

Chapter 17

Global environmental politics: sustainable development, climate change and the energy dilemma

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Humans have always utilised the Earth's resources to sustain life. Whilst many have an idealised view of the past, the negative impacts of human development have long been evident resulting in consequences such as the loss of species, minerals and pollution. However, the advent of mass industrialisation in the nineteenth century exacerbated many of these damaging effects. The twentieth century saw exponential population growth and continued rapid expansion of industry. Over this period the detrimental impact of human development on the environment became even more apparent. Concerns about pollution and resource scarcity in the 1960s and 1970s led to debates about the 'environment' becoming truly multidisciplinary encompassing, but not restricted to, politics, philosophy, law, geography, economics and the natural sciences.

This chapter focuses on the relationship between global environmental politics and environmental problems. It explores how this relationship has evolved over the last fifty years, the period in which the environment has been recognised as a distinct policy area and when there has been acceptance that many environmental problems are not just of local, or even national concern. The recognition that the negative impacts of human development are transnational has created some unique challenges for politics and the question of how to find ways to address *global* environmental problems has occupied the attention of scholars and policy makers alike.

Global environmental politics is conventionally understood to have evolved over the past fifty years. There have been major debates about the nature and extent of environmental

problems, which actors should be charged with dealing with them and how they should tackle them. Initially there was a clash of ideas between those advocating dealing with environmental problems by limiting economic and population growth and those who questioned whether such drastic action was really needed. When governments accepted that they needed to do something about environmental problems this largely meant individual states creating departments and developing regulation. With this 'traditional nation state' approach, if problems crossed borders, states would create bilateral agreements. However, it was increasingly recognised that this approach would not work because the problems were often global in nature requiring greater international cooperation. These challenges needed a different approach and the answer lay in the concept of *sustainable development* which defined much of the debate in the latter part of the twentieth century. Sustainable development recognised the link between economic growth and environmental degradation and advocated involving new actors and finding new mechanisms to facilitate sustainable growth which would alleviate global poverty and inequality.

Sustainable development emerged alongside the changes in the role of government associated with the growth of neoliberal ideology after the 1980s. Scholars have described these changes in debates about governance which were taking place within nation states, and at international and subnational levels of government (Rhodes, 1997; Rosenau, 1992; Hooghe and Marks, 2001; Finkelstein 1995). By the end of the twentieth century the term *Global Environmental Governance* (GEG) became prominent and, despite some variation in usage, is now widely used to describe the change in approach to governing global environmental problems (Dauvergne and Clapp, 2016; Biermann and Pattberg, 2008). The GEG narrative of increasing actors (state and non-state), more informal and networked solutions with overlapping tools provides an effective framework for understanding the development of global environmental politics. More recently, as scientific evidence has increased, there has

also been a shift from general concerns about pollution and resource scarcity towards a new focus on the huge challenges posed by climate change (Dauvergne and Clapp, 2016). The attempts to address climate change have resulted in renewed attention on the relationship between economic development and energy needs which highlight many of the tensions from the earlier sustainable development debates; how to resolve issues of growth and individual nation-state goals with global long-term interests.

This chapter provides insight into the progress made in how global environmental problems have been addressed by reviewing three areas:- the development of sustainable development, the problem of climate change and the energy dilemma. In each area it is claimed that there has been a shift from a traditional nation state government approach with standard command and control tools towards GEG with more international agreements, more actors and different ways to implement the necessary changes. However, assessment of these claims shows that we remain a long way from finding successful ways to address global environmental problems and tensions continue between the industrialised West, which has benefitted from unsustainable growth practices, and developing nations which still seek their own path to economic development. GEG has led to the inclusion of more actors but this has largely meant greater private sector involvement and the focus for solutions on supporting innovation and new technology. The narrowness of this approach fails to recognise the complex relationship between humankind and the planet and enables the continued dominance of the industrialised West over the Global South.

