Real Instituto Elcano working paper

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Area: International Economy & Trade
Working Paper 62/2009
11/12/2009

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Madrid – Spain
www.realinstitutoelcano.org

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Summary
Spain, on its own, is not a key player in the negotiations for the potential successor of the Kyoto Protocol that is expected to be 'politically agreed' at the Climate Change Summit in Copenhagen. It is well known that this 'honour' is reserved for the US and China, the world's two main emitters of Greenhouse Gases (GHG). However, Spain can play an important role in that it will occupy the Presidency of the EU during the first half of 2010. Moreover, Spain could influence the negotiations towards win-win situations for the country. In this working paper we argue that the economics and politics of climate change provide few incentives for countries to engage in an ambitious deal that would drastically cut carbon emissions. However, we expect the Copenhagen summit to deliver a workable successor of the Kyoto Protocol, whose main mechanisms are two types of partnerships: (1) developed countries with developing countries; and (2) public and private partnerships. Spain can benefit from an agreement like this given the first-mover advantage it has acquired in the deployment of clean technologies, the importance of its energy firms and their strong links with Latin America. However, among other initiatives needed, the country must adapt its energy and environmental policy to facilitate the transition towards a low-carbon economy. This is a complex task because energy and environmental policy objectives are intertwined, and in some cases trade-offs are inevitable. This paper presents some principles put forth by evolutionary economics that could guide policy makers in this endeavour.

Introduction
t is likely that Spain will be badly hit if current climate-change trends continue. The Spanish Office for Climate Change (OECC), for instance, predicts greater temperature variability, reduced water availability, frequent fires, increases in energy demand, alterations in terrestrial and marine ecosystems, biodiversity losses and adverse effects to the Spanish finishing and tourism sectors (OECC & UCLM, 2005; Ciscar, 2009).

However, the coincidence of two events will place Spain in a key position to attempt to reverse these trends. The first is the United Nations Climate Change conference in Copenhagen, where the successor of the Kyoto Protocol is expected to be 'politically agreed'. The second event is that Spain will head the EU in the first half of 2010. Having both events in such a short period of time will give Spain significant leverage to influence the outcome towards potential win-win situations for the country.

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As a preparation for the Copenhagen summit (COP-15), the Bali Road Map establishes four building blocks for negotiation: mitigation, adaptation, technology and financial transfers (See Figure 1). Countries will work to solve the problem from different angles using different strategies, including technology efficiency, carbon markets and taxes. In this paper we argue that it is the last two building blocks –technology and financial transfers– on which Spain should concentrate, given its relative advantages. This is because Spain has taken a leading role in the deployment of clean technologies (it already has the second-largest installed wind capacity in Europe), the country hosts leading energy companies and has strong links with developing countries, especially in Latin America.

Figure 1. The Bali Road Map's building-block negotiations

	Concept
Mitigation	Reduction of GHG emissions to limit global temperature increase to 2º Celsius
Adaptation	Adaptation is a damage minimising strategy that has been used throughout human history
Technology transfer	Deployment of low carbon technologies from developed countries to developing countries
Financial transfer	Transfer of cash from developed countries to developing countries. The Clean Development Mechanism is the financial transfer mechanism within the Kyoto Protocol

The paper is organised as follows. First we discuss what is at stake in Copenhagen. We explore the difficulties that arise from the economics and politics of climate change to reach an effective agreement on global warming. We also discuss what positions key countries have on this issue and analyse one of the possible outcomes of the negotiations. In the second section we argue that a workable successor of the Kyoto Protocol has to include two types of partnership: (1) developed countries with developing countries; and (2) public and private partnership. In the third section we discuss how the Spanish energy sector, in particular the power sector, could evolve in the light of a potential climate change agreement. A key question is whether the current climate regulation goes hand in hand with the requirements of a new climate agreement. We therefore provide guidelines for the transformation of Spain's energy policy based on the contributions made by evolutionary economics. The last section will present a brief summary of the main ideas discussed.

What is at Stake?

The rationale for an international agreement is to transform an open-access resource, in this case the global atmosphere, into international common property. The United Nations Framework Convention on Climate Change (FCCC, 1992) established an institutional legal infrastructure intended to facilitate a long-term governance process addressing the climate change problem, with substantive obligations embodied in successive protocols. In 1990 the International Negotiation Committee (INC) was formed to take charge of the

negotiations for the FCCC. The INC considered two alternative models. The first is the general framework agreement on the law of the atmosphere and the second is to negotiate conventions and protocols specifically on climate change.

The aim of the following sections is to review the basic characteristics of the climate change problem from an economic and political perspective. We will argue that climate change is a complex issue, and that given the nature of the economic and political incentives, it will be difficult to reach an agreement. Thus, a 'shallow' agreement is one of the possible outcomes.

Climate Change Economics

The problem of climate change presents a complex economic scenario. There are many countries involved, each with different abatement costs and with different levels of responsibility –past and future–, either because they contributed to create the problem or because they are likely to worsen it with their future emissions. Simply put, if the world were to act as a monolithic entity whose aim is to reduce carbon emissions rapidly, the question would be how to accomplish it in the most cost-effective way. As the world is not a monolithic entity, solutions in terms of global warming are not the result of a negotiation between equals, ie, not a democratic negotiation where 200 or more countries have a say and an equivalent 'weight' in the decision-making process. Given that there are just a few carbon-producing countries which are really relevant, the crux of the negotiation is how to form a cartel of carbon-producing countries that commit themselves to a reduction target that will lead to a manageable increase of global mean temperatures. The problem, as with any cartel, is the potential for free-riding: countries can enjoy the benefits of carbon-emission cutting without bearing the costs. To complicate things further, the cartel of emitters bears different responsibilities. Some rich countries have a moral obligation to act because their industrialisation processes led to the Global Warming problem, while other poor countries should bear some responsibility because their current industrialisation will worsen the problem. Moreover, the potential costs and benefits of climate change are unevenly distributed across the globe. Thus, from a purely economic perspective there are no incentives to reach an agreement when decisions are made bearing in mind just short-term objectives, as costs are greater than benefits if only individual action –not coordinated ones– are implemented.

In sum, achieving a global agreement on climate change will be difficult from a purely economic perspective. It will be politics what will make an agreement possible although such an agreement will be sub-optimal: either emission cuts are not as aggressive as required or, if drastic reductions are promised, they will not be delivered in the near future, as is also needed. This is an interesting paradox: the less strict the agreement is, the more chances it has of being adopted. Politics and politicians will also need to deal with the positions of the main players, as well as with the need to raise civil society's climate-change awareness. These issues will be discussed in the next section.

Climate Change Politics

In this section we discuss the problems of climate-change politics. Especially important is the fact that although climate change action is backed by a long sought-after scientific consensus and despite the fact that it could have catastrophic consequences, it is an issue that remains on the backburner in the minds of politicians and civil society alike. Raising the issue in national and international agendas is something that needs to be done in Copenhagen and after. In this section we also discuss the position of key countries in the negotiation process and we analyse the core issues in the post-Kyoto agreements.

