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BUSINESS AND CLIMATE CHANGE: KEY STRATEGIC AND POLICY CHALLENGES

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Introduction

Over the past decade climate change has evolved as the most pressing environmental problem of our time. Particularly due to temperature increases, it already affects physical and biological systems by changing ecosystems and causing extinction of species, and will have an increasing social impact and adversely affect human health. Further, as a result of the economic costs and risks of extreme weather, climate change could have a severe impact on economic growth and development if no action is taken to reduce emissions. Consequently, climate change affects companies active in a wide variety of sectors and countries. However, it is not a 'purely' environmental issue, as it is closely linked to concerns about energy security due to dependence on fossil fuels and oil in particular, and to energy efficiency in relation to economic activity in general. In turn, economic and financial conditions, such as the recession and credit crisis, have implications for business and climate change as well.

Over the years, the impact of climate change has been surrounded with great uncertainty. This has, for example, included uncertainty about the type, magnitude, and timing of the physical impact, the best technological options to address the issue, and the materialization of public policies. In this article we will focus on some key challenges from a corporate perspective, considering recent policy and economic developments, and broader issues related to innovating for climate change.

I. The Uncertain Policy Environment

It has been almost two decades since the first deliberations on regulation of greenhouse gas emissions started, leading to ratification and thus entry into force of the Kyoto Protocol in early 2005. The adoption of the Kyoto Protocol in 1997 set things in motion, such as an emissions trading scheme in the EU (the EU-ETS which started per 1 January 2005). For companies, however, the overall policy context has been ambiguous with a range of national and international initiatives, some binding, others voluntary, and

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with a multitude of actors involved.[1] Moreover, as the Kyoto Protocol expires in 2012, there is a large uncertainty as to future emission reduction targets and policy arrangements at the various levels of government. This also affects emissions trading and the Clean Development Mechanism that was designed as an integral part of it.

While the recent Copenhagen Conference (in December 2009) was supposed to result in a successor to the Kyoto Protocol, this has not materialised. The EU and several countries, including the US and emerging economies (including China and India), have committed individually to greenhouse gas reductions but an overall binding framework, and a coherent international approach, is still lacking. In the coming year, new attempts will be made to deal with the many unresolved issues on the table. These include the level of the emission reduction targets for both industrialized and emerging/developing economies, the future shape of emission trading schemes and the relationship between them, the transfer of money and technology to less-developed countries, and of course the accompanying timetable and encompassing legal frameworks.

There is much more at stake than the environment only; there are many trade-offs related to climate change, involving social equity, development, innovation and competitiveness. The credit crisis and the economic recession have also affected the current setting for business and climate change in various ways, thus shifting the terms of the debate and highlighting the contradictions of the climate-economy nexus.

II. Implications of the Economic Recession

The economic recession has reduced economic activity, especially industrial production, leading to lower greenhouse gas emissions and making it easier for companies and governments to reach their GHG targets. At the same time, this has reduced prices for carbon permits and other tradable emissions rights, lowering incentives for long-term investments in low-carbon technologies. In the absence of a binding international framework, the emissions market has not matured yet and the definite outcomes of the negotiations for the post-2012 regime will decide its future shape and viability. Current carbon prices are rather volatile and too low to provide sufficient incentives to change behaviour in a more climate-friendly direction. The economic slowdown has also put downward pressure on oil prices, making the search for alternatives less attractive. The silver lining, however, is that this has lowered investments in tar sands, which are energy-intense in extraction and processing. Also problematic was the loss of incentives to develop renewables, which was reinforced by the credit crisis and the

[1] A. Kolk & J. Pinkse, 'The influence of climate change regulation on corporate responses: The case of emissions trading', In R. O'Sullivan (Ed.), *Between the market and the state: Corporate responses to climate change*, Sheffield: Greenleaf Publishing 2008, pp. 43-57.

difficulty in raising venture capital. In the US, for example, clean tech venture capital investment fell from $1 billion in the last three months of 2008 to $154 million in the first quarter of 2009.[2] It has shown a recovery since (to $898 million in the third quarter of 2009) as a result of bailout plans that included incentives for energy efficiency and renewable energy (see III below).[3] Economic difficulties have also affected companies in Europe, which reported similar problems. The Dutch company Econcern, for example, went bankrupt, and the Danish wind company Vestas announced a lay off of 10% of its workforce and a (temporary) closure of its US production plant for lack of sufficient demand.

