Energy Security and Climate Security: Synergy or Conflict?

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Abstract

This paper explores the concepts energy security and climate security in the context of the energy-climate nexus. After locating the dominant understandings of energy security (international energy cooperation) and climate security (global climate change mitigation), we suggest that neither objective on its own is likely to make significant progress in terms of global governance. The energy security agenda is confronting renewed trends of price volatility and resource scarcity, while global climate objectives are being weakened by perceptions of high costs and the rise of containment or management approaches. Partly as a result of such relative stagnation, a number of 'synergistic' policy approaches have been implemented in major economies around the world. Most of these, however, turn out to be relatively pragmatic, short- to medium-term strategies aimed at enhancing specific aspects of national energy security. The potential conflicts, including the temporal divide at the heart of the energy-climate nexus, are largely neglected. Greater compatibility might be achieved by devising energy-and-climate programmes informed by long-term strategic planning under conditions of uncertainty. Strong cross-sector coalitions would be required to mobilise sufficient financial resources for a far-reaching structural transformation.

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For a long period ‘security’ was both a central yet extraordinarily underdeveloped concept in International Relations. Critical scholarly attention really dates from the pioneering work of Barry Buzan (1983). Since then varying security perspectives have proliferated.
Released from the 'shackles' of the Cold War bipolarity and narrowly defined notions of national security, scholars, politicians and activists pressed for the widening and deepening of the domain of security. *Environmental* security became the subject of a long-running debate and the 1994 UN Human Development Report introduced the people-centred approach of *human* security which now represents a staple of scholarly literature (Dalby 2009). The 2000s, moreover, have been marked by a series of 'crises' which highlighted new or revitalised risks arising from global terrorism, the increasing scarcity of natural resources and a warming climate. It is now commonplace not only to emphasise national border security, but also refer to food security, water security, and other 'sectoralised' security areas (Brauch et al. 2009). This expansive re-definition should alert us to the significance of the ‘referent object’ or in other words ‘that which is to be secured’. In orthodox security studies, there is no doubt that the object of security policy remained the integrity of the state and its interests. There might be reference to people, but, as Buzan (1983:245) noted, there was always ‘an unbreakable paradox’ between state and individual security. In much recent security discussion notions of threat may have changed, as in the typical security tryptych of ‘terrorism, failed states and weapons of mass destruction’, but the preservation of the state remains the essential object of policy. This is also true of the overwhelming bulk of environmental security discussions, while a genuinely radical move would be to shift the object of security to the environment or to the earth’s climate.[4]

The other notable aspect of security debates is that they involve ‘securitisation’ – speech acts that reflect the intention to raise the political salience of particular issues or causes. The reference here is of course to the Copenhagen School, Buzan, Waever & de Wilde (1998).[5] To some extent, this process of 'securitisation' amplifies ideas proposed in the 1970s when natural resources and the environment were first recognised as security issues. In this sense, energy security and climate security, the core issues of this article, have merely been recast as critical components of security thinking in the twenty-first century. The unprecedented surge in oil prices between 2004-2008 rekindled strategic concerns over the security of energy supplies in import-dependent countries. Similarly, mounting scientific evidence for present, and future, climatic turbulence suggested the potential applicability of security thinking in this domain.

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[4] The substantial literature on environmental security was stimulated in particular by the ending of the Cold War. In general it attempts to tease out the relationship between environmental degradation and conflict as in the extensive work of Homer Dixon (1994). Deudney & Mathews (1999) explore some of problems of securitising the environment.

[5] The securitisation idea was not entirely new, witness the following from Arnold Wolfers (1962:147) writing that security while apparently offering both broad guidance and consensus ‘…may be permitting everyone to label whatever policy he favours with an attractive and possibly deceptive name’.

The standard definition of energy security was forged amidst the oil crises of the 1970s and remains a conceptual cornerstone. Understood as "access to secure, adequate, reliable, and affordable energy supplies" (Bordoff et al. 2009: 214)[6], energy security represents a broad, if somewhat vague, placeholder for a range of policy-making priorities. Admittedly, it does not adequately address other important aspects of energy governance such as carbon emissions or overall environmental sustainability. To keep these concerns separate nonetheless reflects the reality of policy-making where successful policy integration is rare, whilst parallel, competing tracks are still the norm. But even according to the orthodox definition, there have been plenty of reasons in recent years to highlight growing energy insecurity. The rise of major energy-consuming economies, such as China and India, has lowered overall confidence in 'secure' and 'affordable' energy supplies. Affordability may be compromised due to an increasing imbalance between the demand and supply of fossil fuels and especially the widespread recognition of 'the end of easy oil'. Secure access may be at risk because increasing scarcity implies greater international competition and may encourage a move away from market allocation towards 'statist' forms of energy security.

Climate security, on the other hand, has its roots in the environmental security debate. The critical questions raised and empirical results first offered in the early 1990s[7] are equally valid for today's discussions. Unsurprisingly, in theoretical terms the precise meaning of climate security therefore remains contested. Understandings range from the adaptive capacity and resilience of societies in the face of extreme weather events to ambitious mitigation which reduces the risk of catastrophic consequences. Yet, in the realm of international climate governance, political consensus has developed around a precise target. In 2009, both the Major Economies Forum, which assembles sixteen countries plus the EU, and the Copenhagen Accord established the goal of keeping average global warming below 2 degrees above pre-industrial temperatures. The 2010 Cancun UNFCCC agreement on ‘Long Term Cooperative Action (Decision 1/CP.16) recognises the urgent need for deep emission cuts to hold temperature increases below the 2°C threshold but also mentions the more stringent target of 1.5°C required by AOSIS. Garcia (2010: 273) has even interpreted these resolutions as the creation of a "norm of behavior" and the setting of "collective expectations" about low-carbon economic development. The 2 degree target is justified by purporting to represent the boundary between 'dangerous' and 'manageable' climate change, with the former implying severe impacts on all aspects of national and human security.

While there are several significant greenhouse gases (GHGs), current mitigation efforts concentrate on energy-related carbon emissions which currently accounted for around 65 percent of all GHG emissions (IEA 2010a: 54) and whose importance rise in line with

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[6] Bordoff et al. themselves prefer a more concise conception that distinguishes between a macro-economic and a national security dimension.