Sustainable development

In 1962 Rachel Carson's *Silent Spring* detailed the growing scientific evidence which helped draw political and public attention of the detrimental impact of human activity on the

environment. Concerns about pollution inspired the environmental movement and drew a political response as governments began to recognise the environment as a policy area in its own right. The initial reactions saw the introduction of legislation primarily to address pollution concerns (clean air, water and pesticide use) and institutional changes (1970 saw the first UK Department of the Environment and the establishment of the US Environmental Protection Agency). Environmental pressure groups formed such as Friends of the Earth (1969), Greenpeace (1971) and explicitly 'green' political parties were established around the world. The emergence of the zero growth school of thought, typified by Paul Ehrlich's (1968) *The Population Bomb* and Meadows et al (1972) *The Limits to Growth* fuelled a wider debate on how environmental problems were to be dealt with by an industrial society.

The most enduring contribution to this debate was Garrett Hardin's (1968) article 'The Tragedy of the Commons' which provided a widely accepted argument for why technological solutions were not sufficient for certain types of problems as they lead to free riding and overuse of resources. Hardin's main concern was population growth but he recognised other 'no technical solution problems' including pollution. Hardin identified the reasons why individual decision-making and self-interest are unlikely to result in optimum outcomes for society even in the face of pressing evidence. The problem is market failure, notably of negative externalities, which mean that private costs are less than social costs (Pigou, 1920). Hardin argues that the answer lies in regulation to coerce and, controversially, to recognise that there is a necessity to limit the freedom to choose. The solution advocated by environmental economists was to internalise the environmental costs of production and consumption, namely waste and pollution, in order for the market to work more effectively (Baumol and Oates, 1975).

In the natural sciences, ecologists turned their attention to improving the understanding of complex ecosystems. Resulting knowledge of sustainable yields and

carrying capacity helped identify the limits of the Earth's resources to support life. The recognition of which underpinned the 1980 World Conservation Strategy which introduced the concept of sustainable development (IUCN, 1980). The 1987 World Commission on Environment and Development (WCED) publication *Our Common Future* (commonly known as the Brundtland Report) provided the most influential definition of sustainable development as '...development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED 1987: 43). The task the WCED undertook was to formulate 'a global agenda for change' (ibid, ix) and to find ways to address environmental concerns to ensure that everyone had the opportunity for prosperity and security.

The Brundtland Report acknowledged that economic growth brings the risk of environmental damage and accepted that there were limits to growth as determined by the planet's capacity to sustain human development. However, it also argued that economic growth was necessary because it was the key to alleviating poverty and so should not be limited but rather needed to be managed and delivering sustainable development would require a change in approach by governments. The Brundtland Report argued for a framework of international agreements, nation state cooperation, stronger local government and greater public participation to integrate economic and environmental concerns (WCED, 1987; 63-64).

The concept of sustainable development was further established at the 1992 the UN Conference on Environment and Development (the Earth Summit) in Rio which marked a milestone in obtaining international agreement with delegates committing to deliver sustainable development through the Agenda 21 programme. This required nation states to devise their own national and local action plans, identifying policies and processes to achieve sustainable development. The Rio Earth Summit also agreed 27 principles to deliver

sustainable development (United Nations, 1992). As a normative concept sustainable development, as defined by the Brundtland Report and the Rio Earth Summit, provided a framework for addressing global environmental problems and the inequalities between the North and South through sustainable economic growth. It was also a more palatable way forward which helped its wide acceptance by western governments, business and (some) environmentalists and citizens. However, the Rio Earth Summit also sparked further debate about what sustainable development really meant as it became clear that as a concept it could be interpreted in many different ways. Economists distinguished a spectrum from weak to strong sustainability, differentiated by disagreements over how much attention should be paid to environmental capital as special in its own right and whether the environment's role was an adjunct to economic growth or more fundamental precondition to economic and social wellbeing (Pearce, 1993:15-19).