There has also been a sharp decline in interest in biofuels, which had emerged in preceding years in the context of surging oil prices and government stimuli for biofuels in the US and Europe. Particularly in the US, corn-based ethanol was directly supported as possible alternative to oil, and demand for sugar-based ethanol, traditionally produced in Brazil, increased as well. However, this picture has changed due to lower oil (petrol) prices, reduced driving activity due to the economic recession, and oversupply. The US ethanol industry went from boom to bust and even the strong Brazilian producers have been severely hurt, leading to bankruptcies and a consolidation wave. This development has ended the previously heated debate about the (potential) upward effect of biofuels on prices of particularly corn and soybean. The discussion centred on the extent to which biofuels had contributed to soaring food prices given other factors (such as bad harvests, export restrictions, higher demand, speculation in agriculture derivatives markets), with estimates early 2008 ranging from 10% (Food and Agriculture Organisation) to 20-30% (the International Monetary Fund and the International Food Policy Research Institute).[4] Moreover, there were allegations as to who profited most from this role; some car company executives believed that the oil industry had an interest in raising doubts about ethanol in order to defend their existing business models.[5]

As gasoline prices peaked above $4 per gallon, the high oil price was one of the drivers of sales of hybrid vehicles and more fuel-efficient cars in the US, but lower prices have ended this as well. Overall car sales dropped due to the economic recession, although 'cash for clunkers' programmes (see III) have resulted in temporary boosts in the US and some other countries, particularly Germany and France. Hybrids have suffered surprisingly little compared with the overall market, and their sales are also being stimulated by preferential tax measures in some countries. In the Netherlands, for example, hybrids receive favourable tax treatment, especially for leased vehicles, which influences corporate purchases. In the first eight months of 2008, sales via leasing of

[2] R. Waters, 'Venture capital investment falls', *Financial Times* 18/19 April 2009.
[3] M. Arnold, 'Cleantech shines in the venture capital gloom', *Financial Times* 26 November 2009.
[4] J. Blas, 'UN says oil rise hits food prices harder', *Financial Times* 26/27 April 2008.
[5] E. Reed, 'GM chief hits at UN biofuel data', *Financial Times* 21 April 2008.

Toyota Prius cars in the Netherlands increased by 550% compared to the same period in 2007 (for the Honda Civic hybrid, the figure was slightly over 300%).[6] In 2009, the Honda Civic hybrid became the country's most leased car.

III. 'Green' Bailouts

The car industry and the need to lower emissions have also received attention in the bailout plans that governments around the world introduced to sustain their economies. These plans included spending for purposes labelled as 'green' – sometimes even characterised as attempts to kill two birds (the credit crisis and the climate crisis) with one stone. In almost all plans, a considerable portion of the measures is labelled for the environment, particularly in the form of investments to further higher energy/fuel efficiency, renewables/clean energy and in some cases also public transport. Table 1 gives an overview of the 'green' share in the bailouts by ten countries and the European Union as estimated by HSBC.[7]

Table 1. Size and share of green bail-out plans

Country	*Size of green bail-out (in $ bn)*	*Share of green bail-out (as % of total)*
Australia	9.3	21.2
Canada	2.8	8.8
China	218.0	33.6
EU	24.7	63.7
France	6.1	18.1
Germany	13.8	13.2
Italy	1.3	1.3
Japan	23.6	15.3
Mexico	0.8	10.4
South Africa	0.8	10.7
South Korea	59.9	78.8
Spain	0.8	5.6
UK	5.2	14.9
US	117.2	12.0

The table shows that South Korea stands out for the high percentage of its green bailout, followed by the EU and China, whereas Italy and Spain have by far the lowest share. In terms of volume China scores highest, followed at a distance by the US and then South Korea, the EU and Japan. Considering size of GDP as well, China's green investment is relatively high. Overall, caveats are the reliability of the figures, including the labelling of what is "green", and the eventual realisation of the spending. It is also unclear what the environmental implications will be of infrastructure and construction

[6] H. van de Wiel, 'Klein is cool', *P+ People Planet Profit*, (7, 2) 2008, p. 36.
[7] F. Harvey, 'Healthy rebound for clean energy', *Financial Times* 18 August 2009.

activities, and other measures to stimulate domestic production and consumption. Nevertheless, it is clear that the plans have helped the clean tech industries to recover somewhat after the collapse due to the economic slowdown. Globally, investment in clean energy was expected to approximate $110 billion in 2009; this was $155 billion in 2008.[8] And there are high hopes as to the future of clean energy and the profits to be generated from developing green products and markets, expressed explicitly in inter alia the EU, US, China and South Korea.