[7] For an excellent survey of different IR perspectives on climate security during this period see Stripple (2002).

increasing global energy consumption. In Europe, the figure is even higher at 80% (Commission 2007: 3). This physical link between energy and GHG emissions lies behind the evolution of the UN Framework Convention on Climate Change (UNFCCC) over the past decade. It largely explains why energy and climate change agendas have become increasingly intertwined. The particular characteristics of the Kyoto Protocol meant that for an extensive period most Parties were able to avoid this conjunction. Non-Annex I developing countries were not required to make any reduction in their fossil fuel-based emissions and the EU could sustain its climate 'leadership' without having to make significant cuts in energy use through the fortuitous use of the 1990 baseline in its burden-sharing agreement. The United States, which would under the Protocol have had to make real and economically damaging energy-related reductions, simply opted out, while others either failed to meet their obligations or were able to take advantage of CDM offsets. In the post-2012 discussions, that followed entry into force of the Protocol in 2005, the energy-climate connection became all too painfully clear and dominated the international discussions leading up to the 2009 Copenhagen CoP. At the highest level, climate politics became international energy politics and could be portrayed as a competition to secure shares in a diminishing 'carbon space' or, perhaps, to ensure that the burdens of reductions in energy use should be borne by others. Energy security has habitually been associated with 'high politics' and it was noticeable that, in this regard, the climate CoP at Copenhagen departed markedly from other analogous 'low politics' environmental regimes.

The primary purpose of this paper is to understand the energy-climate nexus within a security framework. We proceed by initially analysing both domains in their own terms. The energy security agenda is characterised by (geo)political and material (scarcity) constraints, and governance responses have largely been confined to the national arena. By contrast, climate change has long been subject to multilateral, UN-related governance processes. Explicit security lenses have been applied to the potential short- and long-term impacts of climate change. Associated policy responses can be broadly categorised as *reactive* or *preventive*. Finally, a third section provides a conceptual and institutional comparison between energy security and climate security agendas and considers the important question of 'synergies' between them, leading perhaps to the elusive 'win-win' solution under which a progressively de-carbonised economy might provide for really comprehensive security in terms of climate stability, sustainable energy and the avoidance of the more disruptive traditional threats associated with rapid climate alteration.

Energy Security

Historically, realist theoretical assumptions have dominated thinking on energy security. Widespread recognition of the role of energy resources during the build-up and conduct of the

Second World War ensured the status of energy as an issue belonging to the 'high' politics of national security. The role of energy as a "strategic good" par excellence is not only related to its essential function in 'fuelling' military activities. Its price level and availability also play a fundamental role in a country's economic performance and socio-political stability (Lesage et al. 2010: 183). For instance, there is considerable evidence that a large number of post-war recessions in the US have – at least partly – been caused by spikes in oil prices (Bordoff et al. 2009: 215). A realist interpretation of energy security was further reinforced by events in the 1970s when a trend towards the nationalisation of energy supplies and the sporadic use of oil embargoes, orchestrated by the Organization of Petroleum-Exporting Countries (OPEC), highlighted the dangers of energy dependence. Even today the privileged position of major energy-exporting countries still represents a constraint on the foreign policy agenda of major importers (Müller-Kraenner 2008: 27).

Market expansion and low energy prices from the 1980s until the mid-2000s encouraged the development of liberal approaches to energy security. Greater diversification of sources, a gradual shift to coal and natural gas, and a consolidating world oil market all but eliminated the threat of an effective use of the 'oil weapon'. Well-functioning global markets for oil – and potentially for liquefied natural gas – have been increasingly promoted as effective mechanisms to provide cheaper energy inputs in an increasingly competitive, global economy and guard against both structural undersupply and short-term supply disruptions (Goldthau and Witte 2009). The US economy, for example, is now substantially less vulnerable to fluctuations in oil markets than in previous decades. However, realist notions of energy security have not been superseded. On the contrary, Brazil, Russia, India, and China – the so-called BRIC states – are not just consuming increasing amounts of fossil fuels. They also employ the traditional, statist tools of energy security policy such as bilateral contracts and the promotion of national energy champions (Lesage et al. 2010: 27). China and India have struck numerous energy deals with oil- and gas-exporting countries from the around the world, even if this has meant giving economic and military aid to 'pariah' states in Africa and Latin America (Müller-Kraenner 2008: 72). While this has served to raise rather than lower the availability of fossil fuels on global markets, it demonstrates that – given an uncertain future – no major power will rely exclusively on the market allocation of energy supplies.

When it comes to natural gas, a commodity still largely reliant on pipeline infrastructure and long-term supply contracts, overtly political considerations have remained dominant. The European Union, although founded upon an agreement on coal and steel, has yet to produce a coherent energy policy or to perfect a ‘real internal energy market’ (Commission 2007:6). There are very significant differences in the energy mix and strategies of member states whose perspectives remain stubbornly national. Thus, the Commission’s principal approach has been to seek energy security through the perfection of a properly functioning, interconnected and transparent internal energy market. There has also been a largely unsuccessful attempt to extend EU liberalising regulatory practices to the EU's gas suppliers in its eastern 'neigbourhood'. Failure was demonstrated in the twin Ukrainian gas crises of 2006 and 2009. In January 2009, ostensibly for commercial reasons (a dispute with Naftogaz of Ukraine) , Gazprom interrupted gas supplies with the serious knock-on effect of reducing EU gas availability by 20%, which affected 12 member states (Commission 2009: 7). The crisis again revealed the EU's vulnerability and the lack of internal planning and emergency co-ordination. It was only resolved through an EU-mediated political agreement between Russia and Ukraine (ibid: 4).

Russia, having rejected the EU's invitation to subscribe to the Energy Charter Treaty, increasingly relies on its economic power derived from natural resources and energy services. It uses the mechanism of 'pipeline politics' to compensate for its loss of superpower status and to preserve its zone of influence, particularly in the Caspian region and Central and Eastern Europe (Baran 2007; Müller-Kraenner 2008: 47-56). The EU counterpart is the suggestion that security of supply can be achieved through diversification involving new pipelines circumventing Russian territory, Nabucco providing the best known example. Youngs (2009) has suggested that in fact the EU is in fact caught on the horns of a dilemma, between attempts to install market based governance of energy supplies and an essentially realist approach to the geopolitics of pipelines. Certainly one of the significant outcomes of the gas crises has been the call for energy policy to play a major role in the Union's external relations in building up a network of bilateral energy supply deals with its neighbours in the Caspian region, in North Africa and beyond (Commission 2007: 23). In the US, by contrast, new shale gas discoveries over the last few years have – for now – made the country virtually independent from imports. The situation is, of course, completely different for oil supplies even though the US – if it was minded to incur the costs – could achieve a degree of autarchy in this sector too.