The concept of sustainable development is also criticised as being anthropocentric, human-centred, with an argument that growth should be measured in qualitative terms with equal value awarded to human and non-human life (Dobson, 2007). The attempts to classify the interpretations of sustainable development highlight different approaches to measuring growth, but also philosophical differences, which reveal diverse perspectives on the environment's role for society and policy making (Baker, 2006:28).

The spirit of governance can be seen in the early sustainable development debates, particularly in respect of recognising the need to include actors beyond the formal state and that operate at different spatial levels to address global challenges. However, the wider economic and political environment has influenced the development of this new approach. The neoliberal ideology of the 1980s conflicted with traditional nation state interventions to dealing with environmental problems with resistance to solutions that affected the market and imposed additional costs to business. Sustainable development, as defined by the Brundtland

Report, found synergies between the economy, environmental and social objectives rather than arguing for limits to growth. This provided support for Ecological Modernisation (EM) Theory, which argued that economic and environmental goals could be achieved together and called for changes in state-market relations to deal with the environmental crisis (Mol, 1996; Mol and Janicke, 2009). EM emphasised exploring new policy measures, integrating environmental policy into areas which previously neglected the environment and, importantly, the innovation and diffusion of new technology which is environmentally friendly and more efficient, thereby solving environmental problems and benefitting business (Gouldson and Murphy, 1996). The approach advocated by EM has influenced the sustainable development agenda, for example, the EU has a commitment to sustainable development in its rhetoric but in practice this has been implemented through an EM approach based on the principle of environmental policy integration (Baker, 2007).

International agreements have played a key role in leading the way to address global environmental problems, with the UN central to the commitment to deliver sustainable development (Baker, 2006:54). The core themes from Brundtland and Rio have been reinforced in other international agreements from the Millennium Development Goals in 2000, the 2002 World Summit on Sustainable Development (Rio +10), the World Bank's *Inclusive Green Growth* (2012) and the UN's 2030 Agenda for Sustainable Development (2015). Such agreements have largely sought to establish formal targets and, influenced by EM, there is a continued focus on new technology as key to delivering sustainable development. There are criticisms of the progress made. Even the UN recognizes that more needs to be done to deliver the goals of sustainable development (United Nations, 2002). The Millennium Ecosystem Assessment (2005) found that the degradation to ecosystems has continued since 1960. International agreements are negotiated by nation states and many times efforts have been thwarted by powerful state players who defend their own interests

which undermine solutions for global environmental problems.

Addressing the collective action challenges identified by Hardin (1968) remains a key issue for GEG. The recent UN 2015 Agenda promised to deliver sustainability through a 'revitalized global partnership' with 17 Sustainable Development Goals (SDG) and 169 targets. There is some hope that this 'novel approach' of global governance by goal setting may succeed (Biermann, Kanie and Kim, 2017). In 2016, for the first time, the World Bank's World Development Indicators included reference to the UN's global goal to promote sustainability and the SDG's. However, the implementation of agreements remains at national and subnational levels. The use of regulation continues and, whilst increased participation of citizens is encouraged, it is the relationship with industry which is key as governments have turned towards using voluntary agreements and market-based solutions such as eco-taxes and trading schemes to promote improvements in environmental protection. Questions remain as to whether this approach will succeed in delivering sustainable development (Paterson, 2009).

Climate Change

Knowledge of our climate and how it is influenced by greenhouse gases (GHG) goes back over 200 years to the mid-nineteenth century debates culminating with John Tyndall's 1859 paper which laid the basis for understanding the greenhouse effect (in Hulme, 2009). In the twentieth century scientists looking to explain the fluctuations in Earth's temperature, particularly in the post-industrial period, pointed to the increased GHG being the cause of temperature rises. As concerns grew in 1988 the UN's Environment Programme (UNEP), together with the World Meteorological Organization, formed the Intergovernmental Panel on Climate Change (IPCC). The main aim of the IPCC was to review and assess the scientific

