J *Time Series* Princeton **1994**

[9] Handrich. L, Kemfert. C, Mattes. A, Pavel. P & Traber. T *Turning point: Decoupling Greenhouse Gas Emissions from Economic Growth* Heinrich Böll Stiftung **2015**

[10] Hayashi. F *Tobin's Marginal q and Average q: A Neoclassical Interpretation* Econometrica 50(1), 213-224. **1982**

[11] HCP *Plan quinquennal 1960-1964* 34019-59-NO **1959**

[12] HCP *Plan Triennal 1965-1967* 33557-70-ET **1967**

[13] HCP *Les sources de la croissance économique au Maroc* HCP.ma **2005**

[14] HCP *Etude sur le Rendement du Capital Physique au Maroc* HCP.ma **2016**

[15] Heutel. G *Centre for Climate Change Economics and Policy Working Paper No.201* Grantham Institute, London School of Economics **2015**

[16] International Energy Agency *Annual Report - Morocco* **2014**

[17] Lutkepohl. H *New Introduction to Multiple Time Series* Springer **2005**

[18] Ministère de l'Environnement *Charte Nationale de l'Environnement et du Développement Durable* **2009**

[19] Ministère du Transport - CNPAC *Statistiques des accidents corporels au Maroc* **2013**

[20] Nordhaus. W To Slow or Not to Slow: The Economics of the Greenhouse Effectiple Time Series Economic Journal, vol. 101, issue 407, pages 920-37 **1991**

[21] Lutkepohl, H. *New Introduction to Multiple Time Series Springer* **2007**

[22] Office National d'Electricitié *Rapport Annuel d'Activités* **2015**

[23] Raworth. K *A Safe and Just Space for Humanity: can we live within the doughnut.* Oxfam discussion paper **2012**

[24] Wang. P & Wen. Y *Hayashi meets Kiyotaki and Moore: A Theory of Capital Adjustment Costs* Review of Economic Dynamics Volume 15, Issue 2, Pages 207?225 **2012**

[25] World Bank *World Development Indicators* **2016**

Appendix: Model description

The model is derived from Finn (1991) and describes an economy where consumers maximise their utility subject to resources. In this version, households value final consumption goods C_t as well as CO_2 emissions, which are function of the amount of used fossil energy e_t. Their utility sums over discounted flows of consumption and CO_2 emissions at factor β. The optimisation programme writes:

$$\max_{C_t} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t^{1-\sigma}}{1-\sigma} - CO_2(e_t) \right] \tag{1}$$

$$s.t. \quad Y_t = (1+\tau_t^c)C_t + I_t + G_t + P_t e_t \tag{2}$$

where Y_t denotes output, I_t investment, G_t government expenditure, and P_t energy prices. We model CO_2 emissions in a manner similar to Nordhaus (1991) and Heutel (2015) with: $CO_2(e_t) = \alpha_0 + \alpha_1 e_t + \alpha_2 e_t^2$. Technology production combines capital K_t and productivity Z_t such:

$$Y_t = Z_t \left(\mu_t K_{t-1}\right)^{\alpha} \tag{3}$$

where μ_t is a capacity utilisation index. Capital depreciation at a factor $\delta(\mu_t)$ which is function of capacity utilisation, *i.e.* capital depreciation rapidly when fully utilised. Capital law of motion writes thus:

$$K_t = (1 - \delta(\mu_t))K_{t-1} + I_t \tag{4}$$

The government funds its expenditure by levying a consumption tax τ^c as well as a carbon tax to be defined later on. Consumers' preferences are derived from the optimisation problem in equation (1). Its consumption schedule writes:

$$\lambda_t = \frac{C_t^{-\sigma}}{1+\tau_t^c} \tag{5}$$

$$\lambda_t = \beta \mathbb{E}\left[\lambda_{t+1} \left(1 + \alpha \frac{Y_{t+1}}{K_t} - \delta(\mu_{t+1}) - P_{t+1} \frac{e_{t+1}}{K_t} \right) \right] \tag{6}$$

Equation (6) shows consumers decide on their future consumption on the basis of expected returns from capital net of depreciation and future costs from energy intensity. An increase in energy prices means capital use becomes more expansive, and its future returns decline.

Firms seek to maximise their own value subject to the capital law of motion and some costs of adjustment to investment, and their optimisation programme writes:

$$\max \mathbb{V}_t = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[Y_t - R_t K_{t-1} - I_t - \frac{\varphi_k}{2} \left(\frac{I_t}{K_{t-1}} - \delta(\mu_t) \right)^2 K_{t-1} \right] \tag{7}$$

$$s.t. \quad K_t = (1 - \delta(\mu_t)) K_{t-1} + I_t \tag{8}$$

$$I_t = K_{t-1} \left(\frac{q_t - 1}{\varphi_k} + \delta(\mu_t) \right) \tag{9}$$

Equation (9) describes the firm's investment schedule: it increases in q_t which is Tobin's marginal value for capital, and decreases in parameter φ_k which captures investment cost of adjustment.

Government expenditure is then directly injected in equation (8) in order to subsidise depreciation $\delta(\mu_t)$ and the green capital value $q_t^\star$ writes thus:

$$q_t^\star = \left(G_t \frac{I_t}{\varphi_k} - \delta(\mu_t) \right) K_{t-1} \tag{10}$$

In addition to consumption taxes, the government also extracts a carbon tax on CO_2 emissions, which is levied indirectly on the intensity of energy use per capital unit. At the optimum, the carbon tax balances out contemporaneous utility from consumption and CO_2 emissions.

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