The uncertain future evoked by realist commentators is not merely concerned with 'above-ground', political-economic factors, but intimately bound up with the status of 'below-ground' energy reserves. While the momentous increase in energy prices during 2004-2008 may have been partly caused by the growing 'financialisation' of energy markets and an upsurge in speculation (Bradshaw 2010: 276), there is now a strong chorus of voices pointing to underlying factors of supply and demand. Data problems caused by failure to report or intentional misreporting cannot conceal a general pattern of stagnant reserves and limited new oil discoveries (Owen et al. 2010). The expectation of a significant future shortfall in oil supplies is supported by a raft of additional arguments. First, significant additional demand will come from emerging economies, especially India and China, and may result in global energy demand growth of 36 percent by 2035, with demand for oil projected to grow by 15 percent (IEA 2010b).[8] Second, considerable investments will be needed to expand (or even maintain) supply because there will be growing reliance on non-conventional, more expensive oils from

[8] The IEA's 'New Policies' scenario takes into account both existing policies and declared intentions.

tar sands, enhanced oil recovery, or even coal liquefaction. Such investments, however, will be hindered by structural uncertainty and short-term price volatility, as evidenced by the negative impact of the 2008 financial crisis.

Third, even those countries with the capacity to ramp up production of fossil fuels will struggle to increase exports. Many energy-rich countries – for example Saudi Arabia, Russia, Iran, Venezuela – are dominated by state-owned companies which frequently lack the capital or expertise to substantially increase production. Moreover, substantial energy subsidies have long been employed by these and other governments to reduce energy poverty and secure the consent of their populations. Expectations of cheap energy and a lack of interest in energy efficiency are now so entrenched in most energy-rich countries that a continued rise in energy demand, which could ultimately cancel out increased production, is likely (Rubin 2009).

Critics of such projections highlight a decade-long history of erroneous predictions of scarcity. They argue that the supply of fossil fuels will be ensured by technological change, which can unlock previously unprofitable reserves, and higher prices triggering increased investment and exploration. At most, they acknowledge the potential for politically created supply crises through increasing resource nationalism and insufficient investment (Radetzki 2010). This riposte is, however, less forceful now than it used to be. Even the traditionally conservative IEA has recently accepted the tenor of the end of 'easy oil' (Bradshaw 2010: 277) and conceded that crude oil production from conventional sources will never again reach its "all-time peak" of 2006 (IEA 2010b: 48). Because this entails a switch to non-conventional oils and a progressively lower 'energy return on investment', it is bound to result in rising oil prices.

Besides oil supplies, the general picture for fossil fuels is even more contested. Given recent technological advances in shale gas production and underground coal gasification, it remains very uncertain when tangible scarcities will materialise. With regard to oil, however, the significance of the 'peak oil' thesis is that both materially and politically induced supply shortages are likely to occur. Once the world economy has fully recovered from the ongoing debt crisis, we may therefore expect the return of price volatility and, probably, a continuing increase in the price of fossil fuels. This projection cements the high status of energy security on governments' agendas because it suggests serious implications for economic development and heightened international competition for scarcer energy resources.

The pursuit of global energy security

Given the revitalised interest in energy issues, there is now a burgeoning literature both on *national* and on *global* energy governance, including the security dimension. In institutional terms, however, the idea of collective energy security has only made very limited progress over the last few decades. Continuing international discord is underpinned by the fundamentally divergent interests of fossil fuel exporting and importing countries. For OPEC member states and other important exporters of oil and gas, energy security is primarily a question of stable and predictable demand from industrialised economies. The latter, on the other hand, created the International Energy Agency (IEA) in 1974 to coordinate their response to future oil crises and provide information and expertise for national energy policy. For importing countries, energy security hence refers to security of supply.

Although the fierce producer-consumer clashes of the 1970s are unlikely to return, the bifurcated structure of energy security policy has proved persistent. The establishment of the International Energy Forum (IEF) in 1991 was intended to signal a new era. It provides a basis for enhanced producer-consumer cooperation and already features initiatives on improving the transparency of oil and gas data with regard to production and investment levels. But a legacy of conflict and "deep-rooted mutual suspicion" has so far stood in the way of major governance breakthroughs (Lesage et al. 2010: 62). The EU is a supporter of multilateralism but its approach to energy security is in part to secure a network of deals with its neighbours.

To bolster the case for global cooperation, commentators have underlined the high degree of interdependence and 'intervulnerability' (Lesage et al. 2010; Yueh 2010) which typifies global energy relations. In theoretical terms, this condition has long applied in a globalising world. The drive towards an efficiently functioning global energy market (primarily for fossil fuels) is nothing less than an institutionalisation of economic interdependence. But in practical terms, shared vulnerability was brought to the fore by surging energy prices during 2004-2008. From 2005 onwards, several G8 meetings treated energy as a high priority and initiated a number of assessments and action plans by drawing on the IEA's expertise (Lesage et al. 2010: Ch 7).

A minimal common ground between consumer and producer countries is the avoidance of extreme price volatility because it makes planning for the future exceedingly difficult. For example, the budgets of fossil fuel exporting countries were initially buoyed by rising revenues, then shrank suddenly when the financial crisis hit and prices collapsed. Given the nature of energy policy, however, it is unlikely that UN institutions will take the lead in this venture. Even though many UN organisations and programmes also pursue energy-related activities, dedicated negotiations in the Commission for Sustainable Development broke down in 2007. The envisaged central organisational node, UN-Energy, is currently no more than an embryonic focal point. Therefore, in a 'business-as-usual' scenario of global energy governance, serious coordination will remain the preserve of 'coalitions of the willing', while broader multilateral processes are most likely to proceed through the UN climate change regime (UNFCCC) (Karlsson-Vinkhuyzen 2010: 193). As we argue in the final section of this article, this regulatory dynamic may actually increase the compatibility of energy security and climate change mitigation. In order to substantiate this point, however, we first turn towards the notion of climate security.

Climate Security

While the concept of *environmental* security has frequently appeared in discussions about environmental governance ever since the 1980s, the related notion of *climate* security is a relative newcomer. This process of 'securitisation' may be understood as a gradual and mainly discursive accomplishment from a constructivist perspective or as an inevitable and necessary development from a rationalist standpoint.

A constructivist approach would trace the rise of the climate security discourse over the past few years. Given a long history of strong environmental and developmental framings of climate change, some have pinpointed the year 2002 as the point at which the political mainstream acknowledged potential security implications. According to Dupont (2008: 30), a report commissioned by the Pentagon (Schwartz and Randall 2003) helped trigger a learning process through which climate change "metamorphosed from a boutique environmental concern to a first-order foreign-policy and national-security problem that is now being ranked alongside terrorism and the proliferation of weapons of mass destruction." The following years did indeed witness a flurry of similar, if more sophisticated, assessments, most prominently a 2007 report by a US think tank (CNA Corporation), a 2008 EU report on 'Climate Change and International Security', and an explicit recognition by the 2010 US Quadrennial Defense Review and the 2010 UK Strategic Defence and Security Review.