research and publish the evidence with the goal of finding solutions for what most scientists concluded was a man-made problem. The first report of the IPCC in 1990 confirmed the link between human activity and climate change. With scientific evidence mounting it was recognised that this global problem needed a global solution and international cooperation became the focus of attention. In 1992 over 150 countries signed up to the United Nations Framework Convention on Climate Change at the Rio Earth Summit. Key to the agreement was the principle of 'common but differentiated responsibility' which acknowledged that, whilst everyone has responsibility to protect the environment, the industrialised countries had gained their economic growth through methods which had resulted in high GHG emissions and the resulting negative consequences. Developing countries would need support to grow in a more sustainable manner. The Precautionary Principle, which states that scientific uncertainty cannot be used to stop measures to prevent environmental degradation, was also important given the nature of scientific uncertainty about the causes and particularly the likely impacts of climate change. This uncertainty has contributed to the continued opposition to any solutions which suggest that there should be limits to economic growth.

After Rio international negotiations continued with regular Conferences of the Parties (COP) and in 1997 the Kyoto Protocol (COP3) saw developed countries agree to reduce their GHG emissions by 5.2% against a 1990 baseline. However, negotiations were difficult and many criticised the final agreement as weak. The USA refused to ratify the treaty. Russia and Australia also delayed (Kyoto was not implemented until 2004 when Russia signed to meet the threshold to enact it). After 2000, increased scientific knowledge led to more consensus on the cause of the problem, namely human activity, which was reflected in the IPCC reports of 2001 and 2007. Other events, such as the devastation caused by hurricane Katrina 2005, saw climate change recognised beyond the scientific community. In 2006 Al Gore's *Inconvenient Truth* reached a wide audience and in the UK the Stern Review (2006)

highlighted the economic cost of taking action later rather than sooner. In 2006 the IPCC and Al Gore shared the Nobel Peace prize for raising awareness of climate change and in 2007 climate change was high on the agenda for discussion for political and business leaders at the World Economic Forum (Davos) in Switzerland.

Although 2006 appeared to mark a turning point in recognition of climate change, actions did not follow. Hopes were high that the 2009 Copenhagen Climate Conference would agree a framework to mitigate climate change post-2012. However, in the end the outcome was disappointing. Despite widespread acceptance of the evidence, questions remained about who was responsible and crucially who should pay. China as a 'developing country' had not been part of the 1997 Kyoto agreement, but by 2009 was the biggest emitter of GHG. The USA never ratified Kyoto and was second biggest GHG producer. However, some countries, particularly low-lying countries such as Bangladesh and the Maldives, were beginning to see the impact of climate change. They demanded action and wanted those who had caused the problems to pay. When world leaders arrived in Copenhagen there was no agreement to sign. It was left to the US President Obama and Chinese Premier Wen Jiabao to broker a deal to rescue the talks (Giddens, 2011:190-92).

Agreements were reached to limit global temperature increases to no more than two degrees Celsius above pre-industrial levels and to reduce emissions. However, there was no legally binding commitment. Progress continued slowly, the Cancun (2010) and Durban (2011) Climate Conferences reaffirmed commitments to reduce emissions and support developing countries. However, the turning point came at the Paris Climate Conference (2015) which at last saw a legally binding agreement reached. With USA and China on board targets were set to limit warming to below two degrees Celsius with financial arrangements in place to support developing countries and a more rigorous monitoring of progress. The

most significant success was that the treaty was quickly ratified by the required 55 percent of countries for it to enter into force before the end of 2016.

Alongside the UN, the European Union has taken a lead on addressing climate change. From the early commitment to reducing CO₂ emissions in 1991, the EU has recognised the challenge of agreeing to reductions and finding ways to achieve them together with its obligation to developing countries (Giddens, 2011: 195). The first EU Climate Change Programme in 2000 worked with a variety of stakeholders including member states, industry and environment groups to find ways to implement the Kyoto targets to reduce emissions. The second programme in 2005 continued this work and in 2010 Directorate-General for Climate Action was created. The two main tools for action have been the setting and monitoring of emission targets and, schemes encouraging innovation, particularly around energy efficiency (Giddens, 2011:195).