Overall, some are quite positive about these first attempts at a 'new green deal', but there has also been ample criticism. Doubts have been raised about whether the measures go far enough, whether they are really beneficial for the climate, and whether they are not (implicitly) protectionist and tend to favour established companies that struggle rather that stimulating new (innovative) ventures. Much attention has focused on incentive schemes to scrap old, energy-inefficient cars earlier and boost demand for more efficient ones. Concerns have been expressed about the (net) environmental benefits, given that the measures stimulate new car sales (sometimes even explicitly for types that are not widely available in all markets yet), as well as about other economic consequences.

The latter have included the fact that 'cash-for-clunkers'/'dosh-for-bangers' will mean lower demand in the future, and that they distort competition. In Germany, the luxury carmakers have complained about disproportionate benefits for their high-volume competitors, which have seen growing sales since the scheme entered into force. In the US, trade-in incentives initially aimed to apply only to cars produced domestically (thus not covering the Toyota Prius, for example, as it is built in Japan),[9] but this was corrected in the scheme as implemented. Results show that actually the majority of the new cars sold were produced in the US, though most often by non-US, particularly Japanese, carmakers.[10] Interestingly, in December 2009, the US government complained about the Japanese vehicle scrappage plan because US-made cars could not meet the fuel efficiency standards as they were applied (focusing on low-speed emissions rather than for high-speed highway driving). European cars could not meet the standards in the beginning either, but these producers made adjustments fairly soon.[11] In France, national producers have profited most from the scrappage scheme, which increased car sales to the highest in two decades.[12]

Stimulus measures have thus given rise to quite some debate about the extent

[8] E. Crooks, 'EU warned of threat to green energy goal', *Financial Times* 16 November 2009.
[9] E. Reed, B. Simon & S. Jung-a, 'Trade-in incentives not long-term solution', *Financial Times* 27 March 2009.
[10] US Department of Transportation, *C.A.R.S. Program Statistics*, Washington, 26 August 2009.
[11] J. Soble, 'Scrappage rules spark US protest', *Financial Times* 15 December 2009.
[12] S. Daneshku, 'Scrappage scheme sends French sales to 20-year high', *Financial Times* 29 December 2009.

to which national companies can be favoured and whether they result in domestic and/or foreign job creation. This has extended beyond cash-for-clunkers schemes, In the case of wind energy grants handed out by the US government in the Fall of 2009, more than 80% turned out to have gone to foreign turbine manufacturing companies, suggesting that the majority of jobs was created abroad despite funding set up for domestic purposes.[13]

IV. Broader Issues Related to Innovating for Climate Change

The developments outlined above point at some relevant dilemmas in the economy-climate-policy nexus in the current setting. In this final section, we will briefly put them in the broader context related to innovating for climate change, to highlight some of the issues on the way forward.[14] In view of the importance of transport, fuels and energy use for the economy, emissions must be reduced in key sectors such as automobile, oil & gas companies, as well as utilities. Not only have these industries been most frequently targeted when it comes to measures, they also provide good illustrations of the trade-offs that we face in moving towards a low-carbon economy, where quick and easy solutions are not at hand. While it is widely recognised that a much greater deployment of low-carbon or carbon-free alternatives is needed, it is not all clear what should replace the prevailing fossil-fuel based technologies – there is no technological 'silver bullet' solution at the moment. While alternatives are being explored, problems usually come to the fore when they are scaled up.