Political economy

The first problem is that for many citizens, climate change is a low priority rather than a fundamental concern. This is a paradox since, according to surveys, civil society accepts that global warming is major threat but few are willing to make significant changes in their lifestyle to mitigate it. Thus, the politics of climate change have to cope with what is being called the Giddens' Paradox (Giddens, 2009): the fact that people find it hard to perceive the future as real and certain as the present, which is arguably logical given the inherent uncertainties of the climate-change dilemma. Thus, a small reward now will normally be preferred to a much larger one sometime in the future. Not only does Giddens' Paradox apply to ordinary people. Governments are also subject to this paradox: most government priorities are short-term,[1] while climate change is a long-term problem. Moreover, current politicians who want to be re-elected depend on current voters, who are more worried about present problems. Most politicians will not be active when the most catastrophic consequences of climate change take place. This idea has been picked upon as a campaigning initiative by Greenpeace in the media prior to the Copenhagen summit.[2]

Negotiation

In the section on the economics of climate change we argued that countries do not have incentives to sign a climate-change agreement from a short-sighted cost-benefit perspective. A sovereign country will not sign up to an agreement that makes it worse off. On the contrary, sovereign states can be expected to follow their 'self-interest' in negotiations. However, this would be a narrow approach since self-interest can be broadly defined. The perception of the benefits/costs of an agreement is influenced by (on-going) negotiations and their 'socialisation' by international institutions. For example, sovereign states are increasingly interdependent not only with regards to environmental issues but also in trade. There are two theoretical perspectives on how a sovereign state's 'self interest' can be moulded. The first is liberal institutionalism: in this approach

[1] What Ed Miliband referred to as 'the politics of now' in one of the Ralf Miliband Lectures at the London School of Ecnomics this past November (available on-line at http://www2.lse.ac.uk/newsAndmedia/videoAndAudio/publicEventsVideos/LSELive_previous.aspx).

[2] http://www.greenpeace.org/espana/.

international institutions influence preferences as well as the behaviour of states and strive to coordinate agreements. In other words, international institutions embody and promote international social norms, although states remain the key actors. The second is the critical political economy, according to which the power of dominant 'hegemonic' actors (states and corporations) influences negotiations. Here the scope for regulation is limited by capitalist property, trade and investment rules.

There are about 200 individual sovereign nation states involved in negotiations. Major alliances are the G77, the EU and the Umbrella group (the US, Canada, Russia, Ukraine, OECD countries outside the EU). However just a handful of countries are important in curbing carbon emissions. Among them, the most important players are the US and China because they are the largest $C0_2$ emitters in the world. Furthermore, China can be seen as 'the loudspeaker' of developing countries whose economic growth prospects cannot be halted because it will bring millions of people out of poverty and poorer countries should not be paying for the developed countries' previous rise. According to The Economist Intelligence Unit (Economist Intelligence Unit, 2009), the two key countries will find it difficult to ignore a global agreement. Both the US and Chinese governments will find it too costly to be blamed for failure in Copenhagen. Having both the US and China in a global agreement will draw other developed and developing countries into the agreement. However, as the climate change paradox explains, that does not mean that the agreement they reach can make a real difference in emission reductions. It is possible that the 'law of the least ambitious programme' (Underdal, 1983) applies in this case. Regime analysis emphasises that the likelihood of reaching an agreement is determined by: (1) a low transaction cost associated with participating in the agreement; (2) transparency regarding the extent to which state actors meet their commitments: (3) common interests between states in co-operating to address the perceived problem; (4) a high level of scientific understanding about the nature of the problem and the appropriate responses; (5) modest targets which translate into high rates of compliance; and (6) a non-confrontational compliance mechanism. Figure 2 shows the position of key countries with respect to a new climate-change deal.

Evaluation

There are different ways of evaluating the potential effectiveness of an agreement in Copenhagen (Young, 2002). The first is compliance effectiveness. This refers to the fact that actors implement and obey regime prescriptions in a voluntary or induced way. In other words, countries comply at least with what was stipulated in the protocol. In terms of climate change, we have argued that it would not make much difference since the economics and politics of the problem imply that countries have no strong incentives to take bold action. The second type of effectiveness is that the changes that actors adopt in their behaviour produce objective environmental outcomes. Thus the regime's effectiveness has to do more with the causal link between behaviour and outcome (ie, the environmental outcome could have changed but for reasons different to the behaviour of

countries). The last one is result effectiveness. This has to do more with whether the implementation of the agreement results in the desired level of environmental improvements. In other words, whether the agreement was successful in reaching the objective, in this case that carbon emissions are reduced to the level that they produce a change of 2º Celsius in the mean global temperature. This measure of result effectiveness should also be weighed in terms of its economic efficiency –the agreement's cost effectiveness– and the fairness equity process (procedural) and outcome (distributional effects). Bearing in mind these points, in the next section we analyse the core issues that could pave the way towards a successful agreement given the constraints that have been pointed out earlier.

Figure 2. Forces shaping key emitting countries' positions in the negotiation

Key Players	Forces pro-agreement	Forces against agreement
US	- International pressure - Change in Administration - Responsibility as the world's main carbon emitter - Stakeholders' pressure - Regulatory proceedings, court challenges, growing stakeholder support and pressure from the international community	- Concerns about recession - Lobbying by oil companies - Competitiveness concerns
EU	- Take advantage of its more developed low carbon sectors - Industrialisation of European countries created the conditions for climate change	- Recession - Individual member states cannot make any real difference to global carbon emissions
China	- World's second-largest polluter - Inexpensive to cut marginal emissions - Can potentially profit from a carbon market	- Per-capita emissions are still very low - Punish consumption of emissions rather than production
BRIC (excluding China)	- Technology Transfers - Other international negotiations - Financial transfers in addition to Official Development Aid (ODA)[3]	- Not morally obliged (they did not create the problem) - Need to grow - Environmental problems can be more easily solved when development issues have been solved

[3] The EU estimates that €100 billion need to be transferred to developing countries for adaptation and mitigation by the year 2020 to tackle Climate Change. Between €22 billion and €50 billion would come from public funds. The EU's share EU would be between €2-15 billion by the year 2020 (*http://ec.europa.eu/environment/climat/pdf/future_action/com_2009_475.pdf*).

Core Issues in the Post-Kyoto Agreements

Unprecedented Cooperation Between Developed and Developing Countries

In the previous section we argued that reaching an agreement in Copenhagen will be difficult and discussed what the likely outcome of the Copenhagen meeting could be. It is clear that climate change is too broad and far reaching an issue for one meeting or treaty to solve. However, while the output of the negotiation could take different forms, the common denominator has to include a partnership between developed and developing countries in terms of financing new technology, mitigation and adaptation initiatives of the latter. The reasons for this are that while the rich world's past high-carbon growth is responsible for the bulk of current concentrations of greenhouse gas emissions in the atmosphere, developed countries alone cannot meet the scale of the challenge which is reducing the current level of 50 GT of CO_2-e –together with the projected rate of economic growth in large developing countries– to around 20 GT of CO_2-e by 2050. Thus, the developed countries have come to recognise that they alone cannot reduce global emissions enough to keep climate change in check. For this reason they need to incorporate developing countries knowing, that they will require assistance as they expand investment in low-carbon technologies.