In 2005 the European Emissions Trading Scheme (ETS) was established which became the world's biggest carbon trading scheme (Stern, 2009). This market-based initiative set overall caps for emissions and companies that signed-up were allocated a specific allowance for each tonne of carbon released. If they limited their carbon emissions they could trade their allowances, if they exceeded them they had to buy more allowance. Some success can be claimed as it introduced regulation, via a market, to carbon emissions, a previously unregulated commodity and, by setting upper limits, provides a way to meet climate change targets through introducing price created incentives and costs to produce the necessary outcomes. However, the scheme has been beset by problems and behavioural change has been limited, not least because too low a price was set with too many allowances available (Stern, 2009). Debates about reform of the EU ETS scheme continue (Grosjean, 2016).

Despite the flaws, reformed versions of trading schemes, remain part of the strategy to tackle climate change.

The twenty first century has seen increased acceptance by politicians, business and citizens that climate change is a challenge for humankind. However, there remain debates about who is to blame and scepticism about some of the predicted catastrophic consequences (Lomborg, 2001). International agreements have committed to reducing GHG emissions but have been consumed with difficulties as nation states battle to protect their own interests. The emission of GHG can be understood as an example of market failure (Stern, 2009: 11). Proposed solutions adopt an EM approach with a focus on target setting to be largely achieved through market-based approaches such as trading schemes and encouraging technological innovation.

President Obama hailed the 2015 Paris agreement as a turning point for global action on climate change. However, the election of President Trump highlights the fragility of international agreements and the continued power of nation states. President Trump was explicit in his promise to prioritize American jobs and in his actions, including the appointment of a renowned climate change sceptic to the Environmental Protection Agency and withdrawal from the Paris agreement threatens the progress made. In contrast, China has recognised the negative impact of economic growth on its own environment and has committed to a programme to bring 'blue skies' back to Beijing thereby taking the political advantage if it becomes a global leader on climate change.

The energy dilemma

The energy 'dilemma' refers to the question of whether we can have 'secure, affordable, and equitable supplies of energy that are also environmentally benign' (Bradshaw, 2014:1). The

early environmental debates in the 1960s and 70s raised questions about our ability to sustain economic and population growth and identified the problems specifically surrounding energy. The two key concerns were the detrimental environmental impacts of resource extraction and production together with the long-term sustainability of relying on resources, particularly on fossil fuels (oil, gas and coal), for future energy needs (Meadows et al, 1973). These concerns provided the impetus for the debate around sustainability and further research into how much natural resource was left, with evidence proving the short-term 'doom and gloom' predictions incorrect. This took much heat out of the debate with one consequence being that the political aspect of the energy debate has been neglected (Hughes and Lipsey, 2013). However, worries remain about the longer term sustainability of fossil fuels, with current estimates suggesting production will peak in the next half century (Maggio and Cacciola, 2012).

It is also generally accepted that economic development leads to higher energy consumption and post 2000 the scientific community has provided more evidence of the negative environmental impact of not only energy extraction and production but also of energy consumption. In 2006 83 percent of global energy supply came from oil, coal and gas and the use of fossil fuels as an energy source makes a considerable contribution to GHG emissions a trend which will continue particularly in the light of growing energy demands from China and India (IEA, 2008). The link between energy, climate change and development may reignite the politics of energy debate.

Since 2000 the priorities for the energy policy has shifted as governments have moved from maintaining supply and controlling prices, to addressing energy supply and demand concerns to meet their emission targets required by international climate change agreements such as the Kyoto Protocol. However, the challenges of dealing with environmental concerns are compounded when addressing the energy sector with its multiple

objectives and market failures (Helm, 2005). Private energy production is largely in the hands of a few multinational corporations (including Exxon Mobil, Royal Dutch Shell and BP) and the market is dominated by a few powerful state actors (including USA, UAE and Kuwait) who regulate supply. The energy sector has also been guided by OPEC (Organization of Petroleum Exporting Countries) which coordinates supply and thus price and the distribution of return on investment and on the consumer side, the International Energy Agency (IEA). National governments have been limited to looking towards how to regulate the market through the standard market instruments and attempt diplomacy to smooth cross-national relations (Hughes and Lipsey 2013). The energy sector is also associated with high costs and long lifespan of projects which further constrain national political decision making. This past has produced variations in different countries in infrastructure provision and each country has its own institutional legacy which needs to be taken into account in any attempts to reduce GHG emissions (Helm, 2005).

