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Climate policy in China, the European Union and the United States: main drivers and prospects for the future

In-depth country analyses

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This policy paper is intended to inform decision-makers in the public, private and third sectors. It has been reviewed by at least two internal referees before publication. The views expressed in this paper represent those of the author(s) and do not necessarily represent those of the host institutions or funders.

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Table of Contents

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Executive summary

An improved understanding of current national climate policies, and the factors that drive their development and implementation, is required to aid the domestic implementation of climate policy under the Paris Agreement.

The purpose of this policy paper is to assess the key factors affecting both the development and the implementation of climate policies in three key jurisdictions: the People's Republic of China, the European Union and the United States. The aim is to assist policy-makers, climate change negotiators and analysts from outside these jurisdictions to understand the domestic constraints and opportunities facing each jurisdiction, and to identify areas of common interest or concern, facilitating both mutual understanding and cooperation.

China, the EU and the US together are responsible for the majority of global emissions of greenhouse gases, and produce about half of global GDP. Hence, their climate and energy policies not only have a strong influence on current and future global emissions of greenhouse gases, but also affect policy developments in other countries.

Here we outline their key policies, describing some of the key drivers, including economic factors, institutional settings and features of the political systems, as well as the role of public opinion, interest groups and party politics.

Over the past decade, China, the EU and the US have all made progress in developing and implementing climate policies. Yet each of these three jurisdictions faces unique challenges in delivering on, and raising the ambition of, their nationally determined contributions (NDCs) to the Paris Agreement. This study highlights where levers for more ambitious climate policies lie and where structural factors as well as economic or political developments will likely help or hinder progress. For instance, the co-benefits of fostering a growing green industry and reducing air pollution are so palpable that they have persuaded China to move strongly towards a low-carbon path for economic growth. To help this transition, China could improve incentives and mechanisms for its state-owned enterprises and the provinces to comply with targets set at national level. It could also allocate adequate resources to monitor compliance.

The EU, on the other hand, will need to broker a deal between more and less ambitious member states and unite them behind a common vision for the European energy market. It could also further mobilise the established and growing low-carbon industry as its ally.

For the US, bottom-up action by cities or states could help to ratchet up ambition at the federal level. A few proactive states should champion more ambitious US climate policy. At the same time, a committed executive branch could make further use of provisions under the Clean Air Act to advance climate policy at the federal level. However, this seems unlikely to happen under the recently elected Donald Trump. This analysis of the trends in the development and implementation of climate policies illustrates the importance of understanding the diversity of economic, institutional and political factors at the national level, as well as their interplay with public and private interests and the media. These will strongly affect countries' ability to implement their NDCs and to ratchet up ambition in the future. Notably, the study shows that the relative importance of the factors investigated differs across the three jurisdictions.

In China, the rise and fall of emissions is closely linked to economic development and the ongoing transition of its economy.

For the EU, energy security and economic concerns have been key drivers of European leadership on climate policy and its promotion of the renewable energy industry. The EU also has an institutional system that enables the European Commission, Parliament and some member states to champion ambitious action on climate change. Institutional leadership matched with favourable public opinion,

influential green parties and active non-governmental organisations has allowed it to agree successive packages of relatively ambitious climate and energy policies for 2020 and 2030.

In the US, political institutions enable economic interests, partisanship and ideology to polarise the political debate and stymie climate action via the legislative branch. However, they also leave room for executive action from the President and the Environmental Protection Agency.

Despite these differences, there are some similarities. For instance, the political economy of climate and energy policy in the jurisdictions is driven by similar dynamics. In China, carbon-intensive industries determine the extent to which climate policies are de facto implemented at the provincial levels. Similarly, the voting behaviour of Members of the European Parliament (MEPs) on climate policy tends to be strongly correlated with the carbon intensity of the member state they represent. This is comparable to the US where legislators from states with large fossil fuel resources and/or a large share of energy-intensive industries try to deter ambitious climate action. Also, despite the different governmental systems within the three jurisdictions, they all operate in a fairly decentralised way, with much of the implementation happening at the subnational level.

Key findings by jurisdiction

China's climate policy and the way forward

China is strengthening its actions on climate change based on a new political narrative focusing on the opportunity and ancillary benefits of low-carbon development. A recent political shift away from sole emphasis on economic growth to greater attention to air quality and climate change has led to increased investment in renewable energy sources and strengthened environmental policies and laws. Decarbonising its carbon-intensive economy, however, will remain a significant challenge in the coming decades.

Economic factors – both endogenous changes in the growth rate and composition of economic activity and the central government's new economic development strategy – are likely to keep future growth in Chinese energy demand very low. This means that stronger climate policy in China now goes with the grain of future economic growth and development. With 'green' being one of five key themes of China's 13th Five Year Plan, released in March 2016, climate change mitigation and local environmental improvement will be a whole-of-government priority (with emphasis placed on expanding the service sector, generation from non-fossil energy sources and electric vehicles, increasing emissions reporting and developing China's green finance market). We can expect to see expansion and strengthening of China's domestic climate policies in the years ahead, as well as a greater focus on 'green' foreign investment through China's role in the G20, the Asian Infrastructure Investment Bank, New Development Bank and One Belt One Road initiative.

Nevertheless, meeting the objectives set out by China's NDC (peaking emissions by 2030 at the latest, reducing carbon dioxide intensity by over 60–65 per cent below 2005 levels by 2030) will require a significant deceleration in its emissions trajectory. Three studies reviewed in this paper suggest that while carbon dioxide emissions from China will peak by 2030 at the latest, total greenhouse gas emissions will most likely increase beyond 2030. In order to limit global warming to below 2°C, China will need to reduce its carbon dioxide intensity further to 70 per cent below 2005 levels by 2030. It will also need to reduce emissions of greenhouse gases other than carbon dioxide, from the chemicals and electrical industries.

Climate policy development in China is a highly centralised process undertaken within the senior echelons of the Chinese Communist Party and central government through top-down administrative planning. Implementation is more complex and fragmented and follows the rule of territoriality, meaning local governments are responsible for the implementation of climate policy within their respective jurisdictions. Successful policy implementation thus depends significantly on securing the

cooperation of sub-national government actors and of business enterprises and on devising effective enforcement mechanisms.

The dynamics of public opinion, party politics and interest group influence play out very differently in China compared with liberal-democratic states. Yet policy development is also subject to a variety of significant influences from special interests and elite individuals, both within and outside the official party-state system. Furthermore, public opinion on air pollution has played a significant, albeit indirect, role in driving climate policy.

For China, the greatest risks to climate policy development are, firstly, that continued slower growth and challenges related to structural transition prompt further fiscal stimulus in the construction and heavy industrial sectors, prolonging factor price subsidies for state-owned enterprises (finance, land, energy), diverting capital from more productive investments, and increasing debt. The second risk is that vested interests, especially in state-owned enterprises, use their influence to prevent the introduction of new fiscal and regulatory tools (for example higher taxes on fossil fuel resources, energy and carbon), electricity market reform, stringent caps on coal consumption, more onerous implementation plans for carbon intensity reductions and more systematic monitoring, reporting and verification (MRV) of greenhouse gas emissions.

In terms of implementation, one of the biggest challenges is that policies that impose losses on polluting industries may be evaded by polluting firms and local/provincial governments in regions with large polluting sectors. The risk of social instability caused by high numbers of lay-offs may delay or deter the closure of inefficient heavy industry. Secondly, climate policies that depend on complex governance arrangements, sophisticated and well-resourced regulatory capacity and comprehensive, micro-level MRV (such as the proposed national emissions trading system), are likely to prove challenging to implement and may be vulnerable to manipulation.

EU climate policy and the way forward

The EU historically has been seen as a leader in climate change policy; for example, it set up the world's first cross-national emissions trading system. It has also set a range of targets on emissions reductions, energy efficiency and renewable energy for 2020 and 2030, as well as aspirational long-term objectives for 2050. Some of these have been translated into mandatory national targets.

Despite a relatively unified approach on energy security, large disparities in terms of economic performance and energy resource endowments have affected the ambition of member states' climate objectives. In general terms, northern and western member states have relatively low endowments of fossil fuels, and tend to be relatively large net energy importers. These countries also tend to have comparative advantages in services and advanced manufacturing, including renewable and/or nuclear energy generation technologies and energy-efficient products and services. By contrast, eastern member states tend to have larger endowments of coal, with large fossil fuel production industries and energy-intensive manufacturing. These industries tend to have a strong influence on policy-makers in these countries. As a result, generally western and northern member states have been in favour of stronger climate policies, while eastern member states have often argued for weaker ambition, fearing economic and social repercussions in their carbon-intensive sectors.

The EU's institutional system can be described as 'multi-level' because decision-making is split vertically and European, member state and local levels are involved. The institutional system is also 'multipolar', involving several bodies such as the European Commission, the European Parliament and the European Council. As a result, compromises on policy ambition often have to be made in order to achieve sufficient consensus on new proposals across different bodies and member states. While policy-making is complex, it also makes it difficult to change legislation that has been passed, which in turn means climate and energy policies have been relatively stable. In terms of implementation, regulations, directives and decisions adopted at EU level are passed down to member state and local

levels for implementation. As for enforcement, the European Commission has the power to take administrative and legal action against member states that have infringed a relevant EU law.

Special interest groups – in particular, business firms, industry groups and environmental NGOs – are also able to exert influence over EU climate policy development through various channels and can be powerful in advancing climate policy. In addition, public opinion has been strongly in favour of more ambitious climate policies. While migration and economic issues have taken higher priority since the global financial crisis of 2007–08 and the subsequent Eurozone crisis, public support for climate change action remains stable and provides an important lever for the development and implementation of future climate policy.

The future of European leadership in international climate change politics and its ability to meet domestic decarbonisation goals will depend on how the EU holds together in the face of recent crises. These include the economic malaise that has persisted since the global financial crisis, challenges, particularly in southern European member states, arising from the refugee and migrant crisis, and the growing sense of dissatisfaction among some member states with the concept of a federal Europe. This last point was manifest in the recent UK referendum on its membership of the EU, where it narrowly voted to leave. Greece also came close to leaving the Union amid deep financial crisis after 2010.

The EU must also deal effectively with resistance to European climate change policy from member states with large fossil fuel resources and/or large pollution-intensive sectors (e.g. Poland) as it moves ahead with the implementation of the Energy Union and the reform of other key policy instruments geared to achieving its existing climate targets (both 2020 and 2030).

The EU 2030 climate policy package – which commits it to reducing its emissions by 40 per cent, increase energy efficiency by at least 27 per cent and the share of renewables to 27 per cent of the energy mix – remains vague, and legislation for implementation needs finalising. For 2030, member states are divided over the level of stringency of new policies for implementation. How and whether these divisions can be bridged will determine the ambition of EU climate and energy policy going forward. This dynamic could result in the EU focusing on its current commitments until 2020 while delaying decisions on increasing its post-2020 ambitions in order to appease opposed member states.

At the same time, the EU would need to increase its current internal ambition in order to meet its 2030 targets. Studies reviewed in this paper highlight that with the current policy assessments the EU's emissions are likely to exceed its 2030 target by about 5–10 percentage points. The EU will need to at least double the annual rate of emission reductions from 2015 onwards to meet the 2030 target. On the one hand, the EU will likely meet its renewable energy targets, with continued decarbonisation of the power sector through fuel switching, shifting investments from coal to low carbon sources. On the other, implementing its 2020 and 2030 energy efficiency targets will be more challenging. For example, lowering emissions from transport will require overcoming high capital costs of electric vehicles and addressing sustainability issues around biofuels.

US climate policy and the way forward

Although the US lacks coherent framework legislation on climate change, the federal law that has shaped air pollution controls in the country since the 1970s is the Clean Air Act (CAA). In 2011 the CAA was amended to include the regulation of greenhouse gases. In addition, in June 2013 the Obama administration released the Climate Action Plan, which outlined steps to be taken by federal agencies to reduce greenhouse gas emissions, prepare for the impacts of climate change and lead international efforts to address global climate change. As a first step towards taking action under this plan, President Obama in 2013 proposed the Clean Power Plan (CPP), which would set standards for currently operating plants through federal guidelines and require individual states to implement performance standards with respect to carbon emissions, which they should outline in the state plans to be submitted to the Environmental Protection Agency (EPA), the US environmental regulator, in 2016–

2018. This aims to cut carbon emissions from the power sector by 32 per cent compared to 2005 levels by 2030.

Other policy measures that the Obama administration has issued aim to increase energy and fuel efficiency. In order to meet the target in the US NDC (decreasing emissions by 26–28 per cent below 2005 levels by 2025), studies analysed here demonstrate that the US will not only have to increase its ambition in the sectors above, but also that more comprehensive policies will be needed to reduce emissions in other sectors including industry and transport, coal mines, agriculture and forestry.

The relative importance of energy-intensive industries in GDP affects not only emissions, but also the strength of industrial interests, which in turn influences US climate policy-making. However, the economic importance of the energy-intensive industries varies greatly across states, which means that there are leaders and laggards in climate policy. It remains true, nevertheless, that legislators from high concentrations of energy-intensive industries have actively tried to hinder more ambitious climate action in congress and through judicial rulings. This is comparable to the EU where voting behaviour on climate policy by MEPs tends to be strongly correlated with the carbon intensity of the member state they represent.

While the institutional system in the US with its high degree of separation of powers between the legislative (congress) and executive branches makes alignment of different priorities between these two branches difficult, it also vests the executive with considerable powers to develop policies independently of congress. States also play a key role in developing and implementing climate policies. The implementation of several federal policies, particularly the regulations under the CAA, is primarily undertaken by the states. In addition, states also have the power to develop climate policies under their own authority – so long as they do not infringe the authority of the federal government or conflict with federal laws. California, in particular, has been a leader in implementing policies to combat climate change. Although these initiatives only cover some of the United States, they are still significant. This means that one could see emission reductions at state and local levels even if efforts on the federal level were lagging, although these would have less impact than concerted efforts on a national scale.