Although there are still some doubts about the extent and durability of the securitisation process (Scott 2008; Mobjörk et al. 2010), the first debate on climate change and security in the UN Security Council (April 2007) may come to be seen as a genuine watershed.[9] While most developing countries resisted the security framing and favoured environment/development discourses, small-island developing states (SIDS) – ranking among the most vulnerable nations – sided with industrialised countries to support an active role for the Council in climate change governance (Detraz and Betsill 2009: 312). Despite the session ending without tangible results, high-level diplomatic discussions in 2007 and 2011 have arguably ensured the presence of climate security considerations on the agendas of governments and international organisations.

[9] A second debate in the UN Security Council was called by Germany in July 2011. Russia and China were foremost in rejecting the agenda 'creep' of linking climate change to the Council's mission on international peace and security, but eventually consented to a statement that referred to the 'possible security implications' of climate change (The Guardian 2011).

A rationalist approach, by contrast, places greater emphasis on the expected impacts of climate change and the likely gamut of security responses they are likely to trigger. One of way of developing such predictive capacity is to construct scenarios based on the best available climate science (e.g. Mabey 2008). Another is to study historical instances in which climatic factors seem to have played a critical role, for example the decline or collapse of ancient civilisations (Dupont 2008: 31). Quantitative methodologies can equally be applied to the task. Lewis (2009: 1199) thus cites a Chinese study concluding that 70-80 percent of 'peak war activity' in China's history took place during unusually cold or warm climatic periods characterised by sharply reduced land productivity.

A combination of these analytical pathways holds insights for all major strands of security thinking. For proponents of national security priorities, climate change fits into the category of unconventional, destabilising 'threat multipliers' that could cause state failure, foment extremism, trigger migratory waves, and physically endanger military installations at home and abroad. This was the thrust of a 2008 paper, with special emphasis on climate change and the Arctic, developed by the EU's Javier Solana (Council of the EU, 2008). On the other hand, for advocates of human security approaches climate change impacts pose grave challenges to the twin objectives of 'freedom from fear' and 'freedom from want' by undermining stable livelihoods and imposing significant and costly adjustments on frequently vulnerable communities.

Third, and crucially, what marks out climate change from other non-conventional security threats is its disruptive effect on ecological, 'planetary' security. By adversely affecting the capacity of the atmosphere to render the 'ecosystem service' of providing a stable climatic system, rapid (and potentially abrupt) human-induced climate change may pose an existential threat to the biosphere, including human civilisation itself. To use the terminology of the Copenhagen School, what is evident here is a shift in the referent object of security from the nation state, to the individual in society and finally to the planetary biosphere itself.

Reactive climate security

The argument about fundamental ecological security and climate change impacts has been implicit in the literature since the 1970s. But now that attention to the security implications of climate change is growing, the focus is increasingly re-adjusted onto reactive policies – coping mechanism and adaptation measures. This strategic shift in policy formulation is justified by two weighty arguments. First, the inertia of the climate system implies that the current concentration of CO_2 in the atmosphere is already sufficient to generate a significant degree of global warming over the coming decades. Second, the recognition of inevitable impacts is joined by pragmatic motivations. As David Keith (2009: 56) describes it, in contrast to globally coordinated mitigation measures, "the self-interest of nations, firms and individuals will work to drive measures to ease adaptation to the changing climate since the benefits of adaptation can be captured locally where money is spent".

Apart from positive results for human security, such benefits can equally be understood as the avoidance of violent conflict. Certainly, the causal connection between climate change and conflict remains hotly contested. Yet, a broad-based, if minimal, consensus has emerged around the proposition that violent conflict rests on numerous, complex socio-economic and political – as well as climatic – processes and that the latter may constitute a "non-essential" causal factor (Mazo 2010: 40). When attempting to anticipate future challenges, it is reasonable to assume that a host of climate-related conditions will continue to deteriorate and impose enormous additional burdens on weak states and vulnerable societies.

Among the expected consequences of climate change are sea-level rise, altered precipitation patterns, an increase in extreme weather events, melting glaciers, increasing burdens of infectious diseases, and the progressive acidification of the oceans (Dupont 2008: 32). When set against a number of separate trends, such as population growth, it is evident that climate change will contribute to increasing water and food insecurity around the world.[10] Whereas profound societal destabilisation will not necessarily translate into inter-state warfare[11], it will harm the prospects for human well-being and may trigger unprecedented waves of migration, both within and across national territories. Some estimates suggest there may be 200 million environmental refugees by 2050 (Mazo 2010: 129). Furthermore, failing states could unwittingly 'export' insecurity well beyond their borders by becoming havens for international criminal or terrorist networks.

If security responses to such instabilities were designed by traditional military planners, one may expect the whole gamut of coping and containment tools to be applied. Individual states or alliances of states are likely to step up border security and the policing of major migratory routes (Rogers 2010). The beginnings of these trends can, for instance be discerned in the EU's Immigration and Neighbourhood Policies.[12] Active intervention in failed states, under the Common Security and Defence, for the purpose of conflict prevention, conflict resolution or humanitarian assistance may also appear on the agenda alongside EU counter-terrorism efforts. Ironically, however, many of these measures may also strengthen the

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[10] The 2011 Climate Change Vulnerability Index by the British consultancy Maplecroft rates sixteen countries as being at 'extreme risk', with Bangladesh, India and Madagascar among the top three.

[11] Further potential for interstate conflict, not elaborated here, arises from the problems of resource abundance. For instance, if the melting of Arctic ice continues, this could trigger a 'land grab' by neighbouring countries to secure their claim on previously inaccessible natural resources such as oil, gas and minerals.

[12] Frontex in the Mediterranean along with the environmental and social funding provided to ‘neighbours’ may be construed as having these functions.

widespread perception of an "uncaring West". This may bolster support for extremist groups[13] and perhaps provoke radical civic mobilisation within developed countries themselves (Mabey 2008: 94).

On the other hand, reactive security responses need not be confined to military approaches. Following a human security perspective, there will also be increasing interest in emergency adaptation measures and, crucially, in 'pre-adaptation' strategies such as fostering resilience and 'climate-proofing' of critical infrastructures (Adger 2010; Mazo 2010: 102). Much of the climate aid for developing countries – planned to reach $100 billion annually by 2020 – is likely to be earmarked for this category of actions. Initial projects from late 2010, such as combating coastal erosion in Senegal or flood prevention in northern Pakistan, give an indication of what resilience and 'pre-adaptation' mean in practice.

Preventive climate security

While few would dispute the need for reactive security policy and adaptation measures, the central question is whether these will compete with the requirements of climate change mitigation. Given the slow progress of international climate regulation, adaptation funding – one of the few issues gathering widespread support – might well be employed for policies that further increase carbon emissions. On the other hand, the accompanying capacity-building may also serve to improve the effectiveness of mitigation policies (Mazo 2010: 132). Overall, a broad consensus exists that 'sustainable security' (Dalby 2009: 166) can only be achieved if both policy objectives are designed for compatibility. The governance arrangements for avoiding deforestation (REDD+), currently under discussion in the UNFCCC and affiliated fora, represent a test case for this integrated conception.