Finally, consumers of energy also have conflicting objectives, most want low cost energy but there is increased recognition of the need for cleaner and sustainable energy sources and in the longer term higher prices would ensure energy security (Hughes and Lipsey, 2013). The characteristics of energy production and consumption mean that a wide range of actors have a stake in energy policy, from individuals and interest groups, to governments and business with different objectives (Helm, 2005). There are problems of competing national interests and cross-national differences in energy policy together with the interests of energy firms themselves. Governments need to balance different goals of meeting climate change target agreements whilst protecting national interests by ensuring energy security (often managed through the private sector) and protecting jobs. In addition, there has been a longstanding tension between the nuclear industry and environmental groups, which has influenced government policy (Hughes and Lipsey, 2013). Energy supply and demand

has become a political, and ideological, issue with governments aware that meeting climate change targets will require not only cooperation from energy companies but also subnational levels of government, business and citizens themselves.

The relationship between human development, energy and climate change is complex. The IPCC uses the Kaya Identity, which focuses on four elements; carbon intensity, energy intensity, GDP per capita and population, in its emission forecast scenarios. This helps explain why energy is so important in addressing climate change as governments focus is primarily on how to influence energy policy (Bradshaw, 2014: 19-20). The traditional nation state responses to delivering climate change obligations has been to use legislation to set emission targets and provide support for improvements in energy efficiency and the development of different energy sources. This has largely been done by using market-based initiatives to incentivise or control the direction of investment, to develop renewable sources of energy, namely solar and wind, and encourage consumers to change behaviour. However, private energy actors remain dominant and domestic measures which seek to influence energy demand and energy conservation have been resisted in some countries who are large energy producers such as the USA (Hughes and Lipsey, 2013). Whilst there has been success in improving energy efficiency and some, albeit slow, growth in renewable energy, fossil fuels remain the primary energy source (Bradshaw, 2014: 55).

There are some signs of change within the energy sector. The IEA, which was formed in 1974 to help stop disruptions in energy supply, now claims a wider remit to ensure the reliable, affordable and clean energy for its members. Its annual World Energy Outlook reports have increasingly recognised the role of energy in contributing to climate change and the need for change to move away from fossil fuel sources to ensure the future of humankind; 'what is needed is nothing short of an energy revolution' (IEA, 2008:37). The enormous growth in demand for oil, gas and coal from developing countries, such as China and India

has increased the concerns (IEA, 2008, 2016). China has itself acknowledged the environmental costs of its economic growth and has turned its attention to searching for cleaner forms of energy in the form of renewables and nuclear power. The 2016 IEA report examined the 'new era' opened up by the Paris Agreement and its projections to 2040 reflected the change to global renewable energy. However, the report also highlights that many people will still be left behind relying on basic solid biomass for cooking (IEA, 2016). However, the IEA has no formal policy making powers and in contrast, OPEC maintains its defence of the interests of oil-producing members. Despite the pressures, the traditional governance of an energy system dominated by fossil fuel continues to prevail (Bradshaw, 2014: 189).

Governments now have an increased role in managing the energy sector, although the extent of this depends on nation state structures as to how much they can influence individual decision making on energy production and consumption. The number of actors involved has expanded as interest groups with stakes in renewable sources and those concerned with environmental impacts of fossil fuel have joined forces. Consumers also play a part as they are not just self-interested individuals but share concerns about the impact on the environment and can exert some pressure on governments and business. However, the key actors remain private companies and a handful of nation state producers and the conflict in interests continues to challenge energy policy. Persuading people to consume less energy, or pay more for sustainable sources, involves a multi-faceted approach raising awareness of the environmental consequences and the need to mitigate and improve energy security. The multiple objectives of the energy sector remain and the challenge of how to convince private energy companies and nation states to act in the best interests of all before it is too late.