Also, party politics, namely the interplay between the positions of the two main parties (Republican and Democratic) and their relative power at a given point in time (e.g. which holds the Presidency, controls the House and the Senate, and so on) are the key factors in the development and implementation of climate change policy in the US. Strong polarisation among the main political parties with respect to both climate science and climate policy is an important feature of American climate politics. US electoral institutions also enable various economic interests, including corporations, special interest groups (such as trade associations and business think tanks) and wealthy individuals to exercise considerable influence over the political process. While the overall awareness of climate change among the general public seems to be quite high, it does not translate into a significant demand for action.

Under Republican President Donald Trump it seems likely, based on his comments during the election campaign and his campaign manifestos, that US climate policy will become significantly less ambitious. For example, Donald Trump has announced that he would repeal the Clean Power Plan through executive action, cut all federal climate spending by eliminating domestic and international climate programmes, withdraw from the UNFCCC Paris Agreement, encourage the use of fossil fuel resources and dismantle climate policy in general through executive action. This could be difficult for several reasons, one being that under the Clean Air Act the EPA has responsibility to regulate greenhouse gas emissions, the other being that any change to this law would require significant political commitment and take several years.

However, given that Donald Trump will appoint at least one Supreme Court justice, likely tilting the court towards conservatism, he could seek to repeal previous amendments to the Clean Air Act that bought greenhouse gases under the EPA's remit, and override or weaken the authority of the EPA. It

has already been reported that Trump will appoint a climate sceptic, Myron Ebell, to run the EPA (Bravender, 2016). It is difficult to predict how quickly changes to climate policy will happen, but the Climate Action Plan and the Clean Power Plan will likely stall.

Action on climate change would then depend largely on the individual states. Nineteen states announced (prior to the election) that they will submit plans to comply with the Clean Power Plan, and thus reduce emissions from their power sectors, despite the stay by the Supreme Court. Together these states represent 36 per cent of the emissions reductions due to be achieved by the Clean Power Plan in the interim period (2022–2029), and 30 per cent of reductions due by 2030 and beyond. This means that emissions cuts could take place at state and local levels, even if efforts on the federal level were lagging, although they would have less impact than concerted efforts on a national scale. It is also unlikely that all of the policy progress made in the past eight years would be undone. This study outlines the legislative and regulative procedures as well as the allocations of power in place that could slow down or hinder a new president from scaling back major climate policies.

1 Introduction

Over the past decade, China, the European Union and the US have all developed and implemented their own climate policy agenda. This paper looks at the status quo of climate policy in these three jurisdictions and analyses some of the key drivers that shape and will continue to influence their climate policy.[1] Thus it not only provides a better understanding of the policies and processes on climate change in the world's largest emitters and most powerful economies, but also draws lessons for the achievement of the nationally determined contribution (NDC) targets, future progress on climate policy and ways forward in international cooperation. A summary for each country and comparative overview are provided in the accompanying policy brief entitled *Climate policy in China, the European Union and the United States: main drivers and prospects for the future* (Averchenkova et al, 2016).

This policy paper is organised into chapters by jurisdiction. Each starts with a brief outline of where domestic climate policy currently stands, followed by an analysis of the key economic factors affecting policy choices in the respective jurisdiction. This is followed by a focus on key aspects of institutional arrangements, including distribution of authority across levels of governance[2] for development and implementation of policy, enforcement arrangement and institutions for measurement, reporting and verification (MRV). The importance of vested interests, public opinion and party politics is then considered. Each chapter concludes with a future outlook and implications of the analysis for the future of NDC implementation and the prospects for increasing the ambitions of climate policy in the three jurisdictions.

[1] 'Climate policy' in this paper refers to a policy that has the explicit aim and/or significant effect of reducing greenhouse gas emissions below what they would otherwise be. This definition is intended to capture policies that may have other primary objectives (e.g. energy security or air pollution reduction) if they also have a significant mitigation effect on greenhouse gas emissions. It also covers laws and regulations as well as plans and other non-legal instruments.

[2] We use 'governance' here as distinct from 'government' to connote the expansion of scope beyond formal institutions of government to encompass subnational actors who perform governance functions, which is especially relevant to the MRV of climate policy.

2 Factors affecting climate policy in China

Key findings for China

1. **Likelihood of achieving NDC targets:** China will likely meet its NDC targets to peak carbon dioxide emissions by 2030 at the latest, and to reduce the carbon intensity of its economy by 60–65 per cent by 2030 compared with 2005.
2. **Enhanced MRV:** A significant challenge for successful implementation of climate policies is that regions and industries (including state-owned enterprises) that suffer economic losses as a result may seek to evade them. MRV and enforcement capacity will therefore need to be improved if targets and standards are to be fully implemented. A more rigorous MRV system with greater institutional capabilities (i.e. more staff) would help to improve access to information and help more effective implementation of climate policies. Key for this is to have independent MRV enforcement capacity at the local level, i.e. funded by the national level and not by the local level, whose leaders may be conflicted.
3. **Energy market reform to increase renewable energy penetration:** Further state measures to support the accelerated scale-up of renewable and other non-coal energy sources – such as feed-in tariffs and green finance initiatives – offer strong potential for climate change mitigation in China, as they lead to industrial modernisation and innovation, job creation, lower air pollution and energy security. Such measures are likely also to enjoy widespread public backing. However, as renewable sources compete for grid access with fossil fuel incumbents in a flat energy market, the former may continue to be under-utilised relative to their potential, as local governments and market operators favour coal-fired utilities. Reforming the electricity market to avoid these problems will be a considerable challenge over the coming years. The challenge of connecting major hydro and wind resources to distant populations continues to be a major driver of China's growing grid investments.
4. **Develop transition strategies for steel and coal mining:** The biggest challenges for China's climate policies relate to phasing out high-carbon and energy-intensive industries, such as coal-mining, coal-fired power generation, and steelmaking – industries in which the state and party are deeply entangled. Nevertheless, China has committed up to 100 billion yuan (US$15.27 billion) to cover the significant lay-offs they expect in the steel and coal industries as a result.
5. **Address rising non-carbon dioxide greenhouse gases:** China's overall greenhouse gas emissions are likely to continue to grow until and beyond 2030 due to expected higher production and application of fertilisers, expansion in the electric power sector, coal-mining and because current policies are likely to be insufficient to address non-carbon dioxide greenhouse gas emissions. China will need to implement additional policies to reduce emissions of non-carbon dioxide gases especially from the chemical, electrical, coal mining and agricultural industries.

2.1 Status quo of climate policy in China

Being a rapidly developing country, mitigating climate change domestically has been a relatively low priority in China for much of the quarter-century in which the topic has been on the international agenda. In the 1990s and early 2000s, climate change was addressed by the Chinese government primarily as a scientific and diplomatic issue, reflected in the lead administrative responsibility for

climate being allocated to the China Meteorological Administration and the Ministry of Foreign Affairs. From 2005 onwards, however, climate policy development in China underwent a significant shift as it became more interlaced with domestic policy concerns, especially energy security, environmental/air pollution and domestic stability (Torney, 2015).

The 11th Five Year Plan (FYP) (2006–2010) included, for the first time, a target to reduce the energy intensity of economic growth by 20 per cent below 2005 levels by 2010. The Renewable Energy Law (2005) established targets, subsidies and incentives for renewable energy deployment. Around this time China also began to engage heavily with the Kyoto Protocol's Clean Development Mechanism (CDM), ultimately becoming the largest host of CDM projects and the largest issuer of CDM credits.

Despite these initiatives, China's greenhouse gas emissions growth accelerated dramatically throughout the 2000s. This spurt in emissions, combined with growing concern about climate change internationally in 2007, increased international pressure on China to strengthen its domestic policy. Around this time China set up a central policy coordination body, the National Leading Group on Climate Change, and made China's central policy planning agency, the National Development and Reform Commission (responsible for the Five Year Plans) the lead administrative agency for developing and implementing climate change policy.

Although there is not yet a comprehensive climate change law in China, in 2010 the government announced that China would develop a general law on climate change. After an initial period of research, a review of international experiences and inputs from several academic organisations, the first formal draft of the law was completed in the second half of 2014 and a comprehensive formal consultation got underway with government ministries, industry and other stakeholders (Nachmany et al, 2015). Work is still ongoing and, as of July 2016, the National Climate Change Strategy Center, under direction of the National Development and Reform Commission (see below), was planning a study visit to the UK and EU to hear more about the experience of implementation of climate laws in Europe with a view to further developing the draft. As experienced in many other countries, securing agreement across government for a comprehensive climate change law is tough and it appears that there is internal opposition, presumably from vested interests in fossil fuels, but the debate is opaque (Townshend, 2016). It seems likely, however, that a General Law on Climate Change will be passed at some point in Xi Jinping's term.

In its 12th FYP for national development (2011–15) China set a further energy intensity target of a 16 per cent reduction below 2010 levels by 2015 and scaled up its efforts to improve energy efficiency, especially within heavy industries responsible for the largest amount of carbon dioxide emissions. The 12th FYP also included, for the first time, a carbon intensity reduction target of 17 per cent below 2010 levels by 2015. In its Copenhagen/Cancun pledge, China committed to reduce the carbon intensity of its GDP by 40–45 per cent below 2005 levels by 2020.

Over the past few years, China's leaders have taken a more active approach to climate policy. This was due in part to improved awareness of the potential impacts of climate change on China and, more importantly, a deeper understanding of the domestic non-climate benefits from actions that also mitigate climate change (Zhang, 2015). The government is keen to advance core domestic objectives relating to energy security/efficiency, environmental pollution, economic restructuring and industrial competitiveness (see section 2.3).

Air pollution in China's major coastal cities has become a matter of widespread public concern since around 2011, as citizens have gained awareness of the health threats often using social media (Albert & Beina, 2016) and prompted the government to develop an Air Pollution Prevention and Control Plan (2013). The Plan imposes restrictions on coal and heavy industry, including mid- and long-term caps on coal consumption nationally. In the key economic regions heavily affected by air pollution – Beijing-Tianjin-Hebei, Yangtze River Delta and Pearl River Delta – it prohibits the building of new coal-fired power plants and aims to remove some heavy industry from these regions.

The government has also imposed, from 2016 onwards, a moratorium on new coalmine approvals for at least the next three years. It also announced plans to eliminate 500 million tonnes of surplus coal capacity from the market in the next five years, including by shutting down hundreds of existing mines in 2016 (Chen & Stanway, 2016; Harvey, 2016). A new body, the Regional Coal Consumption Reduction and Substitution Working Group, was set up to evaluate the coal reduction plans of each region and ensure the targets are met (Coghlan, 2016).[3]

China's 13th FYP (2016–2020), released in March 2016, includes an updated target to reduce the carbon intensity of GDP by 18 per cent over the course of the plan period. This equates to a 50 per cent reduction in carbon intensity of GDP relative to a 2005 baseline, a more ambitious 2020 target for carbon intensity than China pledged in the Cancun/Copenhagen agreement. This is consistent wtih comments by China's lead climate change negotiator, Xie Zhenhua, that China was on track to 'far surpass' its Cancun/Copenhagen pledge (King, 2016). The 13th Plan also includes a target to keep energy consumption within 5 billion tonnes of standard coal equivalent by 2020, which is more ambitious than the forecast target for 2020 contained in the 12th FYP (Chen & Stanway, 2016).

In continued efforts to diversify the energy mix away from coal – primarily driven by dwindling domestic supplies that are ever more expensive to extract – the government has also set a target to increase the share of natural gas to 10 per cent by 2020. In addition, China aims to have 150GW of solar capacity, 200–300GW of wind capacity (Roselund, 2015; Climate Group, 2015) and 58GW of new nuclear capacity (Xinhua, 2016) installed by 2020. Financing of zero-carbon energy development is also expected to grow as a result of China's green finance agenda, which entails the establishment of various schemes to channel capital towards zero-/low-carbon and environmentally sustainable firms and projects.

Modernisation of China's electricity infrastructure and the development of a 'unified strong and smart grid' have also been a focus for the country's power sector since 2010 (US Department of Commerce, 2016). The challenge of connecting distant population centres to hydro and wind resources continues to drive Chinese investments in its grid infrastructure and China's largest transmission and distribution company is expected to invest $243.2 billion by 2020, as outlined in the 13th FYP (ibid). China is also committed to significantly increase its use of smart meters and is expected to account for 24 per cent of the global smart grid market by 2020 (ibid).

Furthermore, through its NDC to the Paris Agreement in December 2015, China has committed to:

- peak its carbon dioxide emissions by around 2030 and to make best efforts to peak earlier
- reduce the carbon intensity of GDP to 60–65 per cent below 2005 levels by 2030
- produce 20 per cent of total primary energy consumption from non-fossil energy sources by 2030 (China, 2015)

Finally, China has been experimenting with seven pilot carbon emissions trading systems since 2015 (five at city level and two at provincial level) and plans to begin rolling out a national system in 2017. However, development and implementation of these extremely technically, legally and administratively complex schemes has proved very challenging to date. These challenges are to some extent inherent to emissions trading but are also compounded by China's governance and institutional structures, and by the distribution of costs and benefits across agents and regions with diverse interests (see section 2.3).