Regarding mitigation, ambitious reductions in greenhouse gas emissions are essential not only to curb the need for expensive reactive security policies. Moreover, it is becoming increasingly clear that the process of climate change may not conform to the linear assumptions embodied by relatively conservative modelling exercises. Although the IPCC's Fourth Assessment Report states that climate change is very likely caused by human activity (IPCC 2007), detailed knowledge about the precise mechanisms of an enormously complex climatic system remains a work in progress. This is reflected by the broad ranges of possible temperature change given in the IPCC's scenarios. Rather than taking scientific uncertainty as a reason for hesitation, however, many commentators have pointed out that the probability functions of mainstream climate models could be too linear because the climate's sensitivity to GHGs might unexpectedly turn out to be much stronger. Recent developments – such as

[13] Several southern diplomats have described climate change as an 'act of aggression' and even extremist groups such as al-Qaeda have specifically referred to Western responsibility for climate change and the US refusal to sign the Kyoto Protocol (Scott 2008: 607; Mazo 2010: 129).

unprecedented reductions in mid-year Arctic sea ice in 2010, sustained sea-level rises, and higher GHG emissions than projected – have bolstered these concerns (Mobjörk et al. 2010: 42f.).

Unexpectedly rapid or strong climatic changes are not the only scientifically grounded scenarios that would likely have severe security consequences. It is equally possible that there are non-linear climatic dynamics scientists do not yet understand and which therefore cannot be integrated into their models. There could, for instance, be thresholds or 'tipping points' which act like a light switch and shift the global or, more likely, regional climate system into a new state. Mabey (2008: 22) presents a typology of such climatic events, distinguishing between "high impact reversible events" (e.g. changing Asian monsoons, a weakening Gulf Stream), "irreversible impacts" (e.g. melting glaciers, species extinction), and "runaway climate change" whereby feedback loops – triggered by events such as melting permafrost soils releasing large quantities of methane – would push the climate system into an uncontrollable warming spiral.

Such 'high impact/low probability' scenarios are no mere figment of imagination, as the geological record shows that they have occurred in the distant past (Mabey 2008: 13; Mazo 2010: 29). These scenarios are now frequently recognised in the scientific and policy literatures and some have even questioned the assumption of low probability in the light of the persistent complexity of climate science (Charlesworth and Okereke 2009). Innovative economic analysis has equally cast doubt on conservative 'median' damage functions commonly employed by "climate-policy-ramp gradualism". Weitzman (2010: 24) thus proposes a 'fat-tailed' probability distribution of climate sensitivity to higher greenhouse gas concentrations. This implies a distinct chance (1 percent) of 10 or more degrees of global warming and suggests that ambitious mitigation targets would represent an insurance policy against catastrophic climate change.

Discourses of preventive security strike a similar note. Weitzman's warning of catastrophic global warming driving "planetary welfare to disastrously low levels" (2010: 25) is echoed by various security scholars. The core argument here is that security analysts and military planners have been trained to rely on prudence and foresight which may lead them to consider worst-case scenarios rather than mere 'best guesses' (Dupont 2008; Mabey 2008; Rogers 2010). By implementing this form of assessment, analysts may come to recognise that reactive security responses cannot adequately deal with scenarios of extreme or abrupt climate change. First, every society has a limited adaptive capacity to profound perturbations. Second, as Mabey (2008: 13) puts it, "while climate change raises many hard security problems, it [ultimately] has no hard security solutions". In policy terms, both preventive security and risk-averse economic thinking point towards two major undertakings: a rapid transition towards an ultra-low carbon economy and enhanced international cooperation on climate governance.

Governing energy and climate security

The first two parts of this paper have come to different conclusions regarding the challenges of energy security and climate security. For the former, strong international governance mechanisms are desirable but difficult to establish; for the latter, such advances are very challenging indeed, but ultimately indispensable. While the various benefits of energy security measures can be captured at the national or even regional level and are not necessarily dependent upon attempts at international co-operation, the public good of climatic stability can only be attained by concerted efforts at the global level. This is because the global atmosphere can be regarded as having the characteristics of a commons. Climatic security defined in terms of stability is frequently understood as a non-excludable public good. It requires collective mitigation efforts amongst the largest emitters and mechanisms to ensure compliance and avoid ‘free-riding’. The atmosphere also represents a finite 'common sink' for GHG emissions. Most current economic activities constitute a rival consumption of 'carbon space'. And strict international targets would effectively enclose or 'privatise' this resource in order to limit ruinous over-consumption.

However, the very notion of the carbon space, which has become in recent years a key negotiating concept for the BASIC countries, illustrates the extent of the problem of arriving at an effective agreement beyond the first commitment period of the Kyoto Protocol. The point that is being made is that much of the world’s limited carbon space has already been occupied by the developed countries and that justice demands that the remainder be used to realise the development objectives of the South. In the climate negotiations at Copenhagen and Cancun the objective of the key players has been to avoid being trapped in an agreement that might imperil short-term national energy security. Given the snail's pace of international governance efforts, many major economies have resolved to enact domestic climate and energy policies that pursue 'win-win' solutions, such as fuel-switching to low- and ultra-low-carbon sources, greater energy efficiency, demand reduction, and the development of cost-efficient carbon capture and storage (CCS) technology (Froggatt and Levi 2009).

Variants of 'synergistic' climate and energy policy

There is no denying the underlying attraction of this 'synergistic' proposition. It invokes what must be the ultimate 'win-win' solution neatly addressing energy and climate security concerns through a move to a decarbonised economy. The first essential step towards this must be a decarbonisation of the energy sector. Currently, one of the most comprehensive scenarios modelling a satisfactory contribution of the energy sector to the goal of global climate stability (the 2 degree target) is the IEA's 'Blue Map' scenario. It assumes that energy-related carbon emissions could be halved by 2050 with the help of existing and new low-carbon technologies

(IEA 2010a: 69). Of course, although the scenario seeks to accomplish this 'at least cost', it still requires countries around the world to make very considerable investments in state-of-the-art power plants, energy efficiency measures, and low-carbon R&D. The IEA scenarios emphasise that there are real and substantial benefits for energy security from ambitious climate policy – such as cleaner air, lower import dependence, greater resilience to fossil fuel price shocks, and long-term savings – but, in practice, there is a crucial *temporal* divide separating most climate initiatives from energy policies because the latter tend to operate on shorter political time frames and correspond to a variety of national priorities (Elkind 2009). Bradshaw (2010) provides a whole list of different "energy dilemmas" that range from affluent, high-energy societies to low-energy developing countries and even to fossil-fuel rich, energy-inefficient societies. The extent of the 'synergistic' overlap between climate and energy policies thus depends both on specific economic circumstances and on prevailing political strategies, as the following examples will illustrate.