Addressing climate change will require a rapid and comprehensive transition towards low-carbon energy sources, as required to reduce the risks of higher temperatures. In terms of climate-change mechanics, the question is not about the direction of the transition towards cleaner energy sources –ie, whether transition is needed or not– but, more importantly, the question is the speed and extent of such a transition. This entails the accelerated deployment and diffusion of clean-energy technologies that are commercially operating today, as well as the development, demonstration, deployment and diffusion of new technologies. The International Energy Agency estimates that US$100-200 billion per year in additional global energy investments are needed in the near term to accelerate the deployment of clean technologies, with more than half needed in developing countries (IEA, 2008). It is estimated that the cumulative global investment in a full range of clean power technologies would have to reach around US$7.7 trillion by 2030.

Since huge amounts of money are required to drive a massive deployment of new and cleaner technologies, then intrinsically tied to this is the question of financing. So far, the main instrument for technology transfer within the current Kyoto Protocol's framework is the Clean Development Mechanism (CDM). CDMs were designed to give developed countries carbon offset credits for investments to mitigate $C0_2$ emissions in developing countries. However, CDM results have been disappointing, with just around US$7.4US billion invested in projects in 2007. In 2009 the carbon credits earned by CDM projects accounted for less than 0.7% of global emissions. Furthermore, the CDMs annual transfers to developing countries totalled US$6.5 billion in 2008, while the UN estimates that

between US$300 billion and US$400 billion per year would be needed for adaptation investments (Stern, 2009). It is clear then that this level of funding is insufficient to support the investment level that is necessary to significantly alter emission trends in developing countries. In sum, although the direction towards a cleaner energy sector is clear, the pace of that transition is an open question and will depend on the size of the transfers from developed to developing countries.

In any case, any climate change agreement will require significant financial flows to developing countries to support low carbon growth. Growth is indispensable for developing countries to be able to tackle poverty. But growth must follow a low-carbon trajectory so that global climate-change objectives are not compromised. Poverty and climate change are interdependent: if we fail on one, we fail on the other (Stern, 2009). With regards to multilateral aid, Spain has also contributed to projects designed to help developing countries adapt to climate change, foster technology transfer initiatives, help with the integration of developing countries in the global carbon markets and participate in CDM projects. Spain's efforts in this area have included the contribution of more than €9 million in various projects, including the Carbon Finance Assist initiative, the UNDP-UNEP initiative (mainly directed to African and Latin American countries), the Fund for Less Developed Countries and the Special Fund for Climate Change.

Unprecedented Public-private Partnership

In the last section we argued that reaching an agreement in Copenhagen will be difficult. However, if an agreement is reached, the common denominator of an agreement in Copenhagen will be an unprecedented example of cooperation between developed and developing countries. In this section we argue that the *mechanics* of the agreement should incorporate an unprecedented public-private partnership. This should not be surprising. In the past, other serious environmental problems of the first generation (water contamination, soil, etc) were solved because entrepreneurs saw the opportunity of benefitting from tackling those problems by developing technology that granted temporal monopolistic rents from their inventions (Beckerman, 1995). Climate Change is seen as the ultimate public-good problem where property rights are ill defined and subject to free-riding. Most prescriptions about how to cope with climate change are onerous. They are about saving, cutting back, reducing the use of private transport, cutting back on air travel, reducing energy bills, walking more, etc. Yet because of Giddens' Paradox, no approach based mainly on deprivation is going to work. We must generate a model for a low carbon future and, moreover, one that yields net benefits (economic, moral, etc). That is why the successor to the Kyoto Protocol should actively acknowledge and foster a significant role for the private sector.

There are interesting opportunities for the private sector. The difference between existing transfers and those needed to substantially curb emissions in developing countries shows that the climate-change offset market has the potential for manifold growth. The reform of

existing mechanisms like the CDM can help unleash that potential. Carbon market finance might, in the long term, generate sufficient additional investment to meet stringent emission targets. Purchases of emission offsets by developed countries could generate as much as US$20 billion to US$40 billion a year and another US$7 billion to US$30 billion could be collected through auctioning revenues. Future targets need to be stringent enough to create the demand for credits. Spain can benefit from this given the importance of its energy firms in deploying low-carbon technologies in developing regions such as Latin-America and Africa (Lázaro Touza, 2008).

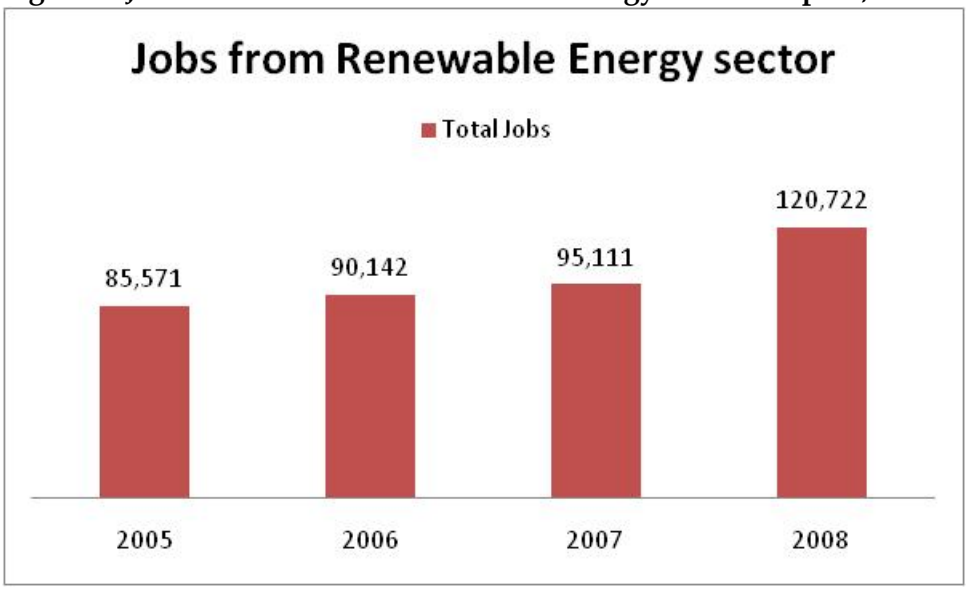
Another argument in favour of engaging in a massive transformation of today's lifestyle is its impact on jobs. If new and better jobs can be created, the lifestyle that is required could be more appealing. Frankhauser (2009) establishes that the employment impact of climate policy can be understood in three states:

(1) A short term effect, when jobs are lost in directly affected sectors and new ones are created in replacement industries. We think of this as the direct employment effect. The energy sector is not very labour intensive.
(2) A medium term effect, when the impact of climate change policy ripples through the economy. Jobs are created and lost along the value chains of affected industries. These are the higher order economy-wide effects of climate policy.
(3) A long-term effect, when innovation and the development of new technologies create opportunities for investment and growth. We call this the dynamic effect of climate policy. The discussion is job numbers, although this is only half of the story. The nature of the jobs created may differ from the nature of jobs lost, and this will have repercussions on labour productivity and pay. Productivity information is scant and little will therefore be said about the relative quality of jobs.

According to a study by Deloitte and the Association of Renewable Energy Producers,[4] this sector employed 120,722 people in Spain in 2008, of which 75,466 were in direct jobs and 45,257 in indirect jobs (from equipment and services). Figure 3 shows the trend in job creation from the renewable energy sector.

[4] *http://www.appa.es/19privado/descargas/APPA%20-%20Estudio%20Impacto%20Macroeconomico%20Energias%20Renovables%20Espana.pdf*.