2.2 Economic factors driving Chinese climate policy

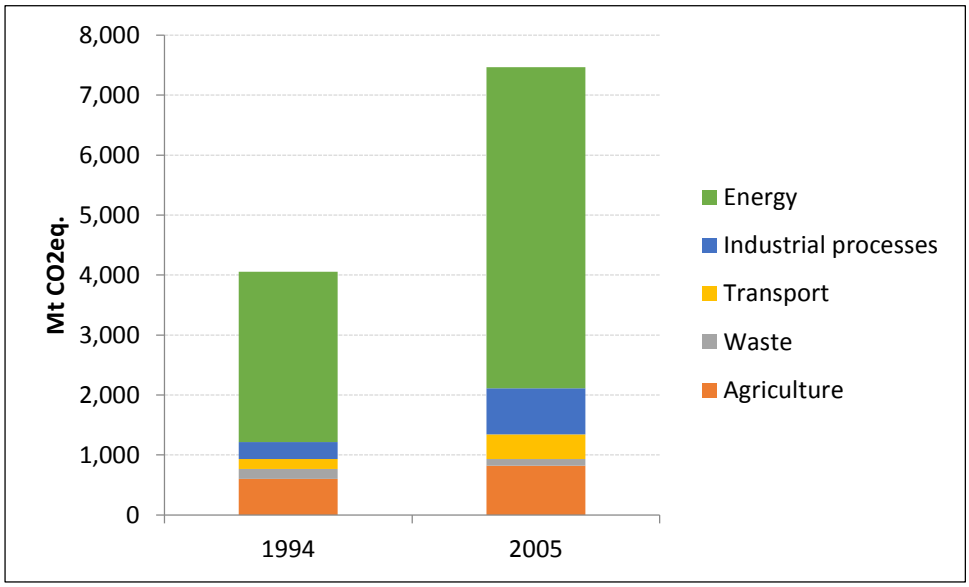
China's climate policies have been heavily affected by the structure of the economy, the stage of its economic development and the associated development strategies the government has pursued.

[3] Due to these recent developments at the time of writing, the accuracy and powers of this new body could not be verified and it is thus omitted in the institutional chapter where the main bodies of climate policy formulation and implementation are described.

Since the late 1970s, China has moved from a closed, centrally planned system to a more market-oriented economy. The restructuring of the economy and resulting efficiency gains have contributed to a more than tenfold increase in GDP since 1978. In 2014, China's GDP accounted for about 16.6 per cent of the world total wealth[4] (Bank, 2016), surpassing that of the US.

Over the last three and a half decades, China has prioritised rapid economic growth and poverty reduction through urbanisation and industrialisation. From 2000 to 2013 its economic strategy was marked by an acceleration in capital investment in real estate construction, infrastructure, energy-intensive manufacturing (e.g. steel, cement, glass and aluminium), and coal-fired electricity generation capacity. By 2013, roughly half of the world's coal, steel and cement production took place in China (Green & Stern, 2015). As a result of this heavy-industry-focused growth model, overall energy consumption, in particular from coal consumption, soared during this period (see Green & Stern, 2015; 2016). This in turn led to steep increases in greenhouse gas emissions, especially from the energy sector (see Figure 1).

Figure 1. Carbon dioxide emissions by sector (excluding LULUCF*), 1994 and 2005



Notes: China emissions data submitted to the UNFCCC are only available for 1994 and 2005.
**LULUCF = land use, land use change and forestry*
Source: Chinese Government (2004, 2012)

As noted earlier, rising concerns about energy security, prompted by growing dependence on imports of fossil fuels, led to strong central policies focused on energy conservation in the 11th (2006–10) and 12th (2011–15) five year plans. However, concerns among policy-makers that more comprehensive climate policies would curtail high GDP growth largely explain China's resistance to international climate commitments and more stringent domestic policies during this period.

Recently a series of structural shifts in China's economy have gathered momentum. In large part these shifts are economic reactions to the distortions and imbalances caused by the heavy-industry-based development model. Despite saturation in construction and heavy industrial goods (like steel and cement), commercial enterprises and local governments continued investing in these sectors. This has resulted in widespread excess capacity, low returns, weak productivity growth and mounting debt level. Additionally, the working-age proportion of China's population is shrinking while the surplus pools of cheap migrant labour from the countryside is starting to dry up, contributing to upward pressure on wages. Together, these factors have made it virtually impossible to sustain double-digit GDP growth. The old model of growth has also led to widening social

[4] In Purchasing Power Parity (current international $)

inequalities (interpersonal, urban-rural, and between eastern and western regions) and extreme levels of environmental pollution and degradation, of which air pollution has been the most pervasive and politically consequential (Green and Stern, 2015; and 2016).

In response, China's new central leadership has articulated a new strategy for economic growth, often referred to as the 'new normal'. This is based around the notion of lower, but better quality growth. In particular, the new strategy is concerned with a shift in the structure of growth towards domestic consumption, especially of services, and a diversion of investment towards more innovative, higher value-added manufacturing and service sectors; and a focus on environmental sustainability and reduced social inequalities (Green and Stern 2015; 2016).

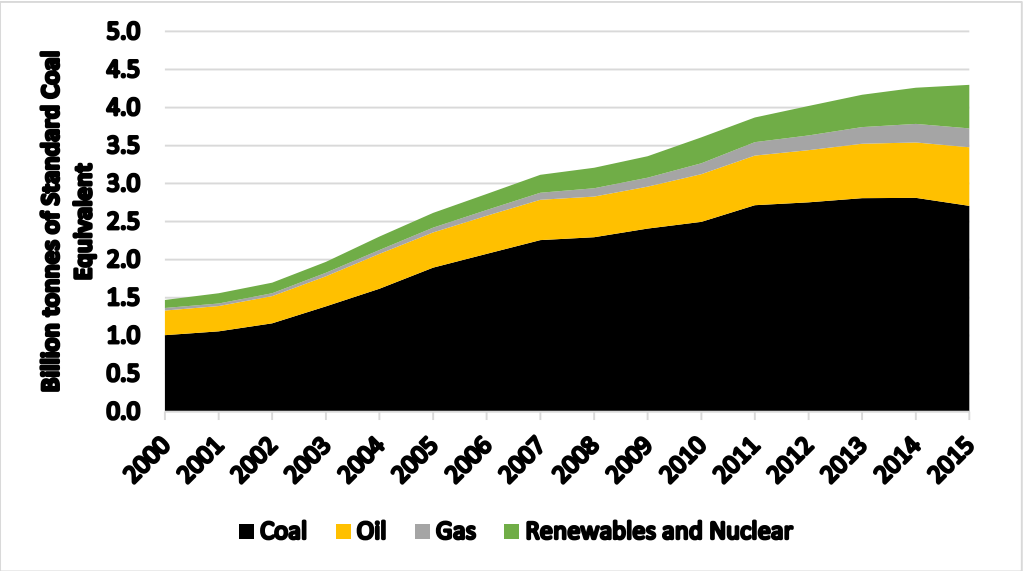
On the one hand, this has entailed state support for low-/zero-carbon energy industries such as wind, solar and nuclear power generation, electric vehicles and battery storage. For example, China matched Europe's spending on renewable energy R&D for the first time in 2015, deploying US$2.8 billion (Frankfurt School-UNEP Centre/BNEF, 2016). Overall R&D spending increased by a record 4 per cent in 2015, the latest step in a decade-long march in which R&D investment has risen every year since 2005 (Frankfurt School-UNEP Centre/BNEF, 2016). On the other hand, it has entailed measures to manage the decline of the over-capacity coal and steel sectors through targets for capacity reduction, and funds to restructure poorly-performing companies and resettle millions of displaced workers from these industries.

Some of these changes are already occurring naturally as a result of China's slowing rate of growth and shift away from heavy industrial production and investment. This structural shift in the economy contributed to dramatically slower growth in energy consumption in 2014–15 than in the preceding decade (see Figure 2). In addition, China is in the process of diversifying away from coal through the expansion of non-coal, and especially non-fossil (renewable and nuclear), energy sources. This has accelerated under the Communist Party's new leadership and is consistent with China's new development model. Preliminary estimates suggest that the slower energy consumption growth and record non-coal energy expansions of 2014–15 together have caused China's carbon emissions from fossil fuels to fall by around 2 per cent from 2014 to 2015 (Peters and Korsbakken, 2016).

Implementation of a comprehensive reform agenda would likely accelerate further decline in the energy and emissions intensity of GDP. Thus, the dynamics of China's new economic model and the transition to it, in contrast to the old model, imply a much stronger inverse relationship between GDP growth and energy consumption/emissions, which is likely to keep emissions growth either low or negative in future (Green and Stern, 2016). Fully implementing the new growth model requires considerable institutional reforms, including to state-owned enterprises (SOEs), the financial sector, and fiscal arrangements. While these reforms are necessary for robust and sustainable growth in the medium to long term, they would likely lead to yet slower growth in the short term (IMF, 2015).

These new economic dynamics have made it both easier and more justifiable for the government to develop further climate change policies, as these are now seen as *net-beneficial* and *complementary* to the 'new normal' growth model and the wide-ranging reforms needed to fully achieve it. However, implementation of these reforms and policies will be affected by the political economy that has evolved under the old model of growth. High-carbon producers and energy-intensive manufacturers, which tend to be concentrated in particular regions, will likely suffer financial and job losses. Firms in affected sectors (disproportionately SOEs), and sub-national governments in the regions where these firms operate, are likely to continue to resist such policies. For example, some coal-producing regions will be hit hard by government reforms to cut excess coal capacity, and officials and SOEs are lobbying to mitigate the impacts on them (Hornby, 2016).

Figure 2. Chinese primary energy consumption by source, 2000–2015



Source: China National Bureau of Statistics

2.3 Institutions in China

2.3.1 Key public institutions and allocation of authority in China

Awareness of the structure and dynamics of 'multilevel' governance – i.e. the vertical relationships between central and local governments, and of the 'multipolar' allocation of authority – i.e. the horizontal relationships across China's central government agencies, is key to understanding the role of Chinese institutions in developing and implementing climate policy.

China's public institutions involve close interplay between the government and the Communist Party of China (CPC). The complex relationship between party and state (government) organs is shown in Figure 3. The CPC has been the sole ruling party since 1949 and sits at the core of the national political power structure. Its structure is described in Box 1 below. During the early decades of Communist rule, the Party and the state operated as one. In the late 1970s, however, their functions started to separate, although the Party still maintains effective control of state institutions (Lawrence & Martin, 2013). Box 2 below explains the administrative system in more detail.

An essential means by which the CPC exercises power is through the cadre personnel management system, commonly referred to as the *nomenklatura* system (nomenklatura literally means job title lists, managed by the CPC). This system is designed so that the Party can appoint and approve individuals on the nomenklatura list to government and industry positions. This enables the Party to have effective control of the state and, more broadly, the economy's public enterprises (Chan & Rosenbloom, 2009). The party has also established grassroots organisations in all state-owned enterprises, some non-state-owned and/or foreign-funded enterprises, as well as in every rural village.

Box 1. The Communist Party of China (CPC) – structure

The CPC is organised around the following bodies:

The Standing Committee of the Politburo sits at the top of the Party's hierarchy, and is the most powerful policy- and decision-making entity. It is currently comprised of seven members, who each is responsible for a specific portfolio. Party **General Secretary** Xi Jinping is ranked first among the seven and controls some of the most consequential portfolios,

including military and foreign affairs. The General Secretary must still win consensus from the rest of the group for major decisions.

The Political Bureau of the CPC (Politburo), above the Central Committee, develops policy, appoints key administrative, judicial and executive government positions, controls the military and guides and supervises state-owned enterprises and so-called Public Service Units.

The Party Central Committee meets at least once a year. It sets the direction for the country in a specific area (e.g. the approval of a Five Year Plan). The Committee also 'elects' the Politburo, Politburo Standing Committee, and Party General Secretary. In practice, however, incumbent top officials provide a list of nominees to the Central Committee, which ratifies it.

Party National Congresses are held every five years and involve about 2,000 delegates, which together elect the Party's Central Committee.

Source: Lawrence & Martin (2013)

Box 2. Chinese government structure

China's highest ranking state officials are the **State President** and **Vice President**. The positions are largely ceremonial. They are appointed by the CPC for five-yearly terms with a limit of two terms. Since 1993, CPC's General Secretaries serve concurrently as State President.

The National People's Congress (NPC) comprises up to 3,000 delegates selected from provinces, municipalities, autonomous regions and the armed forces. According to China's constitution, the NPC is 'the highest organ of state power' (National People's Congress, 2004). It is a unicameral legislature whose role is to debate and pass China's laws and to formally supervise the work of the State Council, State Central Military Commission, Supreme People's Court and Supreme People's Procuratorate. However, in practice, these organs are controlled by the CPC (Lawrence & Martin, 2013). The NPC approves the President and members of the State Council, the Standing Committee of the NPC, which meets when the Congress is not in session. In practice, the powers of the NPC are exercised by its Standing Committee and the State Council (Hart et al, 2014). The Standing Committee has the right to propose bills to the NPC and to revise existing laws without the approval of the NPC (Hart et al, 2014).

The **State Council** is the chief administrative authority. It is officially responsible for implementing policies formulated by the CPC and laws passed by the NPC, as well as for overseeing the day-to-day work of the state bureaucracy. It comprises about 50 heads of governmental departments and agencies and is headed by a Premier (or Prime Minister) (Lawrence & Martin, 2013). The State Council supervises the various subordinate provincial governments and is formally responsible for the nationwide supervision and control of electric power operations (Hart et al, 2014).

China's **ministries** and **commissions** are subordinate to the State Council. Each ministry or commission has an embedded Communist Party committee that makes major decisions for the institution and oversees ideology and personnel matters. Yet the ministries can wield some tactical influence over policy by virtue of their role in drafting laws and regulations and implementing the national policy goals set by top leaders.