China's interpretation of energy security was, for a long time, supply-oriented and concentrated on ensuring domestic production of coal and oil. Yet, the notion of self-sufficiency became increasingly implausible when energy imports rose sharply during the 1990s (Leung 2011). Chinese oil imports are predicted to rise from about 50 to 60-80 percent by 2020 and well over 80 percent of domestic needs by 2030 (IEA 2007; Leung 2011). The country has also been importing increasing quantities of natural gas and even coal. A second plank of supply-oriented energy security has come in the form of massive investments in other energy-exporting countries, but over time a more demand-based conception has come to prevail. The Chinese government has not only passed a raft of energy-saving measures in recent years. China has also made great strides in improving the energy efficiency of its economy over the past decades. Since 1990, energy use has doubled, but the economy has grown fourfold (IEA 2010a) – a dynamic that allowed China to move closer to average global levels of energy intensity (energy consumed per unit of GDP). However, this past performance, the difficulties of reaching its previous energy intensity target (20 percent reduction between 2005-2010), and the modest target for 2020 (a further 20 percent reduction) indicate that the 'low-hanging fruit' of energy efficiency may now have become less cost-effective (Steckel et al.: 3448). Alongside its target on energy intensity, in the run-up to the 2009 Copenhagen conference China committed to reducing the carbon intensity (carbon emissions per unit of GDP) of its economy by 40-45 percent by 2020 and recently specified a mid-term target of 16 percent by 2015. There are reasons to believe that this pledge is partly the product of international diplomatic pressure.

Considering that the ongoing increase in energy consumption continues to be fuelled primarily by coal-fired power generation, which still delivers more than 70 percent of primary energy supplies, it is clear that energy efficiency measures (of diminishing utility) would not be sufficient to meet either energy or carbon intensity targets (Balme 2011: 51; Stern and Jotzo 2010). A more forceful decarbonisation of power generation – through low-carbon technologies and increased R&D – appears to be required. Legislative initiatives such as the 2006 Renewable Energy Law, the 2007 National Climate Change Program, the 2007 Medium- and Long-Term Development Plan for Renewable Energy, plans for a significant expansion of nuclear power, and a recent pledge to increase R&D spending to 2 percent of GDP have, to some extent, prepared the way for a step-change in climate and energy policy-making. The overarching target stipulates that renewable energy is to produce 15 percent of the primary energy supply by 2020, which, if successful, would contribute considerably to reducing carbon intensity and marginally to cutting energy intensity.

Crucially, however, there are weighty national objectives behind the endorsement of stronger climate policies. The Chinese government does not only recognise the risks of climate change and the potential co-benefits derived from stricter regulation, greater 'energy resilience' and low-carbon, energy-efficient innovation. It may also perceive climate policy as a tool to consolidate its domestic legitimacy (lower pollution, higher quality of life, lower fluctuation of energy prices) and improve China's position in the global economy. The government has revised its economic strategy and seeks to reduce the importance of heavy industry in favour of the service sector as well as a number of strategic, higher value-added industries (Jacobs 2011). Such a process of top-down 'creative destruction' is very difficult to implement in the multi-layered Chinese political system and it certainly benefits from new and measurable priority objectives, such as carbon emissions, which can be linked to financial incentives. As Moore (2011: 153) puts it, "the key point about China's policies to promote energy efficiency and renewable energy […] is that they accomplish broader goals", namely as energy security, rural development, technological progress, and enhanced economic competitiveness.

In neighbouring India, the prevailing conception of energy security revolves around the pillars of reliable supply, economic growth/development, and the alleviation of energy poverty. These objectives figure prominently in the Integrated Energy Policy from 2006 which pledges universal energy access by 2012, assumes an annual target of 8 percent of economic growth, and calculates that the total primary energy supply would have to grow three or even fourfold by 2031-32. Like China, India has already made significant investments in energy-exporting countries, but concern persists over its rapidly rising energy dependence. India is projected to import 91 percent of its oil by 2030, and coal supplies – today providing over half of its commercial energy production – are by now increasingly reliant on imports (14 percent), despite doubling domestic production between 1990 and 2007 (IEA 2010a). At the same time, around 40 percent of the population have no or little access to commercial energy services, presenting a formidable challenge for development and infrastructure planning.

Given this energy profile, it is not surprising that Indian policy-makers are preoccupied with 'squaring the circle' of supporting socio-economic development while preventing the slide into serious energy *insecurity*. Promoting energy efficiency would be one promising way forward and India's overall performance in this respect improved by at least 0.75 percent annually between 2000 and 2007 (IEA 2010a). Nevertheless, the potential for energy efficiency savings has by far not been exhausted. While the barriers to progress are associated with institutional failures, infrastructural mismanagement (energy theft and power transmission losses) and ill-designed subsidies, the example of recent energy reforms in Delhi – including simplification of tariffs and stricter compliance mechanisms – demonstrates that substantial efficiency gains are a genuine possibility (Rai and Victor 2010). Such advances would also help to slow the growth of carbon emissions. Although the overall carbon intensity of the Indian economy has decreased by over 30 percent between 1994 and 2007 (Upadhyaya 2010), the primary energy supply has seen a marked increase in carbon intensity (70 percent during 1990-2007), largely due to greater reliance on coal and other fossil fuels (IEA 2010a: 420).

Despite this trend, climate policy in India has so far consisted of relatively modest efforts. Its commitment to reduce the economy's carbon intensity by 20-25 percent by 2020 (from 2005 levels) could probably even be achieved under business-as-usual assumptions (Stern and Jotzo 2010). There are, however, some specific initiatives which harbour significant potential for low-carbon development. The National Action Plan on Climate Change (NAPCC) was approved in 2008 and contains a number of national 'missions' on different aspects of climate and environmental policy-making, including energy efficiency, afforestation and sustainable agriculture. The government has further launched two market-based trading schemes – the 'Perform, Achieve and Trade' (PAT) setting benchmark efficiency levels for 563 major industrial plants, and a renewable energy certificate trading scheme for wind, solar and biomass power plants. But the overall effectiveness of both schemes has not yet been evaluated.

Given that Indian policy-makers prefer to tweak the development pathway rather than tackling carbon emissions head-on, the most promising initiative may well be the National Solar Mission (part of the NAPCC). It sets the target of constructing 20 GW of solar power capacity by 2020 and 100 GW by 2030, counting on the combined effects of feed-in tariffs, technological innovation, and economies of scale. And according to a recent report by KPMG (2011), solar power in India could potentially already achieve grid parity with fossil-fuel power plants by 2017, which would allow the country to greatly exceed its original targets. Even if these estimates proved to be overoptimistic, it is clear that solar power, alongside wind and small hydropower, has become central to India's target on renewable energy (15 percent of total energy generation by 2020).