Figure 3. Jobs created from the renewable energy sector in Spain, 2005-08



Source: adapted from APPA (2009).

Spain's Role

So far we have argued that reaching an ambitious agreement in Copenhagen will be difficult. Also, we argued that any meaningful agreement should include a partnership between developed and developing countries, and a public-private partnership. In this section we discuss what role Spain should have as a negotiator in Copenhagen and at the head of the EU in 2010. We argue that Spain should use its influence to achieve a workable mechanism for the financial transfer of low carbon technologies. Then we review Spain's record with regards to curbing carbon emissions and expand the discussion of the potential dangers the country will face in the event of global warming. In the following section we complete the background on Spain's case, presenting its current energy and climate regulations. In the last section we discuss, in the light of the potential scenario that we described earlier, how Spanish regulations can be adjusted, specifically in the energy sector.

Spain's Role Abroad

As mentioned in the introduction, Spain will have a formidable leverage to try to reach an agreement where win-win opportunities may arise for the country. As the head of the EU in the first part of 2010, Spain can influence the global environmental policy process in three stages. The first is agenda-setting. This would be prior to the Copenhagen meeting. With the support of scientific knowledge, Spain can help to build a consensus. The next stage would be in Copenhagen. Here is where politics come into play, where the bargaining takes place, the treaty is drafted and finally the conventions and protocols are signed. Equally important would be the third stage, which is post-negotiation and which includes implementation, monitoring, verification and enforcement.

The win-win situation that we envisage is that Spain already has a first-mover advantage in the deployment of clean technology. If Spain remains in the top positions on this matter, and given that we expect an agreement in Copenhagen that contemplates the deployment of renewable technologies as the main type of action, then Spain would be in a good position to benefit from these two events. In this paper we have also argued that an unprecedented partnership between developed and developing countries should be pursued at this stage of the climate convention. Spain also has a competitive advantage in this subject given its strong ties with Latin America. The influence in this area in the energy sector is evident. For example, in Mexico, which is a big developing country, Spanish companies have the highest share of foreign private firms operating in the country. Figure 4 shows the international assets of Spanish energy companies abroad.

Figure 4. Main Spanish energy companies with assets abroad

Companies	Total assets abroad (Million €-2008)
Abengoa	6,406
Acciona	2,818
ECyR	1,128
Gamesa	1,237
Grupo Hera	20
Iberdrola Renovables	15,143
Isofoton	135

Source: http://www.appa.es/descargas/APPA_Presentacion

The Spanish Strategy for Climate Change and Clean Energy includes the development of the institutions and legal framework required to participate in the EU-ETS and the participation projects that could enter into the Kyoto Protocols CDM. The CDM is seen as an efficient facilitator to lead to a low-carbon future and as a way of promoting growth in developing countries that host these projects. Most of the projects are planned and executed in Latin America and other countries with which Spain has stronger ties and interests. Plans have been designed to reduce the contribution of energy to GHG emissions via the public investment of €729 million, with over €8,400 million in public sector funds to support renewable energies.

In our main scenario we mentioned that public-private partnerships are also vital for a successful agreement. The private sector can help tackle the climate change problem while it benefits from new opportunities, as discussed above. However, not all can be left to the markets and the private sector. The private sector alone cannot deliver all the investment in mitigation that will be needed. Here is a second point where Spain can help to lead the way. Smart public funding is required to leverage private investments. Governments should focus on trying to solve market failures that arise in climate change. The paradox is that with the introduction of strong regulatory frameworks, these prospects of a sustained carbon price improve and the need for public money will

diminish (Stern, 2009). We also have a potential market failure in innovation: governments should refrain from supporting specific types of technologies that go against other potential solutions, or market failures in the financial markets where the private sector does not yet take into account expected returns from the carbon revenues stream when making their investment decisions. Scepticism prevails about the ability of developing countries to create the appropriate enabling environments for investment. Public financing instruments will be paramount in stimulating private investment into climate mitigation and adaptation in developing countries while the carbon markets continue to develop. In this case it will therefore be crucial to consider instruments to leverage private finance flows while pursuing measures to reform and build the carbon market.

Spain's Current and Future Situation

In this section we discuss Spain's record in reducing carbon emissions. Then we provide a snapshot of the current situation in the energy sector in Spain and in Europe. Spain's GHG emissions account for 9% of total GHG in the EU-27. In comparison with the 1990 base year of the Kyoto Protocol, up to 2007 Spain increased its GHG emissions by more than 52%. In comparison with the EU-15, the EU as a whole had reduced its carbon emissions by 5% in comparison with 1990. The UK and Germany lead the way in terms of reduction, with double-digit decreases. Spain's target for the period 2008-12 is to increase its GHG, in comparison with the base line of 1990, by 15%. Figure 5 shows the record of some members of the EU in reducing carbon emissions in comparison with Kyoto base year.

Figure 5. Compliance of different European Countries with Kyoto Protocol's commitments

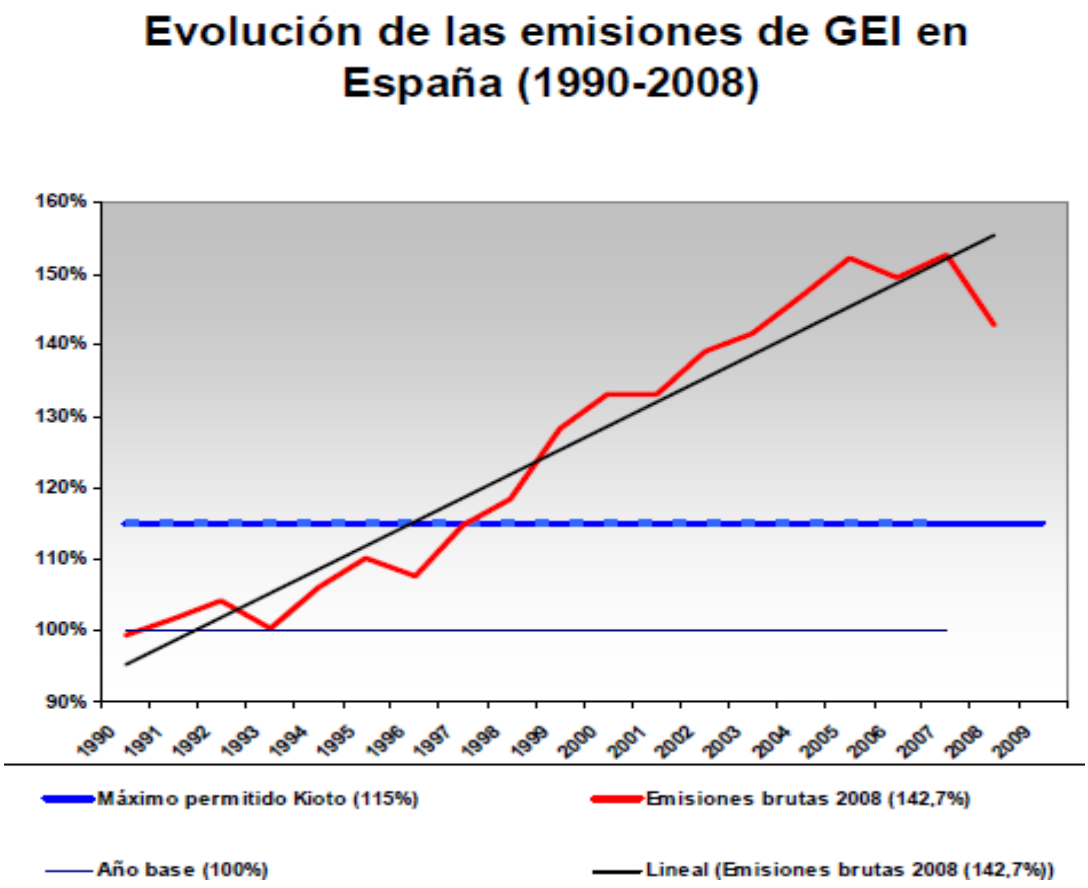
Country	Unit	Kyoto base year	1990	2007	2008	2003-2007 average	2004-2008 average	2008-2012 Kyoto target
Spain	Mt C02 eq	289.8	288.1	442.3	n/a	430.6	n/a	333.2
	% from base year			52.60%	n/a	48.60%	n/a	15%
UK	Mt C02 eq	776.3	771.1	636.7	n/a	651.3	n/a	679.3
	% from base year			-18%	n/a	-16.10%	n/a	-12.5
Germany	Mt C02 eq	1232.4	1215	956.1	944.3	981.9	969.3	973.6
	% from base year			-11.40%	-23.40%	-20.30%	-21.30%	-21%
France	Mt C02 eq	563.9	562.6	531.1	n/a	546.2	n/a	563.9
	% from base year			-5.80%	n/a	-3.10%	n/a	0%
EU-15	Mt C02 eq	4265.5	4233	4052	4001.1	4134	4098.2	3924.3
	% from base year			-5%	-6.20%	-3.10%	-3.90%	-8%