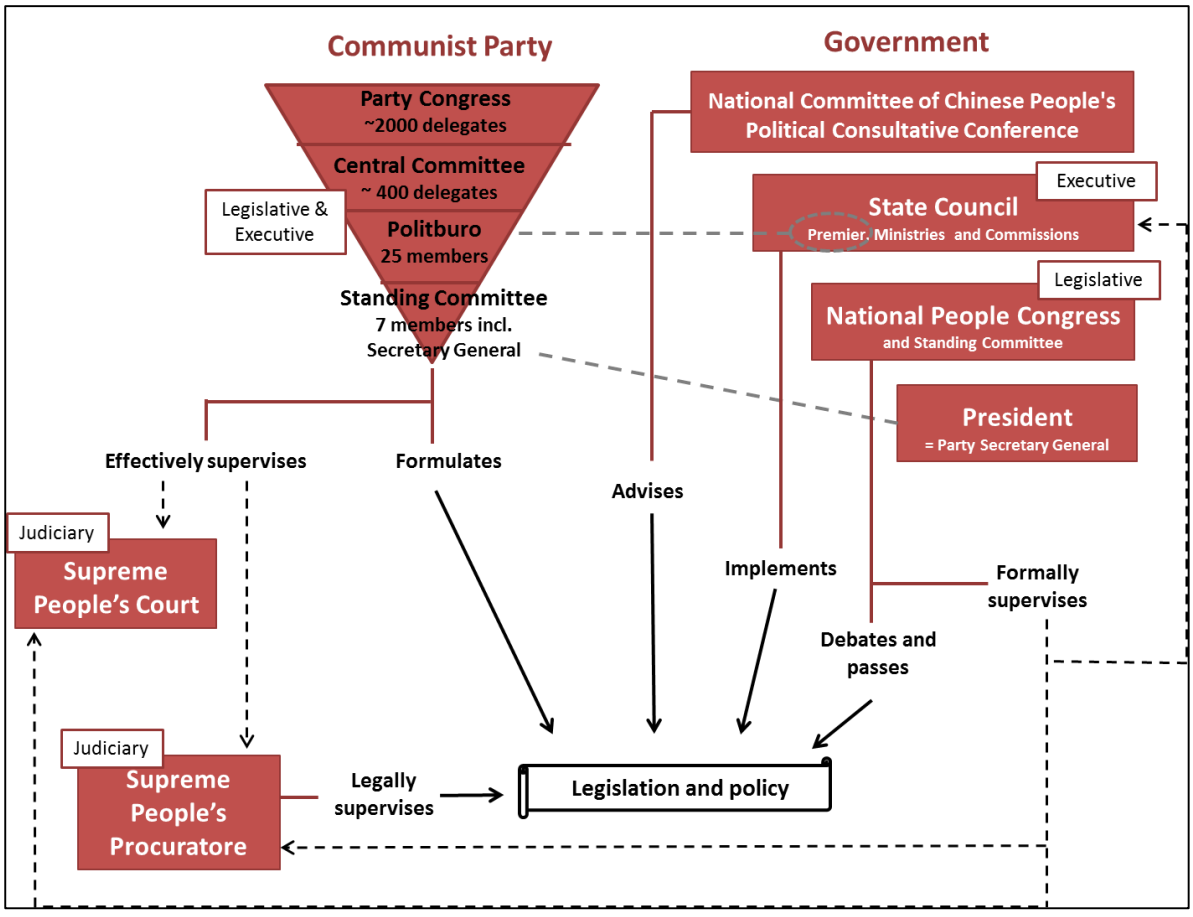
The **National Committee of the Chinese People's Political Consultative Conference (CPPCC)** is responsible for carrying out political consultation on major strategies and key issues at the state and local level, before final decision-making and during policy implementation. It also

provides democratic supervision through commenting on the implementation of the constitution, laws and regulations. Delegates to the CPPCC can make proposals and give suggestions or criticisms on national affairs, although the CPC is not obliged to act upon those suggestions. The institution can thus ignite and influence policy debates but is essentially powerless (Lawrence & Martin, 2013).

The **Supreme People's Court** is the highest judicial organ and the Supreme People's Procuratorate is the highest office of the prosecution service and provides legal supervision. Its members are elected by the NPC. China has also established local people's courts and procuratores at different levels, as well as military courts and procurators and other special people's courts and procuratores. Local people's courts are responsible to the organs of state power that created them.

China is a unitary state. The division of functions and powers between the central and local state organs is guided by the principle of empowering the local authorities to act independently under the unified leadership of the central authorities. Birney (2013) describes this as a 'rule of mandates' where central government's authoritative mandates (dissimilar to laws) are ranked hierarchically, so that some mandates take priority over others. Local governments then have significant discretion in their interpretation and implementation. These include 23 provinces, five autonomous regions and four municipalities. Provinces can also make their own legislation, as can a few specially designated municipalities. However, in practice major legislation is rarely issued at subnational level.

Figure 3. China's political power structure in practice



Source: Based on Lawrence & Martin (2013)

The central government lacks the administrative capability to guarantee close oversight of local policy-making (see e.g. Rithmire, 2014). So this system allows central politicians to issue high priority targets without needing to know about implementation challenges on the ground (Birney, 2013). However, this lack of knowledge also makes assessment of compliance very difficult and when variation in performance at local levels occurs it is difficult to evaluate whether this is due to different levels of effort by local government or de facto differences in conditions (ibid).

2.3.2 Development and adoption of climate policy in China

Climate policy development is a highly centralised process undertaken within the senior echelons of the CPC and central government. The dominant mode of governance is central administrative planning, reflected at the highest level in national five-year plans. Even though China has not yet officially enacted framework legislation on climate change, the one-party political system in China can help ensure relative continuity of climate policies, the consistency of policy goals, and the continuous refinement and improvement of the climate policy portfolio. This is done through various means.

Firstly, the central government periodically makes medium-to-long term plans such as the China National Climate Change Program in 2007, the Climate Change Adaptation Strategy in 2013, and the National Plan for Climate Change (2014–2020) in 2014. Secondly, the government has developed a policy system with concrete goals on climate change and greenhouse gas emissions control, as well as development plans for specific greenhouse gas emitting sectors through its five year plans. Finally, the government has introduced flexible policy tools to enforce climate targets, such as evaluation of local governments and officials, as well as managers of SOEs through the target responsibility system (see section 2.3.3).

China has established an administrative system and working mechanisms for climate change under the unified leadership of the National Leading Group on Climate Change and the centralised management of the National Development and Reform Commission (NDRC). The National Leading Group on Climate Change is the main organ for the deliberation and coordination of climate change policy and strategy in China.

The NDRC, with approximately 900 staff, is the acting agency and dominant actor in terms of climate policy development and coordination, management and services for all participating government agencies, and guiding economic reforms. Its role also includes drafting the national energy strategy, policies and standards in the energy and other industrial sectors and developing new energy and energy efficiency policies (Hart et al, 2014). Under its umbrella, the Department of Climate Change is responsible for drafting and implementing specific climate change policies and standards (ibid), while the National Energy Administration examines and drafts national energy development strategies and considers energy security and development with some regulatory authority over the oil and gas sector. The NDRC is also charged with implementing China's emission trading pilots and international climate negotiations. It is ranked slightly above other ministries and below the State Council. It also exercises certain powers on behalf of the State Council, notably the approval of infrastructure projects such as power plants over 25MW capacity (ibid). It is worth noting that China does not have an energy ministry.

As discussed earlier, the targets and policies set by the central government are broken down and allocated to provincial-level governments, which further disaggregate and allocate them to subordinate governments. Local governments (provinces and cities) are responsible for developing and implementing policies and programmes to meet their assigned targets. They also pilot low-carbon programmes, such as emissions trading and greenhouse gas inventories. Usually the national government announces such programmes and invites interested local governments to apply. The most qualified are selected to participate and provide feedback on the implementation. This generates lessons for expanding those programmes to a wider range of provinces and cities or to the national level.

Various other ministries are responsible for different aspects of climate and environment policy, of which the Ministry of Foreign Affairs is among those with a higher degree of influence. It facilitates cooperation between the NDRC and international organisations, foreign agencies and investors and plays a major role during international climate change negotiations (Ksenia et al, 2012).

Expert groups such as universities, the Chinese Academies and specialised state research institutes (which are usually hosted within the ministries) often inform and develop policy programmes (Hart et al, 2014; Ksenia et al, 2012). For example, the Energy Research Institute, hosted with the NDRC, provides research support on energy, transportation and pricing, energy transition and low-carbon development pathways (Hart et al, 2014). The China Council for International Cooperation on Environment and Development, composed of Chinese and international experts, is a high-level advisory body chaired by a member of the Politburo Standing Committee that feeds directly into Chinese government decision-making (ibid).

2.3.3 Implementation and enforcement of climate policy in China

Relative to policy development, implementation is a more complex, fragmented process, subject to a range of dynamics that have major implications for climate policy. Implementation is governed by the five-year development plans, which are broken down into sub-national plans at the provincial and sub-provincial levels, and into sector-specific plans. Successful policy implementation thus depends significantly on securing the cooperation of sub-national government actors and business enterprises. Because climate policies (at least in the short to medium term) create winners and losers that tend to be strongly divided along sectoral and geographic lines, willingness to cooperate in their implementation is also divergent.

Policies on energy saving and reduction of local environmental pollutants are backed up by specific statutes that provide for implementation and enforcement mechanisms – the Energy Saving Law (revised in 2007) and Environmental Protection Law (revised in 2014), respectively. These policies and laws can have an indirect effect on the mitigation of greenhouse gases. However, policies aimed at reducing greenhouse gas emissions *per se* lack equivalent statutory backing, meaning there are no legal measures that the central government could use to enforce these. Local governments thus do not feel compelled to meet the carbon intensity targets (though it is worth emphasising that carbon intensity targets have so far been achieved as a result of other policies).

The government and CPC, however, can use various mechanisms to incentivise cooperation from local governments and enterprises. The most important is a system of target-based performance management known as the Target Responsibility System (TRS). It took effect in 2007 and is used to evaluate, reward or penalise subnational governments, SOEs, individual government officials and enterprise managers based on their achievement of targets set by the central government. Evaluation results from the TRS are also used by Party organs responsible for the appointment and promotion of cadres in local governments, local Party organs and SOEs, creating additional incentives to comply with TRS targets.

During the current and preceding Five Year Plans, the government has strongly incentivised the implementation of energy conservation measures (ultimately tied to the government's macro-targets for reducing the energy intensity of GDP) through the Energy Conservation TRS. It entails outcome-based and process-based targets, compliance with which is given a high weight in overall evaluations coupled with significant penalties/rewards for non-/over-compliance. There is good evidence that the mechanism has had a significant effect of promoting energy efficiency policies and measures at the local government and enterprise levels (Li et al, 2013).

In relation to implementing climate policy (denoting control of greenhouse gas emissions *per se*), namely the target for reducing the carbon intensity of GDP 17 per cent below 2005 levels set by the 12th Five Year Plan (2011–15), only in August 2014 did the NDRC release the detailed implementation plan for this objective, containing a new Carbon Abatement TRS. Since this is still

very new, some provinces and municipalities have not yet enacted their local equivalent evaluation plans to hold local officials accountable for target performance. Experts believe the new targets are unlikely to significantly restrict local government behaviour (Wang & van Rooij, 2014). As of May 2016,[5] the NDRC had not yet made any formal assessment of progress made by provinces in achieving their targets.

Where climate policy creates winners, incentives for cooperation by local governments and industries are much stronger. Notably, China's policies to support onshore wind, solar PV and high-speed rail (such as feed-in-tariffs and state-subsidised loans), have been successful in accelerating the manufacturing and deployment of these technologies and reducing costs through learning by doing. That said, domestically-deployed solar PV and wind energy sources have been under-utilised in electricity generation, hindered by the micro-politics of grid connection and management, which often results in market operators prioritising the connection and dispatch of electricity produced by higher-carbon incumbents such as coal-fired power stations (Economist, 2014).

Many experts are now pushing for climate legislation, which they believe would impose pressure on local governments to enforce climate targets. For instance, the Environmental Protection Law of China has had a powerful effect on controlling local government officials' behaviour. While law-centred processes and civil society governance are still nascent, slowly-emerging modes of governance in China, they are likely to play an increasingly important role in the future and would likely help efforts in implementation and compliance.

2.3.4 Monitoring, reporting and verification in China

The release of the data accounting, monitoring and evaluation plans by the State Council in 2007 signalled the basis for the formal establishment of a national-level energy intensity accounting and monitoring system in China. All provinces have followed suit by creating their corresponding energy-saving accounting, monitoring and evaluation systems.

The *accounting plan* for energy intensity focuses on energy production, circulation and consumption. It is based on surveys and sampling with reference to the energy consumption characteristics of different sectors in the economy.

According to the *monitoring plan,* energy consumption indicators and data submitted by lower level bureaus are verified and monitored by higher-ranked Statistical Bureaus. Energy intensity monitoring includes monitoring the progress of reductions in energy intensity and monitoring the quality of the data reported by different regions.

The energy-saving *evaluation plan* links energy-saving performance with the political promotion prospects of party cadres, which incentivises local governments and enterprises to respond to national policies and ensures accessibility of data at all levels.

The implementation of the energy-saving accounting, monitoring and evaluation system aims to keep track of the implementation of energy-saving policies and monitor the progress of provinces in meeting targets, thus incentivising their achievement. The current system for the monitoring, reporting and verification (MRV) of energy production and consumption can then be used to infer in part greenhouse gas emissions from the energy sector (which accounts for approximately 73 per cent of total domestic greenhouse gas emissions). The processes and standards used in this system comply with the MRV requirements for developing countries under the Cancun Agreements.