Overall, it is reasonable to state that climate policy in India is not merely subordinate to energy- and development-related priorities, but that it has progressed in those areas where it overlaps most evidently with energy policy objectives, for instance regarding energy efficiency, the reduction of fossil-fuel import dependency, and off-grid rural electrification. Governmental setting of priorities is also in line with wider public perceptions, for a climate-centred agenda would hardly be politically feasible. As Price (2011: 25) has noted, successful environmental campaigns have usually focused on practical issues, while broader environmental aspirations tend to gain very little "public traction".

Most European states – as well as Japan and Mexico – do not have the option of expanding domestic production of fossil fuels in a cost-effective manner. The EU as a whole is projected to see its total import dependency increase from 82.6 percent for crude oil and 60.3 percent for natural gas (in 2007) to around 93 percent and over 80 percent by 2030 (Comolli 2010). In the wake of the 2005-2006 Russia-Ukraine dispute over natural gas deliveries (and pipeline transport to EU countries), reformist momentum resulted in the 2008 'EU Climate and Energy Package'. The Commission has taken a synergistic view: 'Action on renewables and energy efficiency, besides tackling climate change, will contribute to security of energy supply and help limit the EU's growing dependence on imported energy. It could also create high quality jobs in Europe and maintain Europe's technological leadership in a rapidly growing global sector.' (Commission 2006:10) This is matched by calls for cooperation with other players (US, China, India, Canada, and Japan) on energy efficiency, renewables, global market access and investment trends to achieve better results in multilateral fora such as the UN, the IEA and the G8.[14] 'If these countries reduce the use of fossil fuels, it will also be beneficial for Europe's energy security' (Commission 2006: 16-17). "Indeed energy must become a central part of all EU external relations; it is crucial to geopolitical security, economic stability, social development and international efforts to combat climate change" (Commission 2007:17).

The main immediate thrust of external EU energy policy was to create a better relationship with Russia something that continued to obstructed not only by Russian attitudes but also by member states with their own bilateral energy relationships., The other part of the policy was the building up of energy relations with neighbours and with key energy producer and transit countries, OPEC, the GCC, Caspian nations and North Africa. The intent was to enhance relations with other energy consumers – promote open and competitive energy markets, efficiency, regulatory cooperation and research (Ibid., Annex 1, p.24.). This assemblage of policies strives to achieve (by 2020) a 20 percent reduction in GHG emissions, a 20 percent increase in energy efficiency, and a 20 percent share of renewable energy. Existing momentum for climate policy was fuelled by newly salient energy security concerns which, in turn, were once again stoked by a more prolonged Russia-Ukraine gas dispute in January 2009 which caused severe gas shortages in several EU member states. An emerging European energy strategy focuses on investments in the diversification of import sources (e.g. alternative gas pipelines), the creation of a common internal energy market and exploiting untapped potential for energy efficiencies (European Commission 2010). Although significant potential for

[14] The Commission called for a new international agreement on energy efficiency including OECD and developing countries 'to restrict the use of products failing to meet minimum standards and agree common approaches to energy saving' (Commission 2007:12).

synergies remains, energy security considerations have by now largely replaced climate policy objectives as the main driver of regulatory evolution.

The central question remains how these various policy assemblages in major economies fare when compared with the overarching objectives of energy and climate security? The cautious energy-and-climate policy packages enacted by China and India focus on affordability and reliability[15], while the European economies benefit from enhanced security of access. Moreover, in the longer run, if predictions of rising energy prices come true, first-movers in energy efficiency and 'decarbonisation' will reap substantial benefits: they will have already reduced their consumption of oil and thus improved their economic competitiveness.

In terms of preventive climate security, however, most policies may still be inadequate. The US Energy Information Administration (EIA) projects that – assuming a business-as-usual (reference) scenario – in both China and India, domestic (carbon-heavy) coal will continue to play a dominant role in energy generation. EIA figures estimate annual growth rates in energy-related carbon emissions of 2.7 percent (China) and 1.8 percent (India) (EIA 2010: 128). By contrast, the EIA expects an annual reduction in energy-related carbon emissions in OECD-Europe[16] and Japan by 0.2 percent and 0.6 percent respectively. Collectively, the climate and energy policies announced by a number of major economies[17] thus imply limited progress on mitigation. In November 2010, the UN Environment Programme calculated that targets and other pledges by major economies only amount to 60 percent of the GHG reductions needed to stay below the 2 degree threshold.[18]

The International Energy Agency (IEA) has developed the Blue Map scenarios to highlight the potential (and necessary measures) for a 50 percent reduction in energy-related carbon emissions by 2050 (IEA 2010a: 69). Broadly consistent with the 2 degree target, this model is underpinned by estimates of technical feasibility, but it necessarily sidesteps the question of who would finance the enormous additional investments. Crucially, the IEA also assumes an expansion of nuclear power and the availability of carbon capture & storage technologies (CCS).

For China, the IEA simulated the widespread deployment of low-carbon technologies, resulting in carbon emissions in 2050 that are 30 percent lower than in 2007. Special attention would be given to the decarbonisation of the power sector and an efficiency revolution in the

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[15] For instance, fossil fuel powered energy plants provide more dependable output than renewable technologies such as wind or solar power.

[16] OECD-Europe includes all European Union Member countries of the OECD, i.e. countries in EU15 plus the Czech Republic, Hungary, Iceland, Norway, Poland, Slovak Republic, Switzerland, Turkey.

[17] The US has not been analysed in the present paper, but EIA figures project a rise of energy-related carbon emission of 0.2 percent annually.

[18] See the UNEP Emissions Gap Report at www.unep.org/publications/ebooks/emissionsgapreport. The outcome of the 2010 Cancún climate change conference has not altered the validity of these calculations.

industrial sector, alongside the deployment of CCS technology. Second, in the Indian case, carbon emission in 2050 would be a mere 10 percent higher than in 2007. Preferred technological options are similar to the Chinese scenario, but it is clear that interim targets would have to be greatly strengthened to achieve a halving of per capita energy consumption by 2050 (compared to a baseline scenario) without sacrificing economic development. For instance, overall carbon intensity would have declined by 66 percent in 2030, whilst the existing target envisages a 25 percent reduction by 2020. The IEA also mentions that there currently exists no precedent for this kind of low-carbon development pathway. Third, the countries labelled as 'OECD-Europe' (incl. the great majority of EU member states) face the challenge of decarbonising their existing housing stock and transport networks as well as replacing much of their power generating capacity – 80 percent of which will reach the end of its planned lifetime over the next 20 years – with low-carbon installations. More specifically, in the 'Blue Map' scenario carbon emissions in 2050 would have decreased by 72%, with end-use sectors contributing two thirds of this reduction and the power sector one third.