This leads to the broader question of whether companies should focus on addressing limitations for further deployment, thus trying to fully exploit existing know-how and technologies to scale them up, or on developing new possibilities that may imply a departure from the current energy infrastructure and technological trajectories. In most cases, there is not just one 'solution'. For example, if companies want to invest in renewables they still have various options, ranging from more mature to much less well-developed technologies.[15] Most mature are hydropower, biomass combustion, solar boilers and geothermal technologies, which in specific, beneficial circumstances are already cost-competitive with conventional sources. Wind and solar are seen as emerging technologies that are not yet cost-competitive due to a lack of market experience. Some renewable technologies that are still in the R&D phase – e.g. specific forms of solar power, ocean energy and advanced bio-energy – which completely lack

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[13] E. Luce, 'Wind energy stimulus dollars spent overseas', *Financial Times* 30 October 2009.
[14] For a more extensive treatment of these issues, see A. Kolk & J. Pinkse, 'A perspective on multinational enterprises and climate change. Learning from an 'inconvenient truth'?', *Journal of International Business Studies* (39, 8) 2008, 1359-1378; J. Pinke & A. Kolk, 'Challenges and trade-offs in corporate innovation for climate change', *Business Strategy and the Environment* (19, 3) 2010.
[15] K. Neuhoff, 'Large-scale deployment of renewables for electricity generation', *Oxford Review of Economic Policy* (21, 1) 2005, 88-110.

market penetration, and largely depend on public R&D programmes for further development.

The specific decision made in balancing risks and returns differs per company but also depends on the sector and its level of technological dynamism that shapes the room for manoeuvre. The latter can be illustrated by pointing at the difference in R&D patterns between the power generation industry and the automotive industry.[16] R&D intensity in power generation has been notoriously low, due the fact that innovation involves massive capital investments combined with limited opportunities for product differentiation. Car companies, on the other hand, operate in a much more dynamic technological environment and therefore face greater pressure to develop alternative drive-train technologies, such as hybrids, electric vehicles and fuel cells.[17]

In addition to technology, the issue of how to develop new markets should be considered. There are various routes, with pros and cons, for a move to a non-fossil fuel based economy via the development of niche markets that allow companies more opportunity to experiment, or via incremental changes and transition technologies. The car industry can serve to illustrate both. The fact that the fuel cell vehicle was long predestined as the ultimate solution was partly because it followed the route of niche development. Since the 1960s, fuel cells have been used in several market niches, such as space travel and the US army and navy. However, they have demonstrated the typical problems of niche development as well: it has been difficult to move beyond the niche into mainstream markets, also because such a sequence of market niches requires many resources.[18] Transition technologies, on the other hand, may become dominant themselves and then stand in the way. A case in point is that the recent success of hybrid cars such as the Toyota Prius might have serious consequences for the further development of the fuel cell vehicle. The fuel cell's main advantage compared to the internal combustion engine – that it performs much better in terms of emissions – almost completely fades away compared to hybrids and may not weigh up to the much higher costs of bringing the fuel cell vehicle to the market.[19] In other words, because resources for new technology development tend to be scarce, there is a trade-off between developing carbon-efficient transition technologies for

[16] R.M. Margolis & D.M. Kammen, 'Underinvestment: the energy technology and R&D policy challenge', *Science* (285, 5428) 1999, 690-692.
[17] R. Dyerson & A. Pilkington, 'Gales of creative destruction and the opportunistic incumbent: The case of electric vehicles in California', *Technology Analysis & Strategic Management* (17, 4) 2005, 391-408; R. van den Hoed & P.J. Vergragt, 'Institutional change in the automotive industry. Or how fuel cell technology is being institutionalised', *Greener Management International* (47, Autumn) 2004, 45-61.
[18] R. Raven, 'Niche accumulation and hybridisation strategies in transition processes towards a sustainable energy system: an assessment of differences and pitfalls', *Energy Policy* (35) 2007, 2390-2400.
[19] Hekkert & Van den Hoed 2004, *supra* note 11.

mainstream markets and developing carbon-free end-points for niche markets.

Another example of a technology that allows companies to build on existing technologies by providing an add-on element to existing practices, is carbon capture and storage (CCS), popular amongst oil, coal and electricity companies. CCS gives carbon-intensive companies the opportunity to show proactivity on climate change, while concurrently continuing their core business activities – this has also been a source of criticism. Transition technologies also play a role in the oil & gas industry, where gas has been presented as a bridge to a lower carbon economy while alternative energy solutions are being developed. As to the latter, oil companies, and particularly BP and Shell, have invested in the development of niches in alternative energy, including solar, wind, hydrogen and biofuels. BP has focused on solar in particular, while Shell has tried the full range but by now has left all of them except for biofuels. This demonstrates the complexities, as it is not clear what the end-point of these niche-development efforts will be given uncertainty about which alternative energy technologies will prevail in the coming decades.