Major binding energy-saving programmes, such as the shutdown of small coal-fired power plants, the Top-1,000 and Top 10,000 Enterprise Program (see Box 3), the Ten Key Projects, and the phase-out of obsolete production capacity, have all established and implemented institutions that ensure the MRV of these energy-saving efforts (Xiaofan Zhao et al, 2014). However, some programmes that have voluntary indicators or no indicators attached to them in national plans (e.g. goals of

[5] To the knowledge of the authors.

developing low-carbon technologies or improving energy efficiency of agricultural machinery), normally are not subject to associated formal MRV systems. The effects of these voluntary mitigation efforts therefore cannot be converted into measurable emissions reductions.

Box 3. Monitoring, reporting and verification for the National Top-1,000 Enterprise Program (2006–2010) and the Top 10,000 Enterprise Program (2010–2015)

To enforce the national target for energy intensity, the Chinese government has set mandatory energy savings targets (ESTs) for the Top-1,000 and Top-10,000 enterprises as the primary quantitative indicator of their energy-saving performance. ESTs of enterprises comprise two components: a total EST that each enterprise must achieve by the end of a Five Year Plan period and an annual target for each year of the period.

The Energy Saving Office (ESO) of a municipality is responsible for evaluating the EST performance of municipal-level top energy-consuming enterprises. It also evaluates the provincial-level and national-level top energy-consuming enterprises within the jurisdiction of the municipality.

During the 11th Five Year Plan period (2006–2010), enterprises were evaluated each year based on their cumulative energy savings relative to the base year levels (Li et al, 2013). For example, if Enterprise A was required to meet the target of saving 500 tonnes of coal equivalent (tce) by 2010 relative to the 2005 level, then it was expected to have achieved 20 per cent of the 500 tce target (i.e. 100 tce) by the end of 2006 and 40 per cent of the target (i.e. 200 tce) by the end of 2007. Starting in the 12th Five Year Plan period (2011–2015), local ESOs have required enterprises to report their incremental energy savings relative to the previous year in addition to their cumulative energy savings since the beginning of the Five Year Plan period. Enterprises calculate their energy savings based on the National Standard and submit self-examination reports to the municipal and provincial ESOs on a yearly basis.

The ESOs review these reports and organise an assessment group comprised of experts from a variety of relevant agencies and research institutes to conduct an on-site inspection of the enterprises before they make a final assessment (Li et al, 2013). However, because the assessment experts are not full-time inspectors and because they are able to commit only a few hours to an enterprise each year, the final assessment is largely based on enterprises' self-examination reports. The reliability of the EST performance of industrial programmes thus generally depends on the accuracy of energy savings reported by individual enterprises.

Based on an empirical study of 10 case enterprises, Zhao et al (2016) found that while all of the case enterprises claimed full compliance, four enterprises exaggerated their EST performance through violations of the National Standard for Calculating the Energy Savings of Enterprises, yet this went unnoticed by local government agencies. Therefore, official data showing that the National Top-1,000 enterprises have over-achieved their EST by 65 per cent is likely to be an overestimation. Given the different types of energy savings and the different methods for calculating energy savings, the ESTs pose enforcement difficulties because of the complexity of data verification on the part of local government agencies. The mechanism also applies to provincial or municipal equivalents of these programmes.

Source: Zhao et al (2015)

Although the energy-saving accounting and monitoring systems have been established, the current accounting system still cannot provide sufficient support for carbon emissions management and evaluation. First, the coverage of the current energy accounting system is very limited, energy balance sheets or societal energy consumption accounting at the municipal and county level do not exist (Wang et al, 2016). Moreover, small and medium enterprises (SMEs) have not been included in

current accounting systems. This has a significant impact since SMEs constitute a large share of enterprises in many municipalities.[6] Lack of energy data for SMEs makes it nearly impossible to create greenhouse gas inventories at the municipal and lower level. Last but not least, current accounting of coal use only takes into account enterprises above a designated scale, and the energy consumption data in other industries are all estimated based on electricity use (ibid).

In sum, MRV-related challenges constitute a barrier to effective climate policy implementation in China. While governments at all levels are making significant progress in efforts to improve energy and carbon emission-related MRV systems, this is an enormous and complex task that will continue for many years.

2.4 Public opinion, interest groups and party politics in China

The dynamics of public opinion, party politics and interest group influence interact very differently in China compared with liberal-democratic states. Policy development is subject to a variety of significant influences from special interests and elite individuals, both within and outside the official party-state system. Furthermore, public opinion on air pollution has played a significant, albeit indirect, role in driving climate policy.

The ideology and strategic priorities of the Communist Party of China are the most important of this group of factors affecting climate policy development in China. As noted earlier, Chinese government prioritisation of climate policy and environmental issues more generally has changed in recent years alongside the shift in China's developmental imperatives and conditions. The dominant political ideology of the CPC is 'socialism with Chinese characteristics' combining the essence of Marxism with a focus on growing the economy and reducing poverty. In recent times, this ideology has been operationalised in terms of completing 'the building of a moderately prosperous society in all respects by 2020'. China's current generation of political leaders has begun to reinterpret CPC ideology and reformulate strategic priorities in a way that brings economic and environmental objectives into much closer alignment (Green & Stern, 2016; Mathews, 2015). President Xi Jinping has said, "whether or not our society is moderately prosperous in all respects to a large extent depends on the quality of the eco-environment".[7] According to China's Minister of Environment, Chen Jining, "environmental problems have become the greatest bottleneck of completing the building of a moderately prosperous society in all respects".[8] This signals that the driving force behind China's climate change efforts are nationally self-interested domestic considerations (Boyd, 2012; Global Commission on the Economy and Climate 2014; Green & Stern, 2016).

Despite being relatively highly centralised, the development of climate policy is nonetheless subject to a wide variety of influences from interest groups, economic elites and experts (e.g. Williams, 2014). In the past three decades, awareness of climate issues has gradually evolved in China. Government agencies and SOEs have greater resources and opportunities and, accordingly, greater influence in the making and implementation of climate policies. All other interest groups, including private enterprises and NGOs, are 'outside-of-system' and typically lack official channels through which to influence policy-making and implementation. They mainly exert influence through personal relations with government officials, cooperation with SOEs, election to positions in industry associations and private sector appointments of former government officials. Nevertheless, the National Centre for Climate Change Strategy and International Cooperation is an important think tank under the NDRC umbrella and, like Tsinghua's 'Low Carbon Laboratory', produces research on how China can reach more ambitious climate and energy targets. There are also official government

[6] In Ningbo city of Zhejiang Province (one of the most economically developed province in China), for example, SMEs account for 99 per cent of the total economy (Wang et al, 2016) and the situation across China does not look too dissimilar (Commerce, 2012).
[7] Statement made when attending the deliberation of the Guizhou Provincial Delegation at the National People's Congress and the Chinese People's Political Consultative Conference (CPPCC) in 2014.
[8] Statement made during the media session of the third plenary session of the 12th meeting of China's 12th National People's Congress (NPC) Standing Committee.

'consultations' on policies and laws in this field, which allow the public and registered organisations to make submissions but the extent to which the submissions influence content is open to question.

The CPC and state organs seek to maintain their governing legitimacy and to do so they track public opinion carefully and attempt to address issues of major public concern. One could say that social stability is one of the key priorities of the CPC; indeed it is a key source of their legitimacy, and social unrest is therefore something the CPC keenly tries to avoid. Despite low awareness and concern about climate change, public opinion nonetheless plays a significant indirect role as a driver of climate policies because of high public concerns about other issues that are amenable to climate change policy.

Local environmental pollution has become a high-priority public concern in recent years (in some polls, the *highest* priority concern) (Pew Research Centre, 2013; Wike & Parker, 2015). This is especially true for the growing Chinese middle class, most of which are located in cities where the consequences of air pollution, for example, are felt more imminently and many of which are CPC members (Economist, 2016a). There were 180,000 protests against such issues in 2010 (last reported year). Thousands of middle-class people in the southern Chinese town of Lubu protested in July 2016 over plans to build a waste incinerator there (Economist, 2016b). Such high levels of concern have evoked strong rhetoric and significant policy responses from Chinese policy-makers to tackle the underlying problems, such as excessive steel production and coal-fired power generation, both of which contribute greatly to Chinese greenhouse gas emissions (Sheehan et al, 2014). In fact, the growing discontent among the Chinese middle class about environmental pollution, about their lack of representation and persistent corruption and nepotism increase the pressure on the CPC to act (ibid).

One challenge for climate policy created by the power disparities between interest groups is that fossil fuel producers, fossil fuel-based utilities and energy-intensive manufacturers tend to be dominated by SOEs, whereas private companies predominate in the renewable energy sector (at least in the wind and solar industries). Consequently, polluting industries enjoy not only greater operational privileges (e.g. subsidised capital and land, and preferential supply arrangements, which affect climate policy implementation) but also greater access to the political process than key low-carbon industries and elites.

Beyond corporate and economic actors, China's climate change policy has been influenced by scientific elites, environmental NGOs and international developments. As noted earlier, before 2007 climate change was largely treated as a technical issue in China, and so scientific organisations and experts were the key actors. In 2004 the Chinese media started to pay close attention to climate change issues. However, it was not until 2011/12 that state media started to cover environmental pollution more openly and critically (Duan & Takahashi, 2015). This happened firstly because a Chinese celebrity pointed out, on social media, that China's Air Quality Index consistently underreported air pollution levels compared to the twitter feeds by the US Embassy, and secondly because more and more Chinese participated in debates around this issue on social media. While one of China's leading newspapers, *China Daily*, did increase its coverage on environmental pollution as a result (media control is less restricted in this area), the causes of pollution are still portrayed as short-term events like weather or fireworks and less as the result of coal-burning (ibid). However, additional sources especially from Chinese NGOs are becoming more widely accessible and the increased coverage might suggest further change in the cause and effect of environmental pollution and climate change. Scientific elites also exert influence through expressing their opinions and providing editorials in traditional and social media (blogs and 'wechat' mobile text and voice messaging services), lobbying or engaging with public officials, and participating in issue-focused campaigns organised by research institutes.

International developments and pressure on China to act also influenced policy-making to some extent. Following the release of the fourth IPCC report in 2007, which highlighted China's rapid

emissions growth, overseas Chinese embassies and consulates received a large number of questions from foreign media regarding the stance and progress of the government on climate change, raising the status of the issue in the Ministry of Foreign Affairs. International NGOs and think tanks[9] have played a significant role in this. For instance, the low-carbon pilot city programme launched in 2010 was initially proposed to the NDRC by the United Nations Development Programme and the British government. In 2009, the Energy Foundation, a partnership of philanthropic investors working on sustainable energy, recommended funding for five pilot cities. Similarly, China's carbon market policies have been influenced by the experience of the EU.

Domestic environmental NGOs such as Friends of Nature and the Society of Entrepreneurs and Ecology (SEE) are also active on climate issues. These NGOs run public events and campaigns to raise awareness about climate change impacts and behavioural change. While their influence on climate policy-making in China has been increasing, overall environmental civil society in China remains relatively weak and is not a major driver of climate policy development or implementation. Yet this may change as the country seeks to rely more on civil society in environmental governance (for example, to monitor and publicly highlight polluting activity by enterprises).

Finally, the general public barely participates directly in climate policy-making and policy implementation (however, they exert influence indirectly, as described above). This is mainly due to the lack of channels for public consultation and participation. In addition, climate change has not received broad attention from the public, as other issues are prioritised more highly. A cross-country survey by Gallup (Lee et al, 2015; Pelham, 2009) conducted in 2007–2008 suggests that the level of awareness on climate issues among the Chinese population is relatively low. Only 62 per cent of the citizens interviewed declared to know at least 'something' or a 'great deal' about it – much less than in many other countries. Of those aware, only 58 per cent attributed climate change to human activities, and a mere 36 per cent considered it a serious threat to their personal life.

2.5 Future outlook for China

Economic factors – both endogenous changes in the growth rate and composition of economic activity and the central government's new economic development strategy – are likely to keep future growth in energy demand very low (Green and Stern, 2016). This means that stronger climate policy in China now goes with the grain of future economic growth and development. With 'green' being a crucial theme of China's 13th Five Year Plan, released in March 2016, climate change mitigation and local environmental improvement will be a whole-of-government priority. We can expect to see expansion and strengthening of China's domestic climate policies in the years ahead, as well as a greater focus on 'green' foreign investment through China's role in the G20, the Asian Infrastructure Investment Bank, New Development Bank, and One Belt One Road initiative.

Meeting the targets set out by the China's NDC will require significant deceleration in the emissions trajectory (CAT, 2015; IEA, 2015).[10] On the one hand, research suggests that China will meet its NDC targets to peak carbon emissions by 2030 at the latest and reduce the energy intensity of its economy by 60–65 per cent by 2030 compared with 2005 (CAT, 2015; IEA, 2015; Jiang et al, 2013). Carbon emissions from China are likely to peak before 2030, based on reduced emissions growth from the energy, steel and cement industries, and some have argued that the peak is likely to come much earlier (Green & Stern, 2016; Spencer et al, 2016). However, China's overall greenhouse gas emissions are likely to continue to grow beyond 2030 because of increasing emissions of non-carbon dioxide greenhouse gases from agriculture, industrial and energy production, increasing final consumption and international trade (Zhang et al, 2015). A study assessing efforts required to meet a global 2°-compatible emissions pathway[11] finds that China would have to overshoot the carbon

[9] Key among these in China have been Greenpeace, World Resources Institute, Natural Resource Defence Council, WWF, Energy Foundation, the Climate Group, and the Nature Conservancy.
[10] Though these studies do not provide analysis of the land use, land use change and forestry (LULUCF) sector.
[11] With a greater than 66 per cent chance of staying within 2° Celsius in 2100 (CAT, 2015).

intensity target in its NDC by 5–10 per cent to 70 per cent below 2005 levels (CAT, 2015). In this scenario, China will also need to implement polices to reduce emissions of non-carbon dioxide greenhouse gases from its chemicals and electrical industry (CAT, 2015). Jiang et al (2013) confirm this, arguing that it will be hard for China to peak total greenhouse gas emission by 2030 without more ambitious policies, including the pilot testing and implementation of carbon capture and storage (CCS) technologies.