Source: http://www.scribd.com/doc/15706347/Renewables-Global-Status-Report-2009-Update.

Figure 6 shows the performance of Spanish carbon emissions from the conception of the Kyoto Protocol until 2009. Emissions growth was vigorous until 2005, when the rate of increase started to decline. Emissions fell in 2009 compared to the previous year because

of the economic slowdown and also because of the lower proportion of power generation based on coal (Santamarta & Serrano i Giménez, 2009).

Figure 6. Evolution of GHG emissions in Spain, 1990-2008



Source: Santamarta & Serrano i Giménez (2009).

The main sectors that contribute to GHG emissions are: electricity (21.7%), road transport (23.4%), industrial energy consumption (17.9%), oil refining (3.1%) and aviation (1.8%) (Santamarta & Serrano i Giménez, 2009). The power sector is one of the key sectors that contribute to the problem of climate change. In the EU-27, production of electricity and heat account for around 26% of total carbon emissions.[5] However, the power sector could be one of the key contributors for the solution also, because electricity can be produced using different types of fuels and its effect is invisible to consumers. Spain has already made a great effort in introducing renewable sources into its power sector. Spain has the second-largest installed capacity of wind power in Europe, just behind Germany. In terms of the world's total renewable energy, Spain is in a strong position as regards wind power capacity, where it has around a 14% total share, and in the different forms of solar

[5] http://www.eea.europa.eu/publications/eea_report_2009_9.

technology, with a 25% share in solar photovoltaic grids and 20% in solar thermal power CSP. Overall, Spain has around an 8% share of the world's total renewable energy (See Figure 7), although this position could change shortly in light of China's renewable energy development plans.

Figure 7. Share of renewable electric power capacity, as of 2008 (estimated)

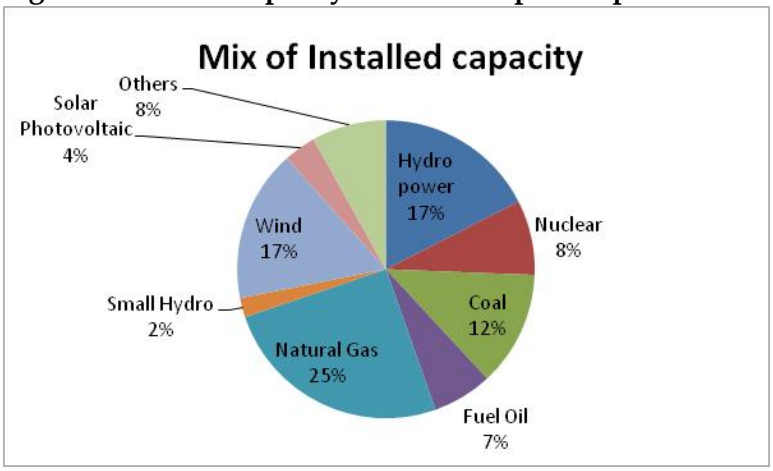
Technology	World Total	EU-27	China	USA	Germany	Spain
Wind power	100%	54%	10%	21%	20%	14%
Small hydropower	100%	14%	71%	4%	2%	2%
Biomass power	100%	29%	7%	15%	6%	1%
Solar photovolatic-grid	100%	73%	n/a	5%	42%	25%
Geothermal power	100%	8%	0%	30%	0%	0%
Solar thermal power-CSP	100%	20%	0%	80%	0%	20%
Ocean (tidal) power	100%	100%	0%	0%	0%	0%
Total renewable poser capacity*	100%	37%	27%	14%	12%	8%

* Excluding large hydro

Source:Author's calculations with data from EIA

Wind capacity in Spain already accounts for an important share of total installed capacity. Figure 8 shows Spain's current generation capacity mix (2008).

Figure 8. Current capacity mix in the Spanish power sector



Source: MITyC (2008).

In terms of the Spanish energy sector's fuel mix, a further reduction in oil-fired capacity is expected as well as a greater role for hydro power as carbon dioxide (CO_2) goals become stricter. Also, the government expects electricity generation from special regimes (CHP and renewables) to meet around 19% of demand, but also that coal and nuclear will remain key in the long-term fuel mix, as they can serve both as baseload generators and as a backup for the expanding role of renewables in the capacity mix. Furthermore, current market trends could lock-in fossil fuel technologies such as gas. The combination of high power prices, with low reserve margins and low gas prices triggered massive investments in gas capacity in the past. After this 'dash-for-gas' in Spain, gas became the prime fuel for electricity generation. The concept of lock-in expands on this in two important ways (Perkins, 2003). First, it suggests that technologies and technological systems are inherently inert, giving rise to distinctive and, moreover, durable patterns of resource use and waste production over time. For this reason, insights from the field of lock-in (increasing returns, technological clusters, etc) hold considerable promise in relation to attempts to model economy-environment relations. Second, it highlights how ecological change is deeply embedded in complex, interdependent technological and socioeconomic systems. Research into the dynamics of lock-in patterns points to the need for more sophisticated policy approaches that take a system-wide perspective to reducing the environmental burden of economic activity.