Conclusion

There have been many developments in global environmental politics over the last fifty years as the impacts of human development on the environment have been recognised. As our knowledge and understanding of complex ecosystems and our relationship with the natural environment have grown, many have recognized the enormity of the challenges we face. However, questions about the consequences and extent of our impact remain and we continue to search for ways to govern which will deliver satisfactory mechanisms to deal with the problems. Global environmental politics has driven, and been driven by, wider political developments. For politicians and business leaders sustainable development resolves the question of whether growth needs to be limited, with the view that alleviating poverty and environmental degradation need to be tackled together. This requires a fundamental rethinking of the way in which global problems are addressed at every level of government. This rhetoric of sustainable development now dominates the international political arena.

Towards the end of the twentieth century consensus developed that climate change was a significant challenge for humankind. However, just as the severity of the problems were being acknowledged, the economic crisis emerged which saw a return to economic priorities independent of the environment. The subsequent recession led many governments to revert to traditional economic models of behaviour. Climate change campaigners have continued to draw attention to an increasing body of evidence, keeping it on the political agenda. The impacts of rising temperatures are being felt ever more sharply and even some businesses, notably insurance, are seeing the costs of not acting. Paris COP21 (2015) might be seen as a turning point for agreement and action as all the powerful nation state actors committed to the agreement. However, the viability of such agreements remains in the hands of nation state actors.

The energy dilemma has become increasingly intertwined with international and nation state commitments to address climate change by agreeing limits to GHG emissions. However, the key actors for the energy sector, such as OPEC, multi-national companies and nation state producers, remain largely focused on supply and return on investment. This makes implementation of agreements at the domestic level difficult as governments are constrained by what they can do to influence the change needed. The main approach is to encourage technological change through market-based instruments, such as the EU ETS, giving industry a central role. Supporting innovation to achieve these changes, such as developing renewable energy sources, requires significant investment. This has to come either from persuading business to invest or from public spending. Given these dilemmas, the governance structures surrounding the energy sector are still in need of improvement to address the complex environmental problems.

The argument that environmental and economic objectives can be achieved together underpins the evolution of Global Environmental Governance. International cooperation and agreements are key but the nature of global problems led to the emergence of the view that a new approach with new actors and different mechanisms were needed to address the problems. Some of this has been realised with new actors now part of the process from the inclusion of the scientific community and citizens who are encouraged to participate in making decisions about their own communities. The 'new actors' are largely economic, from the private sector, and the 'new mechanisms' are usually market-based initiatives notably to incentivize the development of new technology. Yet much remains in the hands of nation state actors driving international agreements, with dynamics dominated by the power relations between them. There may be more actors but traditional ones remain powerful.

Global Environmental Governance has a normative aspect where it is presented as the answer to address the inadequacies of previous attempts to deal with global problems

(Biermann and Pattberg, 2008; Pattberg and Zelli, 2015). However, the early debates around governance also raised concerns about the loss of nation state power to new actors across different spatial levels and problems arising from more fragmented and less transparent decision-making processes (Rhodes, 1997). These problems have been recognised within more recent debates as the increased range of actors may have led to some new initiatives but has also led to a more fragmented political environment. Nation states retain much power but they have devolved implementation to the private sector, which raises some questions about the authority, legitimacy and accountability of private actors. There is a view that such measures should complement not replace government regulations and enforcement (Dauvergne and Clapp, 2016). Whilst there have been changes the question remains whether there really has been a move towards governance (from government). To what extent has this really happened? It is clear that the words ‘sustainable development’ appear across the political spectrum and since 2000 governance is increasingly referred to as a way to approach global problems. However, beyond this rhetoric it is not clear that much has changed in respect to delivering the outcomes of sustainable development.

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