China's energy and cement emissions alone accounted for 24 per cent of global greenhouse gas emissions in 2013 (Jiang et al. 2013). Emissions from these sectors will continue to grow, though less rapidly with slowing GDP growth and construction rates. Consequently, the most important driver for decarbonisation will be ensuring the structure of the economy moves from energy-intensive industries to a high value-added and service-oriented economy (CAT, 2015; IEA, 2015; Jiang et al. 2013). Although it is encouraging to see the high levels of renewable energy deployment (with annual increases of 50 per cent between 2005 and 2010, according to Jiang et al, 2013), the biggest worry is the high proportion of coal power generation that will continue to be used even by 2030.

The political economy of policy implementation in China suggests that investing in and building green infrastructure is likely to be the easiest category of policy measures to implement for climate change mitigation. Further state measures to support the accelerated scale-up of renewable and other non-coal energy sources – such as feed-in tariffs and green finance initiatives – offer strong potential for climate mitigation in China, as they bring industrial modernisation and innovation, job creation, less air pollution and energy security. Such measures are likely also to enjoy widespread public backing. However, as renewable sources compete for grid access with fossil fuel incumbents in a flat energy market, the former may continue to be under-utilised relative to their potential, as local governments and market operators favour coal-fired utilities. Reforming the electricity market to avoid these problems will be a considerable challenge over the coming years.

Energy conservation and efficiency, in the form of both standards for new products, buildings and (electric) vehicles as well as incentives for managerial and technology improvements within existing enterprises, also offer good policy opportunities for climate mitigation, given the associated cost-savings and the considerable administrative capacity that has been built up through past energy conservation efforts. MRV and enforcement capacity will need to be improved, however, if targets and standards are to be fully implemented and cheating minimised.

In the coming years the biggest challenges for China's climate policy relate to phasing down high-carbon and energy-intensive industries such as coal mining, coal-fired power generation and steelmaking – industries in which the state and party are deeply entangled. Nevertheless, China has committed up to 100 billion yuan ($15.27 billion) to cover the significant lay-offs they expect in the steel and coal industry (Reuters, 2016).

In this context the greatest risks to climate policy development are firstly, that continued slower growth and challenges related to structural transition prompt further fiscal stimulus in the construction and heavy industrial sectors, prolonging factor price subsidies for SOEs (finance, land, energy), diverting capital from more productive investments, and increasing debt; and secondly, that vested interests, especially in SOEs, prevent the introduction of new fiscal and regulatory tools (e.g. higher taxes on fossil fuel resources, energy and carbon; electricity market reform; stringent caps on coal consumption; more onerous implementation plans for carbon intensity reductions; and more systematic MRV of greenhouse gas emissions).

In terms of implementation, one of the biggest challenges is that policies imposing losses may be evaded by enterprises and local /provincial governments in adversely affected industries and regions. Furthermore, climate policies that depend on complex governance arrangements, sophisticated and well-resourced regulatory capacity and comprehensive, micro-level MRV (such as

the proposed national ETS), are likely to prove challenging to implement and may be vulnerable to manipulation (Green and Stern, forthcoming).[12]

Strategies to manage the phase-down of high-carbon industries and the millions of workers they employ, and to accelerate transitions within – or away from – the communities in which these industries are concentrated present perhaps the most urgent priority. This is a universal challenge, but in China it is particularly pronounced due to the sheer size of its high-carbon and heavy industrial sectors, and the fact that the decline of these sectors is already occurring as a result of shifting economic development patterns and strategies. Sustainable urbanisation, whereby rural migrants are encouraged to move to sustainably designed cities with appropriate economic and social incentives, presents another important opportunity for jointly managing a range of environmental, social and economic transitions while limiting the energy use and emissions associated with rising residential and service sector consumption.

[12] Upstream fossil fuel resource taxes are likely to be much better suited to China's existing fiscal institutions, information systems and market conditions, but will be resisted by vested interests.

3 Factors affecting climate policy in the European Union

Key findings for the European Union

1. **Likelihood of achieving NDC targets:** The EU will need to increase its current internal ambition and ensure effective implementation in order to meet its 2030 targets. Current policy assessments indicate that the EU's emissions are likely to exceed its 2030 target by about 5–10 percentage points. The EU will need to double at least the annual rate of emissions reductions from 2015 onwards to meet the 2030 target, focusing on power generation, industry, transport and buildings.
2. **Stable climate policies and leadership from the European Commission:** The climate policies already in place commit the EU to a continued reduction in emissions until 2030. A constant annual reduction factor under the EU emissions trading system (ETS) directive will bring the issuance of new allowances to zero by 2067. This target can only be changed by a qualified majority. The EU's integrity is being threatened by a number of current crises (e.g. the economic malaise that has persisted since the global financial crisis and challenges particularly from southern member states; the refugee and migrant crisis; and the growing sense of dissatisfaction within some member states about the concept of a federal Europe). Yet the European Commission – a permanent bureaucracy with a long record of climate leadership – so far has shown itself capable of driving the climate policy agenda among EU institutions and member states, even amid significant shocks, such as the global financial crisis and its regional aftermath. Hence, unless the institutional set-up of the EU itself is undermined, the EU will continue to play a significant role in shaping the climate policies of member states.
3. **Reform despite resistance:** The EU must deal effectively with resistance to European climate change policies from member states with large fossil fuel resources and/or large pollution-intensive sectors as it proceeds with the implementation of the Energy Union and the reform of other key policy instruments (i.e. the EU ETS) geared to achieving its existing climate targets for 2020 and 2030. The Market Stability Reserve, agreed as a reform of the EU ETS, will be insufficient to remove the oversupply of permits. Since renegotiations have started over the EU ETS, the divide over how ambitious the EU should be in its climate policies after 2020 has re-emerged among the member states, creating a risk that the EU will focus on its current commitments to 2020, and delay decisions on increasing its post-2020 ambition. Instruments such as the Modernisation Fund, which sets aside allowances from the EU ETS to support lower income member states to modernise their energy systems, will need to be further developed and transparently implemented.
4. **Energy Union as a give-and-take:** The European Commission needs to come up with a package of energy and climate policies that make member states better off by reaching high-level compromises on issues that they consider to be secondary. For example, Germany might increase efforts to help central and eastern European partners to modernise their energy infrastructure, who in return might accept a continuation of the EU's decarbonisation ambition; or France may cease its insistence on a strong government intervention into energy markets and prices if the price of allowances for the EU ETS is sufficiently high to make its nuclear power generators more competitive. However, such compromises between member states might unbalance delicate compromises between domestic stakeholders. Hence, the European Commission must seek for this agenda to be discussed by heads of states and governments, as well as by

ministers of energy and environment, as the latter are often deeply entrenched in the national balances.

5. **Focus on low-carbon innovation:** European research and development spending on innovation has been decreasing since 2009 and is now at a record low level (although large disparities exist between the member states on innovation spending, and some have been investing more). There is also little cooperation between member states on low-carbon innovation. However, the EU is working to improve this. The EU has set a target to increase overall innovation spending from the equivalent of 2 per cent of GDP at present to 3 per cent (1 per cent public funding, 2 per cent private-sector investment) by 2020. In addition to plans to double its funding for clean energy research under the Horizon 2020 programme, the EU is preparing an integrated research, innovation and competitiveness strategy for the Energy Union, to be launched in November 2016. It has also joined Mission Innovation, a global initiative on clean energy launched at COP21.

3.1 Status quo of climate policy in the EU

The EU has historically been considered as a leader in climate change policy. Internationally, the EU has sought a strategy of cooperation with the international community, was one of the key players in the Kyoto Protocol negotiations and one of the few parties to sign up to a more stringent emission target for the second commitment period of the Kyoto Protocol for 2013–2020 through the Doha Amendment. Internally, the EU set a range of legally binding targets for 2020 and 2030. These were accompanied by a large number of policies and regulations to curb emissions, improve energy efficiency and stimulate the uptake of low-carbon energy sources, including an EU-wide emissions trading system.

In 2007 the EU leaders endorsed a set of climate-related targets for the year 2020. These include two key mandatory targets: the reduction of greenhouse gas emissions by at least 20 per cent below 1990 levels; and an increase in the share of renewable energy to reach at least 20 per cent of total energy consumption. The package also includes a non-binding commitment to improve energy efficiency by at least 20 per cent compared with business as usual.

Ahead of the Copenhagen climate summit in 2009 the Council of the EU supported the longer-term objective of reducing EU greenhouse gas emissions to 80–95 per cent below 1990 levels by 2050 (Council of the European Union, 2009). In 2011, the European Commission published its *Roadmap for moving to a competitive low carbon economy in 2050* (European Commission, 2011b), which outlined a cost-effective pathway to reach the 2050 objective and gave direction to sectoral policies, national and regional low-carbon strategies and long-term investments. The EU also developed a *2050 Energy Roadmap* (European Commission, 2011a) and a *White Paper on Transport* (European Commission, 2011c), detailing how these emission reductions were to be achieved in the energy and transport sectors respectively.

This was followed by the approval in 2014 of the *2030 framework for climate change and energy policies* (European Commission, 2016c). The framework lays down the objectives to be met by 2030, namely:

- a binding EU target for at least a 40 per cent reduction in greenhouse gas emissions below 1990 levels
- a binding target for at least 27 per cent of energy to be generated from renewable sources
- a non-binding energy efficiency target of at least 27 per cent, to be reviewed by 2020 (with potential to raise the target to 30 per cent)
- an electricity interconnection target of 10 per cent between EU countries by 2030.

In 2015, the EU reaffirmed its commitment to creating a European Energy Union which is supposed to foster affordable, secure and sustainable energy, by 'pooling resources, connecting networks and uniting member states' power when negotiating with non-EU countries' (ibid).

The development of renewable energy sources and EU domestic production of energy is addressed through individual member states' mandatory renewable energy targets for 2020, as set by the Renewable Energy Directive (2009), which reflects member states' different starting points and potential for increasing renewables production. These range from 10 per cent in Malta to 49 per cent in Sweden. The EU has also put in place European certification schemes, subsidies and other incentive mechanisms to support the use of renewable energy.

The 2030 renewable target has not been broken down into explicit national targets. This followed the opposition of some member states, like the UK and Czech Republic, who wanted flexibility on how to reach energy reductions, for example by relying heavily on nuclear power (Vaughan, 2014). The absence of national targets could potentially jeopardise the achievement of the 27 per cent EU-wide renewable targets, since it is unclear how individual countries will be held accountable for their contributions.

Energy efficiency and energy demand management are promoted by the Energy Efficiency Directive (2012), which establishes a common framework of measures for the support of energy efficiency. Other laws also promote more energy efficient products and uses, including the directive on the energy performance of buildings (recast 2010), the directive on eco-design requirements for energy-using products (recast 2009) and the directive on labelling and standard product information on energy consumption by energy-related products (2010).

A key component of the EU climate legislation is its emission trading system (the EU ETS), which entered into force in 2005. This mechanism currently covers around 45 per cent of total EU emissions and has been amended several times to extend it to new sectors (for example, aviation) or to further greenhouse gases (besides carbon dioxide, the EU ETS also covers nitrous oxides and perfluoro-carbons). Further information on the EU ETS can be found in section 3.3.3. In parallel, the EU has set up a mechanism for monitoring greenhouse gas emissions to enable a more accurate and regular evaluation of the progress of emissions reduction (see section 3.3.3).

Emissions from sectors outside the EU ETS, such as transport, buildings, agriculture and waste, are due to be reduced by 10 per cent below 2005 levels by 2020. Individual member states' contributions have been agreed in the 2009 'effort sharing' decision.[13] These have been set on the basis of member states' relative wealth, measured by GDP per capita. They range from a 20 per cent emissions reduction by 2020 for the richest member states to a 20 per cent increase in emissions for the least wealthy ones. An effort sharing decision for 2030 has not yet been agreed but is expected by 2017.

Energy security has been an important driver of EU climate policies, especially in recent years following the political crisis in Ukraine and tenser relations with Russia, the EU's main natural gas supplier. A European Energy Security Strategy, adopted in May 2014, mandates short-term energy security 'stress tests' for individual member states, calls for an increase in emergency gas stocks and for the development of emergency infrastructure, completion of the internal energy market, reduction in energy demand (especially in buildings and industry) and switching to cleaner fuels.