Although the specifics of all three scenarios may at times differ substantially, the IEA offers two weighty arguments in favour of attempting this 'synthesis' of energy and climate objectives. Not only would an ambitious set of policies, if coupled with effective implementation, considerably restrain the rapidly rising import dependency of the above countries with regard to fossil fuels. The benefits of such policies would also, in the long term, recoup or even exceed the additional investment costs due to the savings accrued from using fewer fossil fuels – whose price is expected to remain high over the coming decades. Finally, however, the wider literature also contains a warning to those policy-makers who pursue more immediate economic priorities in the short term and enact modest reforms and make minimal low-carbon investments until new, cheaper technologies have come on stream or until fossil fuel prices have risen even further. Analysing the case of Chinese energy standards for household appliances and commercial equipment, Zhou et al. (2011) thus calculated that incremental strengthening of energy-efficiency laws would result in around 16 percent lower carbon emissions between 2009 and 2030. But if these laws were tightened at one fell swoop by 2014, carbon savings would rocket to 35 percent. In other words, such is the scale of the consequences of the temporal divide between many energy and climate policy initiatives.

Conclusion: the governance dilemma

According to the then EU Energy Commissioner: climate change and energy security are two sides of the same coin. The same remedies must be applied to both problems and ‘climate change is a major opportunity to transform global energy security and to move towards a more sustainable economic model’ (Piebalgs 2009:3-4). There certainly exists a conceptual overlap between energy and climate security. Not only are they both, to various degrees, concerned with the transition away from a carbon-heavy, fossil-fuel based global economy. They also have to confront fundamental scarcities: the scarcity of affordable and readily accessible fossil energy or the scarcity of atmospheric 'carbon space'. Both the energy and the climate challenge can therefore benefit from demand reduction as well as from supply-side measures which diminish both types of scarcity, such as low-carbon energy technologies.

The problem is, of course, making the political fit between climate and energy security. The orthodox vision of enhanced global energy security, grounded in economic globalisation and increasing interdependence, still depends on a compromise between producers and consumers of fossil fuels. The sole likely benefit for climate governance would be reduced price volatility and hence greater predictability for alternative energy investments. Overall, strategies prioritising either national or global energy security are likely to result in incremental climate policy and a resort to *reactive* climate security. The widespread preference for incremental policy reform signifies that national energy security will continue to be a "far stronger policy driver" (Froggatt and Levi 2009: 1141) than climate security. Regardless of the progress made through synergistic measures, this 'gradualism' contains considerable structural bias. First, it permits the 'lock-in' of fossil- or biofuel-intensive infrastructures – with important consequences for emission trajectories in rapidly industrialising countries. Second, it relies on domestic 'win-win' policy scenarios which – just like local benefits derived from climate adaptation measures – favour outcomes consistent with *reactive* climate security. Furthermore, global or regional markets for fossil fuels imply that national energy-and-climate policies result in 'carbon leakage' by lowering global/regional energy prices and stimulating energy demand elsewhere.

A different set of national and international policies would be required if governments were to pursue *preventive* climate security, and thus the 2 degree target in earnest. At the national level, energy and climate policy would prioritise longer-term objectives – security of supply, greater foreign policy autonomy and ultra-low carbon emissions – without wholly ignoring short-term considerations of affordability, reliability, and political feasibility (Compston 2010). There are formidable difficulties here, where developed country governments need to overcome the incentives to operate on a short term basis and to work with public opinion. In terms of the latter there are mixed messages. For the European Union, 'An EU level solution to the climate problem has served as a convincing narrative to persuade EU citizens that there is a need to continue the process of European integration' (Adelle & Withana 2010:331). There are also significant similarities in attitudes in the EU, the US and other advanced countries. These include concern about climate change laced with some scepticism on science and an unwillingness to make personally costly changes with the requirements of economic growth being placed above climate protection. While there is support for renewables in general, significant opposition exists to particular technologies such as wind farms (ibid: 327). One key difference which may help to explain divergence between EU and US policy and which is hardly merited by their respective situations is that '…energy security is considered a much more important factor in the US than in EU and is given greater priority than environmental protection by a significant number of Americans' (ibid.329). Thus, 'for governments faced with tough policy choices, the public's reluctance to accept costly policy choices could limit the use and range of policy solutions in the transition to a low-carbon economy' (ibid., 328). Amongst the BASIC countries, the demands facing policy-makers are bound to be more extreme with energy priorities for development dominating other concerns and indeed being fundamental to the continuing legitimacy of governments.

There is also the question of the interaction between national and international climate and energy policies. Is it possible that international commitments could provide momentum for domestic policy reform? There is some evidence that the search for short term national energy security does not always prevail and that international norms and commitments can have a significant effect, especially if the prestige and credibility of governments is engaged. The adoption of the Emissions Trading Scheme by the EU provides a case in point. This particular 'flexibility mechanism' had been opposed prior to Kyoto but became the bedrock of the Union's approach to climate, driven like the 'burden sharing' agreement before it by the requirements to maintain its leading position at the international level. The evidence is not as strong but Chinese and Indian policy changes, involving the announcement of energy efficiency targets, were certainly stimulated by the need to generate a credible position in advance of the 2009 Copenhagen CoP. It remains the case, however, that more often than not energy security drives climate policy, although the result may not always be negative. In this regard the EU's 2006 gas crisis was one of the incentives to agree the 2008 Climate and Energy package that provided the policy basis for the implementation of the Union's 20/30% emissions reduction commitment.

If global climatic stability became an actual policy priority, it would not only deliver important 'co-benefits' for global energy security, but would also provide a genuine basis for implementing a *preventive* climate security strategy. Of course, it is plain that cooperative international climate governance is weighed down by the cost implications and distributive consequences of mitigation measures. To dilute both domestic and international obstacles to ambitious climate policy, advanced industrialised countries would have to engineer an 'energy revolution' – through enormous investments, technology transfer, and capacity-building in developing countries. The necessary coalitions would have to be forged among major energy-consuming countries and not rely on older practices of producer-consumer conciliation (Mabey 2008: 68).

Energy and climate are thus not only materially intertwined, but also interdependent politically. Without increased availability of practical and affordable energy technologies to enable climate-friendly economic development, international climate governance will not progress substantially. What the public goods analysis makes clear is that the regulatory 'direction of travel' should still lead from climate to energy – rather than vice versa – because only this arrangement could favour long-term strategic foresight over short-term pragmatism.

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