The situation in the energy markets in Spain resembles that of the EU. The main concerns are energy security (in terms of the secured provision of fuels at stable prices) and climate change. The concept of energy security in Europe encompasses a wide range of issues including energy efficiency, diversification of energy supply, increased transparency of energy demand and supply offers. Both problems, energy security and climate change, are somehow intertwined since the outcome of the type of fuels that are imported with the fuels that are displaced, will determine whether or not climate change objectives can be met. In the EU the share of fossil fuels in total energy consumption declined only slightly between 1990 and 2005 from around 83% to 79%, but dependency is growing rapidly for natural gas and coal. Natural gas imports accounted for around 59% of the total gas-based primary energy consumption in 2005, while for hard coal-based primary energy, imports accounted for 42%. The largest single energy exporter to the EU is Russia. Oil imports accounted for as much as 87% in 2005 –up from 84% in 2000– driven by substantial increases in demand from the transport sector, reflecting a lack of real alternatives in this sector and low EU oil reserves (EEA, 2008).

Spanish Regulation

In March 2009 the Government Climate Change Commission established six strategic lines to reduce GHG emissions: (1) waste Management; (2) sustainable mobility; (3) sustainable building; (4) sustainable energy; (5) forest management; and (6) innovation. In reference to the sustainable energy strategy, the objectives are to provide more coherence between climate change and energy plans, promote energy savings and energy efficiency,

as well as promoting renewable energy. Also with this strategic line, the government plans to promote innovative firms in the use and provision of clean energy. The most important piece of legislation to derive from these strategic lines of action is the Energy Efficiency and Renewable Energy Law (*Ley de eficiencia energética y energías renovables*). This new law will be accompanied by the revision and updating of two previous laws: the Energy Efficiency & Savings Plan 2013-2020 (*Plan de Ahorro y Eficiencia Energética para el período 2013-2020*), and the Renewable Energy Plan 2011-2020 (*Plan de Energías Renovables para el período 2011-2020*). In line with the EU, the target is to achieve that by 2020, 20% of energy consumption will come from renewable sources and 10% from biofuels. To complement this strategy, the Commission is planning to promote R&D on carbon sinks. These strategic lines are accord with the Spanish Climate Change Strategy, published in November 2007. The strategy divides actions into climate change response and actions directed specifically towards promoting cleaner energy and improving energy efficiency. The main goals of this strategy include a further reduction of GHG emissions in order to help Spain achieve Kyoto Protocol targets, increasing carbon sinks and promoting R&D.

The following are among the policy instruments put in place to respond to the climate-change challenge:

- Spain's participation in the EU-ETS.
- Spanish NAP under the Emission Trading Scheme (ETS): 761.2 million metric tonnes (mt) of CO_2 for the second phase –152.25 mt of CO_2 per year (70.7 mt for the power sector)–. This is a significant reduction compared with a total of 524 mt in the first phase –174.6 mt of CO_2 per year and 108.5 for the power sector–.
- The building performance standards covered by Royal Decree 314/2006.
- The promotion of information and awareness campaigns.
- The implementation of environmental taxes, for example, the tax on atmospheric pollution first levied in Galicia in 1996, and the tax on activities that affect the environment as laid forth by Castilla-La Mancha in 2000.

Energy regulation is focused on promoting the use of renewable energy. There are two support mechanisms for renewable production: (1) fixed feed-in-premium on top of the pool price; and (2) a production incentive as a percentage of the tariff of reference set by the Spanish regulator. A review of the compensatory scheme will be carried out in 2010 and every four years. The plan is that by 2010, 30.1% of electricity consumption will come from renewables. However, meeting the wind target of 20 GW would require an additional 8.5 GW of capacity, which will be difficult to achieve given the shortage of transmission capacity.

More specifically, the energy and climate policy mix includes the following instruments:

- Royal Decree 661/2007, that encourages renewable energy and cogeneration with new tariffs for renewables.
- Feed-in-tariffs for 2007 review the allowed opportunities for solar power as the tariff allowed the use of alternative fuels to back up this technology. Royal Decree 661/2007 revises Royal Decree 436/2004. A transitory regime regulates additions starting up before 1 January 2008, that can continue to be covered by the regulation established in Royal Decree 436/2004 until 31 December 2012.

The Spanish Climate Change and Clean Energy Strategy also analyses the emission trading system. According to MMA (2007), one of the basic pillars of the ETS is the National Allocation Plan (NAP). Spain's second NAP for 2008-12 was approved by Royal Decree 1370/2006 of 24 November and in it emission rights for the first commitment period were assigned, limiting to +37% Spain's GHG emissions compared to the base year. The remaining reductions in GHG emissions, given that Spain is only allowed to increase its emissions by 15% above 1990 levels in order to comply with Spain's KP commitment, will be obtained via carbon sinks (2%) and emission trading (20%) (Lazaro Touza, 2008).

Since some climate change is already under way, no matter how much GHG can be reduced, it is worth thinking about adaptation strategies. Vulnerability to climate change depends on the level of exposure, sensitivity and adaptability (IPCC, 2007). Adaptation is a damage minimising strategy that has been used throughout human history, and more realistic. The IPCC promotes the following adaptation strategies for the energy sector:

- Strengthening of overhead transmission and distribution infrastructure.
- Underground cabling for utilities.
- Energy efficiency.
- Use of renewable sources.
- Reduced dependence on single sources of energy.
- National energy policies, regulations and fiscal and financial incentives to encourage the use of alternative sources.
- Incorporating climate change in design standards.
- Access to viable alternatives: removal of financial and technological barriers, acceptance of new technologies and stimulation of new technologies.
- Use of local resources.

The effectiveness of the implementation of so many instruments is questionable. Helm (2008) argues that one of the reasons why the Kyoto Protocol has achieved little so far is the variety of instruments that were available to comply with it. From the Kyoto Protocol were derived instruments such as the Clean Development Mechanism, tradable permits

and taxes. Most economists would favour taxes as a way of internalising the cost of carbon emissions. Governments worldwide have been reluctant to do so for political reasons and have preferred to implement tradable permit systems instead. According to the same author, the Clean Development Mechanism, although promising on paper, has achieved little in practice. There is a potential problem with the implementation of different policy tools. The problem is that 'mixed tools send mixed messages'. The complex mix of intertwined policy tools raises a number of issues, the most important of which is that the targeted renewables (defined subsidies and mandatory dispatch) and efficiency (mandated standards and products) policies risk undermining the free market-based carbon price in the European Trading Scheme. They further risk establishing a growing reliance on specific technologies to the detriment of a more neutral approach.

In the next section we propose a new paradigm for energy and environmental policy that addresses these problems. It should complement the current paradigm that relies on the correction of market failures through internalisation. However, the paradigm is not robust enough because of political unacceptability issues, regulatory failure and government inability to provide sufficient long-term regulatory commitment, let alone the technical difficulties in estimating the correct value of externalities.

A New Paradigm for Spain's Energy and Environmental Policy: Guidance from Theory

The energy sector, especially the power sector, is the key to fighting climate change. This is because a transition towards low-carbon sources could be achieved with the potential of having invisible costs to consumers, as electricity can be generated from different sources. Spain must adjust its climate and energy policy to make a better match with the potential type of agreement to be reached in Copenhagen. We have argued earlier that the common denominator of a potential successor of the Kyoto Protocol has to deal with the transition towards low-carbon sources.