3.2 Economic factors driving EU climate policy

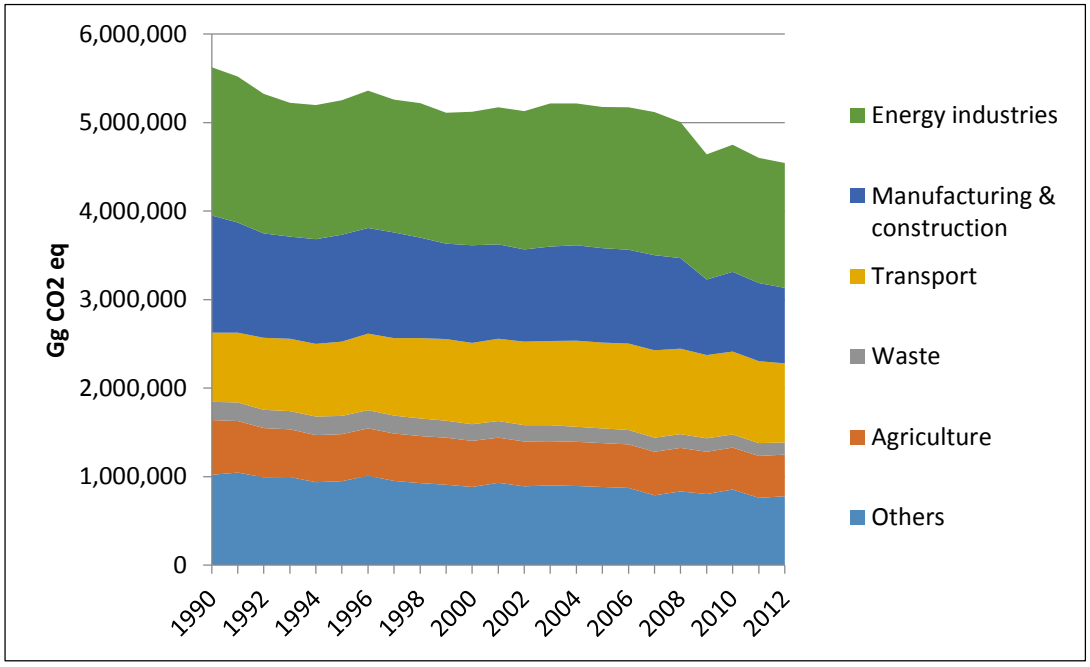
Despite great differences in member states' wealth and national attitudes towards issues like inflation, debt, and foreign trade, the EU has achieved a high degree of coordination of monetary and fiscal policies (CIA, 2015). Across the European Union, GDP almost doubled between 1990 and

[13] Decision No. 406/2009/EC on the effort of member states to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020.

2012.[14] Economic growth, however, slowed down in 2008 and declined in 2009 due to the global financial crisis. Furthermore, after a slight recovery in 2010, in 2012 the European economy contracted again. In 2014 the average annual growth resumed at around 1.4 per cent, although below the OECD average of 1.8 per cent. Nevertheless, the EU still retains the largest share of world GDP, at around 17.3 per cent in 2014 (The World Bank, 2016c). Member states display large differences in per capita income – from US$17,200 in Bulgaria to US$98,500 in Luxembourg (World Bank, 2016b) – and in their capability to recover after the crisis. In 2014 growth rates spanned from negative 0.4 per cent in Croatia, Finland and Italy, to positive 5.2 per cent in Ireland (ibid).

Since 1990 the EU has seen a general decoupling of economic growth from greenhouse gas emissions, driven mainly by emission reductions from industrial and power plants covered under the EU emissions trading system (but also by the downturn of Eastern European economies after the fall of the Soviet Union), milder winters and reduction in oil consumption for transport (Olivier et al, 2015). The economic crisis also contributed to a further reduction in emissions across the European member states (see Figure 4), recorded across all sectors with the exception of transport. Overall, currently energy industries are by far the largest source of emissions in the EU, accounting for about 33 per cent of the total in 2011 (the last year for which official UNFCCC data is available), followed by the transport sector (21 per cent) and manufacturing and construction (20 per cent) (European Commission, 2014).

Figure 4. Carbon dioxide emissions by sector in the EU (excluding LULUCF*), 1990–2012



*Note: *LULUCF = land use, land use change and forestry*
Source: Based on European Commission (2014)

In the past three decades the EU has seen a rapid increase in its dependence on imported fossil fuels, which has led to growing concerns over security of supply. Net imports increased from less than 40 per cent of gross energy consumption in the 1980s to reach 53 per cent by 2013 (Eurostat, 2015a). The highest energy dependency rates[15] in 2013 were recorded for crude oil (88 per cent) and for natural gas (65 per cent). Russia is the EU's main supplier, providing more than a third of oil, gas

[14] An increase of 44 per cent (in volume terms).
[15] Defined as net energy imports divided by gross inland energy consumption plus fuel supplied to international maritime bunkers.

and solid fuels imports (Eurostat, 2015a). Concerns over security of supply have been further heightened by Russia's disputes with transit countries, which have threatened to disrupt supplies in recent years, and the conflict in Ukraine (Eurostat, 2015a).

Significant reliance on energy imports, especially from volatile suppliers such as Russia, has provided a common motivation for member states to seek climate policies that also reduce energy use or substitute for imported fossil fuels. Member states have agreed on a number of initiatives to mitigate the risk from heavy energy dependence, including an obligation on EU member states to maintain minimum stocks of crude oil and/or petroleum products (Council of the European Union, 2009), the creation of the Energy Union and a number of short- and long-term measures included in the 2014 Energy Security Strategy.

Despite a relatively unified approach on energy security, large disparities in economic performance and fossil fuel endowments between member states have affected their willingness to commit to ambitious climate objectives.

In general terms, northern and western member states have relatively low endowments of fossil fuels, and many tend to be relatively large net energy importers. These countries also tend to have comparative advantages in services and advanced manufacturing – including renewable and/or nuclear energy generation technologies and energy-efficient products and services. Energy-/pollution-intensive sectors do not tend to account for a large proportion of economic output in these member states, somewhat limiting their influence on the ambition of climate policy. (See section 0 below for more information on the power of lobbies.)

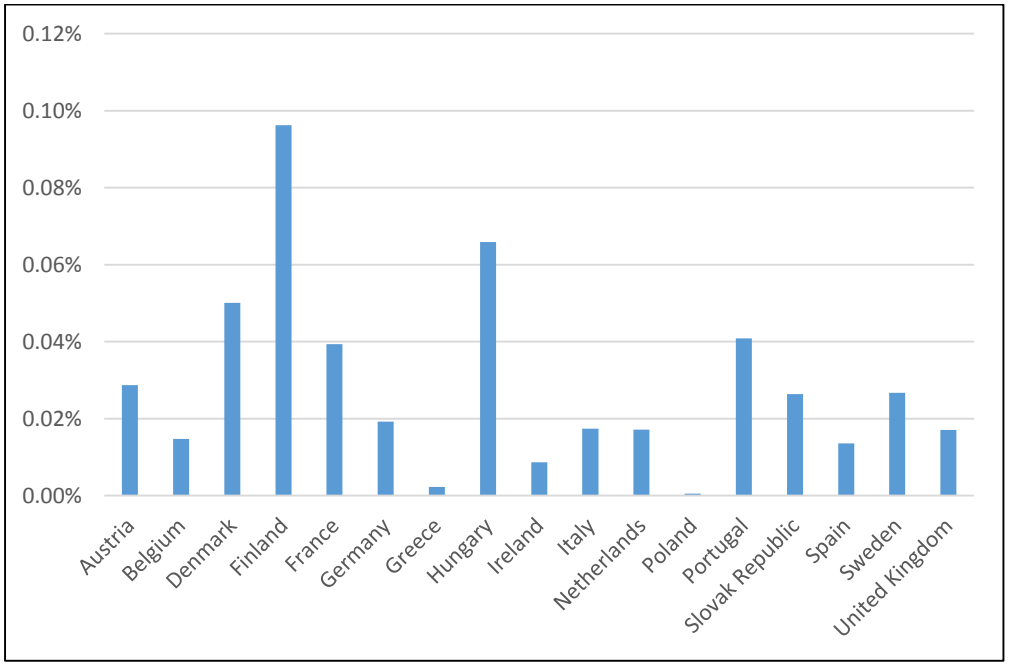
By contrast, eastern member states tend to have larger endowments of coal, with large fossil fuel production industries and energy-intensive manufacturing. These industries tend to have a strong influence on policy-makers. As a result, it has generally been western and northern member states that favour ambitious climate policies, while eastern member states have often argued for weaker policies, fearing economic and social repercussions in their carbon-intensive sectors. The Modernisation Fund has been agreed, for example, to compensate mostly eastern member states with money set aside from revenues generated under the EU ETS and help them modernise their energy infrastructure and make them more energy efficient (European Commission, 2015).

Although innovation is a stated policy priority for the EU area to enhance Europe's competitiveness (European Commission, 2014), public and private financial support for low-carbon research and development is relatively low. The financial crisis has had an impact on both public and private sector innovative activity. Private investment in R&D in the energy sector is four to five times lower now than it was 20 years ago (International Energy Agency, 2015). In 2015, European R&D fell 8 per cent (Frankfurt School-UNEP Centre/BNEF, 2016). European R&D spending in 2015 was lower than in any year since the financial crisis in 2008, deploying US$2.8 billion (ibid).

Overall, gross domestic expenditure on research and development remains below the EU's objective of 3 per cent of GDP (1 per cent public funding, 2 per cent private-sector investment) and the date for achieving the target has been postponed from 2010 to 2020. Again, significant differences exist across the EU on innovation spending (European Commission, 2015b), illustrated in Figure 5 below, and coordination between member states on R&D is largely missing (European Commission, 2016a). However, the EU is working to improve this and, in addition to plans to double its funding for clean energy research under the Horizon 2020 programme, the EU is preparing an integrated research, innovation and competitiveness strategy for the Energy Union to be launched in November 2016 (European Commission, 2016c). It has also joined Mission Innovation, a global initiative on clean energy R&D launched at COP21. Furthermore, under the EU ETS an Innovation Fund will be set up to support first-of-a-kind investments in renewable energy, carbon capture and storage (CCS) and low-carbon innovation in energy intensive industry (European Commission, 2015). Some 400 million allowances − representing up to around EUR 10 billion when sold − will be reserved from 2021

onwards for this purpose; in addition, a further 50 million of the unallocated allowances from 2013–2020 will be set aside to enable the Innovation Fund to start before 2021 (ibid).

Figure 5. Public R&D expenditure on climate change mitigation technologies as share of GDP in the EU (2011)



Source: Based on Dechezleprêtre et al (2016)

Overall, further investment is needed, not only on innovation, but also on the deployment of low-carbon technologies, energy efficiency measures (especially for buildings) and adequate infrastructure (e.g. for energy networks and transport). So far, structural reforms and public budget reforms have been the main priorities in the aftermath of the economic crisis. However, short-term boosts in the form of 'green' investment (see e.g. Spencer et al, 2012), which could increase productivity and employment, strengthen economic resilience against fossil fuel prices, as well as facilitate the low-carbon transition needed to meet the EU climate change objectives.

3.3 Institutions in the EU

3.3.1 Key public institutions and allocation of authority in the EU

The ultimate institutional foundation of the EU is the body of EU treaties, which, taken together, are functionally equivalent to its constitution. EU governance involves decision-making at the EU (supranational) level and at member state level. In general, the EU endeavours to make policy according to the subsidiarity principle, which means that it aims to intervene only if it is able to act more effectively than EU countries at their respective national or local levels. This *multi-level* nature of decision-making is most pertinent and observable in areas of shared competence between the EU and member states, which include the environment and energy.

The EU governance structure is also *multipolar*, in the sense that authority is dispersed among a variety of public agencies; most importantly the European Council, the Council of the EU, the European Parliament and the European Commission (Schreurs & Tiberghien, 2007; Zito, 2000). Judicial authority is vested in the European Court of Justice. The European Council has no formal legislative powers whereas the Council of the European Union (CEU) forms the legislative arm of the EU together with the European Parliament.

The division of powers between the EU's main bodies is complex and subject to a relatively large number of veto points at which policy can be advanced or blocked. The key functions of these bodies are illustrated in Figure 6.

The EU's overall political direction and priorities are set by the **European Council**, which comprises the heads of state or government of the EU's member states, together with the European Council President (appointed by its members) and the President of the European Commission. The Council adopts 'Conclusions', which identify specific issues of concern and outline actions to be taken or goals to be achieved. Conclusions can also set a deadline for reaching agreement on a particular item or for the presentation of a legislative proposal by the Commission. Decisions are mostly taken by consensus.

The **European Commission** has exclusive right of policy initiation, including EU laws and budgets. It is divided into several departments and services known as Directorates-General (DGs) and those most closely involved in the development of climate change policy are DG Climate Action and DG Energy. It also oversees the implementation of laws, the negotiation of international agreements (with mandate from the Council of the EU), as well as the day-to-day administration of the EU.

The **European Parliament** and the Council of the EU share the legislative power for amending, adopting or rejecting the laws and budgets proposed by the European Commission. Box 4 explains the different laws that exist in the EU. Members of the European Parliament (MEPs) are directly elected by proportional representation every five years by citizens of the 28 EU member states.[16] MEPs are grouped by political affiliation, not by nationality. Currently the largest groups are the European People's Party (216 MEPs) and the Progressive Alliance of Socialists and Democrats (190) (European Parliament, 2016). The Council of the European Union (CEU) is comprised of national ministers from each EU member state. Its work is led by the country holding the presidency of the CEU, which rotates among the EU member states every six months.

Besides their legislative role, the European Parliament and the Council of the EU have other important functions: notably, the Parliament elects the President of the European Commission, following a proposal by the European Council. The Council coordinates member states' policies in specific fields such as energy, economic, fiscal and employment policies, develops the EU's foreign and security policy, and initiates and concludes international agreements.

Other bodies advise and monitor the Commission, European Parliament and the Council of the EU. Notably, the **Court of Auditors** checks that the EU budget is spent correctly. The **European Economic and Social Committee**, representing workers' and employers' organisations and other interest groups, and the **Committee of the Regions**, representing regional and local authorities, provide advice on EU legislation and hence exercise no measurable influence on EU policy-making.