A final aspect that deserves some attention is that due to the comprehensiveness of the climate change problem cooperation is usually needed, as one company (or other actor) cannot deliver solutions single-handedly. This raises the question of how far companies are willing to go in taking responsibility for climate change when they need responses from others to achieve a positive outcome, and also how they deal with the competitive dimensions involved. Various types of cooperation can be noted. One is by several competitors together with smaller niche players that own a specific technology, as has happened often in the car industry (e.g. Daimler and Volkswagen together with Choren; or Ford and Daimler with Ballard). A drawback of this construction is that companies share the technology with a close competitor. In that sense, cooperation with companies from other sectors offers more opportunities for creating a competitive advantage for all parties. An example is Dow Chemical and General Motor's joint work on the development of fuel cells, each for a different purpose.

In some cases more systemic, infrastructure-related forms are required. For example, to be able to commercialise the fuel cell vehicle, the car industry needs the chemical and oil industries to supply the hydrogen necessary to attract prospective customers. This necessitates a major breakthrough in the production and distribution of hydrogen, which has not occurred yet because it is threatening to fossil-fuel suppliers as well. As the car industry will not be able to supply the hydrogen itself, it faces a major barrier in bringing the fuel cell vehicle to the market. It is basically a chicken-and-egg problem: oil companies will not scale up their hydrogen activities until car companies come with more affordable fuel cell vehicles, while car companies will only

launch such models if there is a hydrogen infrastructure.[20] A somewhat comparable problem exists regarding plug-in hybrids or electric cars, which need electricity networks capable of meeting (peak) demands to charge the vehicles and thus depend on utilities. Various partnerships have been formed in recent years between car companies and utilities (inter alia Toyota with EDF, Renault with EDF, Daimler with RWE, and Daimler with Enel) with the aim to develop a recharging infrastructure in selected locations. For a more widespread use, there must also be a sufficient number of charging points and/or places to exchange batteries, which often requires cooperation with local authorities and electricity grid operators, and substantial investments. In the Netherlands, a partnership has emerged to this end that aims to realise ten thousand charging points in public spaces in the coming years.

Ultimately, a crucial issue regarding electric/plug-in solutions is whether the electricity originates from fossil fuels or from renewables, because if the former prevails, a 'solution' to the climate problem is not any nearer. However, the power generation industry has a vast grip on the infrastructure for the transmission and distribution of electricity. The system for supply of electricity clearly suffers from a 'carbon lock-in' as technological and market systems surrounding electricity favour generation from fossil fuels,[21] which hinders scaling up the use of renewables for electricity generation. Technologically speaking, renewables involve intermittent generation instead of the constant generation that characterises coal or gas-fired power plants. This creates a barrier because existing transmission networks cannot handle intermittent sources of electricity very well, due to the fact that power stations would need more back-up and storage capacity.[22] To reach a mainstream market of electricity-consumers, renewable energy suppliers thus rely on cooperation with incumbent utilities. However, the barrier lies therein that adjusting the transmission network to enhance access of renewables is not in the benefit of these utilities because the transmission network is specialised towards working with large conventional power plants, which they generally own themselves. Adapting the network would thus open the door to new entrants at the cost of profitability of their own power plants.

Conclusion

This article outlined key issues related to business and climate change in the post-Copenhagen period, in which a global binding agreement on emissions reductions is still lacking. We identified systemic issues that require determined policy efforts to break the deadlock and escape the current

[20] J. Romm, 'The car and fuel of the future', *Energy Policy* (34) 2006, 2609-2614.
[21] B.A. Sandén & C. Azar, 'Near-term technology policies for long-term climate targets - economy wide versus technology specific approaches', *Energy Policy* (33) 2005, 1557-1576; G.C. Unruh, 'Understanding carbon lock-in', *Energy Policy* (28) 2000, 817-830.
[22] Neuhoff 2005, *supra* note 9.

"carbon lock-in". These policy initiatives need to take in to account not only the technological options, but also competitive, strategic, and market considerations. The key challenge for the coming year is to develop a comprehensive approach that simultaneously addresses the economic slowdown and the climate crisis.