Climate change policy involves many uncertainties, ranging from the likelihood of its failure to be fully implemented, the adoption of unrealistic or unclear targets to a focus on temporary solutions. Should these prevail, then policy itself could introduce further uncertainty and make it even more difficult for industry to make critical long term investment decisions. Furthermore, where multiple policy initiatives are being pursued in parallel, there is the risk of inconsistency and a potential need for trade-offs between outcomes, as discussed in the previous section. For example, energy policy should also take into consideration other important concerns, such as energy security and climate change, and this within the framework of liberalised markets. In other words, the energy focus, at least in the EU, should be based on: (1) pursuing an efficient and competitive single energy market; (2) driving the European low-carbon agenda; and (3) preserving the overall security of the energy supply.

The first point has to do with the liberalisation of the energy markets, where there must be harmony in regulations across countries and where networks are independent. There are a number of issues to deal with here, such as market transparency and liquidity and how companies are supposed to deal with stranded costs, availability, financing and international competitiveness. The second objective –to achieve a low-carbon economy– includes, for instance, imposing performance/efficiency standards, supporting renewables and emission trading, etc. The third issue –energy security– requires an adequate mechanism for timely investment in new infrastructure, the promotion of flexibility of supply and diversifying risk with different sources. The mandatory approach with environmental policy confronts the other objective of energy market efficiency and this is because investment decisions and the ability to compete in the despatch of energy lies at the heart of competitive markets. If the government makes these decisions for firms and markets, there is a risk that the efficiency objective in the markets is not achieved. This discussion will be expanded at the end of this section.

The new paradigm that we propose requires thinking in a more systematic and comprehensive way to achieve the transition towards a low-carbon economy and energy sector. The transition of the energy markets would have an effect on market volatility, environmental sustainability, market prices, fuel costs, availability and, of course, climate change. For example, the potential impact of a transition like this on prices and volatility depends on the which way an emergent technology develops, and this is uncertain. In Spain's case, for example, the country can enter a vicious circle if predictions with regards to climate change become true. Temperature increases of 3º C are said to cause a 10% variation in energy consumption. Climate change is expected to lead to increases in the demand for electricity, oil and gas –eg, through more intensive use of air conditioning–. If Spain does not replace the main slot of power generators to non-emitting technologies, higher demand would lead to higher carbon emissions, which would lead to higher temperatures and that to higher demand, and so on. Also, Spain is highly hydro dependent. If forecasts are correct, droughts will make hydro generation more difficult. Low hydro and exceptional weather conditions could trigger tight balances at certain periods of the year. This could imply problems for the Spanish power sector given that hydro provides an average 13% of the country's total generation. Also, rapid wind-power development adds concerns about the intermittency of generation and transmission bottlenecks would intensify the effect.

In the EU's case, the energy-import dependency aspect of security of supply has direct environmental consequences. Part of the link between the environment and energy-import dependency is determined by the fuel mix used to deliver energy services, the level of demand for those services and the speed with which they have to be delivered. The impact of imports on energy security depends on which energy sources are being imported and which are substituted. In Europe a higher penetration of renewable energy sources in the energy mix, coupled with a switch from coal to gas, resulted in reduced

energy-related GHG emissions and air pollution but also in increased dependency on gas imports. However, these environmental benefits were partly offset by increasing energy consumption and, more recently, by the tendency to increase the use of coal in electricity generation due to concerns about the security of supply and the high and volatile prices of imported fossil fuels. But also, the transition towards a cleaner energy sector has the benefit, besides that of combating climate change, that it could substitute fossil fuels, that are becoming more expensive and scarce and furthermore largely come from more unstable regions.

We will now provide a theoretical framework that we argue can help policy-makers understand better how transitions take place. Although it has a normative approach, it could help to guide them. Transition is the term used to denote a society-wide system innovation with a focus on basic or fundamental activities such as energy provision, transport and agriculture and also structural change in economics (van der Bergh & Bruisnma, 2008). These changes involve complex mechanisms and multiple objectives and transformations have been studied by a number of disciplines and scholars. For instance, innovation studies have been carried out by Schumpeter and Freeman, organisation studies by authors such as Hanmann and Freeman, and others have looked at the history of technology, sociology, development and complex systems, including chaos theory and evolutionary modelling. These approaches share the view that the ability to manage transition is questionable. This is because historically none of the most important technological transitions have occurred by mandate but have occurred following a natural process of evolution. However, some approaches give some normative suggestions for transitions.

Although evolutionary processes are fundamentally lacking any specific goals or targets, there are normative implications for policy makers. As a general advice, policies should concentrate on processes and not solely on outcomes. By this we mean, for example, that governmental technology policies need to pay more attention to diversity of technologies, strategies and businesses rather than, for instance, economic efficiency as the sole key goal. Specifically, policies should promote technological diversity –not pick winners– in order to promote innovation. The selection of technologies should try to avoid the technological lock-in of inferior technologies. The last part of this section introduces the main principles of evolutionary economics that explain how transitions occur. The main concepts from evolutionary economics (van der Bergh, 2008) are presented below.

Bounded Rationality

The objective of economic agents is to reach a satisfactory solution, not an optimal solution. Therefore, agents rely on routines, imitations, habits to make decisions for a limited horizon of both time and scale. To have an optimal solution requires too much effort and time in gaining full information and this simply is not practical or economical. In terms of climate change, this principle is important to acknowledge, since it recognises

that climate change is a phenomenon that will have a greater effect in the medium to long term while the actions that trigger it will happen in the short term. How to incorporate this fact, which follows a similar argument to the Giddens' Paradox, is something that policy makers must address.

Diversity

A consequence of bounded rationality is heterogeneity in the strategies of economic agents. This translates into a diversity of economic strategies, technologies, knowledge, agents and institutions. Diversity is a central concept in the evolutionary framework as it is regarded as a measure for the flexibility and evolutionary potential of an economic or ecological system. The concept is divided by variety, balance and disparity. In terms of the transition towards low-carbon technologies, this principle implies that the industrial policy that is advocated by some experts should not, for example, pick a winner technology. On the contrary, industrial policy should level the playing field so that promising technologies are not locked out of development.

Innovation

Innovation is often the result of combining insight and expertise with chance. Knowledge is crucial for processes of innovation. Innovation increases diversity in economic systems. Innovations can be breakthroughs or radical changes, or small changes along the path of the same technology. Diversity will change as a result of the combined effect of innovation and selection. In terms of climate change, innovation could be leveraged by the public-private partnership that we referred to in a previous section.

Selection

Diversity is reduced by processes of selection. Selection refers to the survival and reproduction of successful agents or strategies in a system. A complex selection environment contributes to the difficulty of planning and forecasting transitions. Selection outcomes can be directional, stabilising or disruptive and can be frequency dependent or density dependent. For climate change, the selection of technologies must also address other energy policy concerns such as their commercial viability and the impact they have on energy security.

Path Dependence and Lock In

This is the result of increasing returns thanks to advantages of scale, learning by doing, imitation, network externalities, information increasing returns and technological interrelatedness or complementariness (Arthur, 1993). Increasing returns are important as regards competition between alternative technologies. Whoever gets a larger market share by coincidence has an advantage and can grow relatively quickly and at the cost of others. Increasing returns are thus a type of positive feedback from a self-reinforcing mechanism, which can give rise to the dominance of a particular technological or economic regime, also known as lock-in. In standard economic terminology this translates

into the existence of multiple equilibriums. Some authors would argue that the current problems of global warming are explained as a side effect of fossil fuel technologies being locked in.

Co-evolution
Mutual influence and interference between two or more systems or populations: one system may exert selection pressure upon another system and vice versa, leading to related evolutionary developments in both systems. Co evolution is thus a particular concept of dynamic interaction between two populations with internal diversity.

These principles are normative and can serve as a guide for policy makers. However, they lack the variable of time, ie, nothing is said about the speed of transition. For climate change, transition needs to be delivered relatively quickly and for that reason policy makers must have a hands-on approach. A gradual transformation of the power sector would be feasible in technical terms, despite the intermittency problems of the most advanced and scalable technology, wind power. For a technical description of how this could be achieved for Spain, see Mulas Granados (2009). A fair question is how much a transition that is driven by a central planner would cost. The cost would depend on the up-front technology costs now and on how they develop in the future. The cost of new technologies depends on the economies of scale of their mass deployment and on learning by doing, which would probably bring about lower costs, although an increase in demand would probably push up the price of the raw materials used in the construction of the equipment and other site-specific considerations are equally important.

How much would transition cost for Spain? Lázaro & Fuentes (2009) estimate three ranges of costs according to how technology costs can be reduced. They calculate that the financial up-front cost of transforming the Spanish energy sector to 100% renewable would range from €102 billion to €347 billion. The current debate on whether to shut down nuclear facilities and transform the power sector to 100% renewable is wrong as regards government intervention in that no single technology should be singled out –either for or against–. The amount of money required for this transformation is quite considerable. But, ultimately, climate change is all about risk and how to manage it. Obviously, if this were a final solution, where zero carbon emissions are emitted in such an important sector for the problem of climate change, and that guaranteed that no catastrophic scenario could take place, the amount of money required would not be considered expensive. The problem with risk management is that risk in the end is a social construct, and as such allocating important parts of the budget to a single problem will inevitably be debated in the political arena. Furthermore, Lazaro & Fuentes (2009) show that the technology choice has to be decided in the political arena, as the economics in terms of costs of deployment and employment can be fairly similar, depending on the assumptions made. The risks to be tolerated cannot be decided solely based on technical criteria, as they are also a matter of public preference.

The underlying assumption in the previous exercise is that the government is willing to adopt a command-and-control approach, which goes against the very nature of liberalised markets. In the presence of the climate change problem, it is very important how investments are made in the power sector. A transformation of the power sector can deliver rapid decreases of carbon emissions, as occurred in France and Sweden. In these countries it is much easier to transform a centrally-planned power sector from a fossil-fuel-intensive sector towards a more sustainable sector just because it can be mandated from a central planner, who can more easily disregard the cost of implementation and their governments do not have to fully engage with purely self-regulating market mechanisms and profit requirements from stakeholders. However, it is likely that this would be too expensive to do for individual countries, especially in developing countries. Also, state intervention could lead to large-scale inefficiencies in the energy sector, as has occurred in the past. But, on the other hand, the deregulation wave has also failed. This is because markets have difficulties in taking into consideration uncertain future events such as the long-term availability of energy resources (both concerning their eventual depletion, price and reliability of supply) as well as the implication for the energy dependency level. Furthermore, markets cannot easily incorporate considerations of long-term effects such as global warming. Because of short sightedness, it is difficult for the energy markets to promote the development of those technologies that are most suitable under a long-term perspective. Agents will not undertake costly investment in new technologies in highly uncertain regulatory, technical and economic contexts. Investors are not convinced that governments will internalise externalities to their full extent.

Thus, there is room for greater emphasis on industrial policy. This point is obvious in the case of fostering low-carbon technologies. These attempts can hinder the benefits of liberalising the power markets. For example, the EU has a commitment to achieve liberalised energy markets but it is also committed to dealing with the problem of climate change. To achieve both objectives it has mandated that a fixed percentage of power capacity should come from renewable sources. Since investment decisions lie at the heart of liberalised markets, this type of command and control can put at risk the benefits of having liberalised markets, namely in terms of efficiency. Thus, there is an urgent need to combine the benefits of both paradigms. The question is how governments can put in place rules in the market that allow them to attain both objectives.

One way to do so could be, for example, by providing the market with some kind of long term vision similar to the UK's Climate Change Act in its three five-year plans for carbon budgets:[6] while minimising the interference in the efficiency of the allocation mechanism of markets, market agents receive additional signal to steer them in the right direction. This return to market-friendly planning has been suggested by authors like Gidddens (2009). How do we plan for a future which is inherently uncertain and in order to limit

[6] http://www.decc.gov.uk/en/content/cms/legislation/cc_act_08/cc_act_08.aspx.

risks, which, since we have no prior experience of them, cannot be assessed with complete precision? How can the mistakes made in the previous generation of planners be avoided? Planning in the old days was based on forecasting, but the limitations of this method are by now well known. It works best for short-term planning and also in cases where present-day trends are to some degree set in stone (replacing timescales of power plants). We often want to predict the future in order to change it –and our attempts to change it become part of that future–. One way of dealing with this is by 'backcasting': asking what changes have to be made in the present in order to arrive at alternative future states. A successful outcome is imagined in the future, and different scenarios are calculated as to how it might be reached. We are talking, therefore, of alternative and plural futures, where adjustments or radical revisions are made as time unfolds and then built into other scenarios. This approach is essentially that used by the IPPC. The distinct advantage over traditional forecasting is that it allows much greater space to unforeseen contingencies that might dramatically alter predictions made at any specific date. The point of backcasting is not to reveal what the future will be, but to weigh up future options and policy goals. Backcasting is especially relevant for environmental and energy planning issues, since they fit the circumstances to which the approach is most relevant. These are that the context is complex, a major re-orientation of current trends is demanded and a timescale of several decades or more is involved.

In thinking about planning, especially over the longer term, we find ourselves back with risk and uncertainty. Planning sounds like a straightforward process, but this is far from the case –it is highly complex and contingent–. One of the main reasons for this is the fact that predictions, forecasts and plans become themselves part of the universe of events that unfold. In an important sense they have to, since the point is to shape the future, yet at the same time an inherent element of unpredictability is introduced and has to be coped with.

Summary of Key Points

In this paper we argue that reaching a comprehensive and ambitious global agreement in Climate Change at the Copenhagen summit will be difficult. This is because of the nature of the economic and political aspects of the problem, where individual countries have no incentives to make a true commitment to solve it. However, we present a basic agreement that involves two types of partnerships: (1) developed and developing countries; and (2) public and private sectors. Although the Copenhagen conference is not expected to settle the debate about financial transfers and offsets, it will make a more effective offset framework in the future more likely. In the future the focus will be on improved financing, and the carbon intensity targets for developing countries, as it works to forge a long-term compromise between economic growth and emission-abatement efforts.

Spain's leadership in the first half of 2010 will give it a formidable leverage in this negotiation. There are potential win-win situations that Spain must pursue in the agreement. Spain is well positioned to take advantage of this agreement because of the leading role of its energy companies, especially in Latin America, and the first-mover advantage that the country has acquired with the deployment of clean technologies. However, the country must adapt its domestic regulatory framework in order to reach a successful transition towards a low-carbon sector. An evolutionary economic framework is suggested to guide the designing of policy. The latter must also address issues of energy security and the involvement of the power sector. There is no quick fix, but some steps can be taken in the right direction.

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