The **European Court of Justice** settles legal disputes (between EU member states, EU institutions, businesses and individuals) about the interpretation and application of EU treaties and laws. Its decisions are final and binding on the national courts of the member states.

Box 4. Laws in the EU

Regulations are the strongest form of EU law. They have general application (i.e. they address abstract categories, rather than specific entities), they are legally binding on the EU institutions, the member states, and individual persons/entities, and they apply directly throughout all member states, i.e. they do not need to be transposed into member states' legislation.

[16] The number of MEPs for each country is roughly proportionate to its population, although no country can have fewer than six or more than 96 MEPs and the total number cannot exceed 751.

Directives stipulate results to be achieved, and are binding on member states. Member states have to transpose the directives into national laws but typically have a significant margin of manoeuvre on how they do so.

Decisions are binding only on the specific entities to which they are directed, which can include member states or private individuals and companies. In contrast to regulations and directives, which are enacted in co-legislation between European Commission, Council and Parliament, decisions can be enacted by the European Commission on its own.

3.3.2 Development and adoption of climate policy in the EU

The proposals for the overall framework for the EU's climate policy and the key underlying laws and policies are being initiated by the EU Commission, namely by the DG Clima. The proposals that concern the overall framework are then presented for consideration of the European Council, which effectively sets the direction of the EU's climate policy.

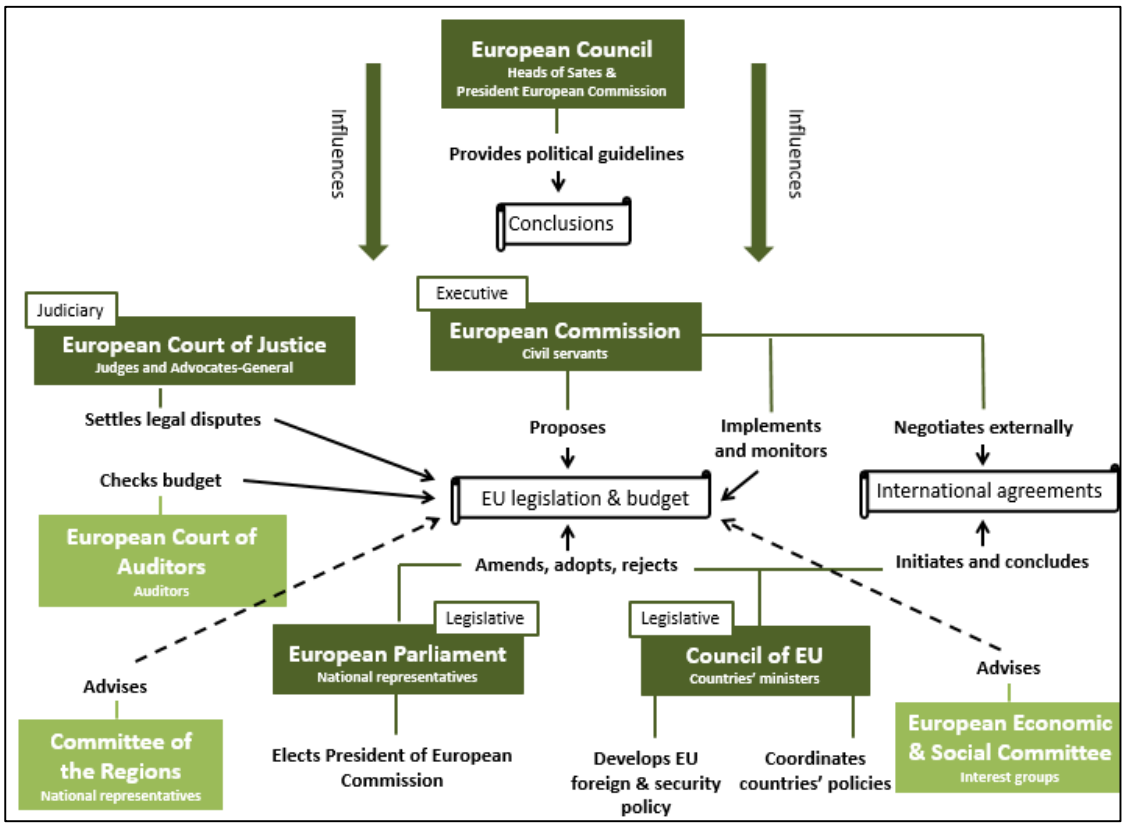
The specific climate and energy laws and associated budgets developed by the EU Commission have then to go through the European Parliament and the Council of the EU, which share the legislative power for amending, adopting or rejecting these laws and budgets. Depending on the substance of the law being voted on, different voting procedures apply. The vast majority of laws, including those on climate and energy, are voted on under the Ordinary Legislative Procedure,[17] which gives the same weight to the European Parliament and the Council. Decisions under this procedure are taken by qualified majority, requiring that 55 per cent of member states, representing at least 65 per cent of the EU population, vote in favour. This means that decisions are passed with the favourable vote of at least 16 of the 28 member states. Another form of voting is through simple majority requiring at least 15 member states to vote in favour in order to pass a decision. Simple majority is merely used for procedural matters, such as the adoption of rules governing committees and for requests to the European Commission to undertake studies or submit proposals. In the field of energy and environment (including climate change) unanimity is required for decisions that are primarily of a fiscal nature. This effectively makes every EU member state a veto player on carbon and energy taxation.

Differences in the voting procedures have had significant influence on the EU's choice of climate policy instruments. This is most clearly evident in the EU's approach to carbon pricing. The Commission's 1992 proposal for introducing an EU-wide carbon-energy tax was withdrawn in 1997 because it proved impossible to reach unanimity (see Convery, 2009: 392–393). By contrast, emissions trading was not considered a fiscal issue, so unanimity was not required and the EU emissions trading system (EU ETS) was eventually approved with a qualified majority in 2003.

On the one hand, the EU's multi-level and multi-polar decision-making structure creates multiple 'veto points' at which agents opposed to climate policy can block or slow the development of policy. On the other, it also creates multiple 'access points', which enable agents in favour of climate action to advance policy (Schreurs & Tiberghien, 2007; Zito, 2000). In both cases, this complex structure implies that compromises on policy ambition often have to be made in order to achieve sufficient consensus on new proposals, but also that climate and energy policies have been so far relatively stable, even when the political composition of member states and of the European Parliament has undergone significant change.

[17] Formerly known as the 'co-decision' procedure. This was renamed under the Treaty of Lisbon (2007).

Figure 6. The role of the main EU bodies and institutions



Source: Authors

3.3.3 Implementation and enforcement of climate policy in the EU

The implementation of policy and law in the EU is highly institutionalised and law-centred, and characterised by complex multi-level dynamics between EU institutions, member states and other stakeholders (e.g. regions or NGOs). The most important climate change policies within the EU are implemented by way of European directives, supported by more detailed regulations and implementing decisions.

The EU ETS is a good example of how policy instruments can evolve in the EU multi-level structure of policy implementation. While the core legislation was proposed and adopted by the relevant EU agencies, the politically sensitive allocation of free allowances was initially left to the member states. This caused foreseeable inefficiency. Over time, the European Commission restricted the role of the member states to that of national auctioneers that are allowed to sell a predefined amount of allowances to the market. Reforms of the EU ETS are currently ongoing. However, they are unlikely to result in sufficient removal of surplus allowances on the market to incentivise firms to invest extensively in low-carbon measures or to allow for the necessary responsiveness to economic fluctuations (Doda, 2016).

Overall, the EU's law-making and implementation procedures differ substantially across a number of the issue-areas relevant to climate policy, with progress fastest in those areas where the EU's authority is most well established and slowest in those areas that remain closest to the concerns of member states. While this differentiation allows for certain flexibility, policy experimentation and innovation, it has also contributed to an uneven and fragmented policy landscape. This makes it difficult to ensure that the climate and energy strategies of member states do not undermine European climate policies; for example, installing more renewable sources of electricity could be currently offset by higher emissions from electricity installations covered in the EU ETS. If different

policy instruments would be more aligned, emission reduction targets could be achieved more quickly and it would be easier to develop a coherent European energy strategy.

Box 5. Multi-level dynamics in the implementation of the EU emissions trading system

The EU emissions trading system (EU ETS) places a cap on the carbon dioxide emitted by large businesses (since 2013 it also covers nitrous oxide [N_2O] and perfluorocarbons [PFCs] from aluminium production). Currently, these include more than 11,000 heavy energy-using installations (power stations and industrial plants) and airlines operating between 31 countries accounting for about 45 per cent of total EU greenhouse gas emissions. It is the largest emission trading system in the world, covering annual emissions of about 2 billion tonnes of carbon dioxide. The EU ETS was introduced in 2005.

The first phase, from 2005 to 2007, was essentially a contained pilot period to test the system's design. Under phase I and II, member states were able to determine the total number of allowances (caps) applicable in their national jurisdictions under their National Allocation Plans (NAPs). The Commission had a review role in ensuring that these plans accorded with criteria set out in the ETS directive. Several over-generous plans proposed by member states were rejected or amended by the Commission. Almost all allowances (95 per cent in phase I; 90 per cent in phase II) were distributed for free to regulated industries.

For the current phase III (2013–2020), a number of reforms have been introduced to improve efficiency and reduce the surplus of allowances in the system resulting from over-allocation in phase I and II and the fall in demand caused by the economic crisis and the deployment of low-carbon energy sources. Notably, a single EU-wide cap on emissions was introduced. Rather than being constant, the EU cap now decreases every year by 1.74 per cent. Furthermore, auctioning of allowances has replaced free allocation as the default method, with at least 40 per cent of allowances auctioned in 2013.[18] Allocation rules across member states were harmonised to limit competitiveness distortions and strengthen the system's incentives for clean technologies. This has improved both the effectiveness and the efficiency of the scheme (van Zeben, 2014). Nine hundred million allowances have also been 'temporarily' withdrawn from the market ('backloaded') to address the issue of over-allocation.

In addition, a market stability reserve (MSR) – a rule-based system for injecting and withdrawing allowances from the system at times of high surplus or deficit – will be introduced to improve the system's resilience to fluctuations caused by economic or policy shocks as of 2018. For the fourth phase of the EU ETS, starting in 2021, the European Commission has proposed that the emission cap shall be further lowered by 2.2 per cent per year.

The European Commission has the power to take administrative and legal action against member states that have infringed a relevant EU law, for example by failing to adequately implement a directive or associated implementing legislation. If a possible infringement of EU law is identified by the Commission or reported in a complaint, the Commission attempts to find a quick solution with the member state concerned by means of a structured dialogue. If the member state does not agree with the Commission or fails to implement a solution, the Commission can launch a formal infringement procedure. In that case a member state would receive a 'letter of formal notice' and, if it fails to provide a satisfactory reply, the Commission will send a further 'reasoned opinion'. If the

[18] Procedurally, auction occurs via a central EU-administered auction mechanism, though member states can opt out of this and conduct their own auctions, as has been done by the UK, Germany and Poland (van Zeben, 2014).

member states fails to act upon it, the Commission would refer the case to the European Court of Justice. After an average of two years, the Court decides whether the member state has breached EU law and may impose a pecuniary penalty (European Commission, 2016b). While the process can be lengthy, it is rarely used – its main value is seen to be in 'naming and shaming' allegedly non-compliant member states. In the last few years, more than 85 per cent of cases have been resolved before litigation.

This European compliance system appears to be relatively effective (Panke, 2010 cited in Börzel et al, 2012; Bergman, 1997; Martin, 2000; Rhodes, 1986; Steunenberg, 2010; Sverdrup, 2004; Tallberg, 2002; Wallace, 1984 cited in König & Mäder, 2014), in particular in relation to the ETS directive, one of the main pieces of climate legislation that directly targets behaviour of industry, with high overall levels of compliance documented in annual reports of the Commission (1983–2010, cited in König & Mäder, 2014). Notably, compliance by member states was 99.9 per cent in 2015[19] and at the time of writing there were no ongoing infringement cases concerning the implementation and application of the ETS directive. In terms of compliance with the effort sharing decision (ESD), an evaluation of the ESD showed an increase in the implementation of national policies in the ESD sectors in most years starting from 2007, when the European Council agreed on the overall EU climate targets for 2020 (European Commission, 2016d). Without the ESD and other EU-level initiatives on energy efficiency and renewables, actions to mitigate emissions in the ESD sectors at member state level may not have been taken, or may have been taken at a slower pace (ibid). Reporting requirements under the directive on emissions (yearly), projections and climate and energy policies (bi-annually) also helps to track and compare progress among member states.

Nevertheless, there are cases of non-compliance. All member states violate EU law, as Perkins and Neumayer (2007) show using data on the number of official infringements received by 15 member states for non-implementation of environmental directives over the period 1979–2000, or Börzel et al (2012) in their analysis of 5,000 violations of European law committed between 1978 and 1999. And while all non-compliance cases ultimately get settled (Panke, 2010 cited in Börzel et al, 2012), some cases take years before they are resolved and some member states give in to compliance pressure much more quickly than others. Subnational authorities also play an increasingly important formal role in the implementation of EU measures (Borghetto & Franchino, 2010). While their participation contributes to possibly more effective policy design, it further increases the time spent in transposing EU laws (ibid).

Compliance is also an incomplete measure of the success of the policy. Especially in climate policy it is difficult to assess the effect of a certain policy on greenhouse gas emission reductions. So while an increase in the number of implemented climate and energy policies is likely to be correlated with some reduction in emissions, the question of whether the implemented policies achieve their objectives and do so efficiently and in a timely manner is more difficult to resolve. It is therefore important to use the policy learning generated through more implementation and tracking of member state progress to improve current policy instruments and possibly develop more effective ones.

3.3.4 Monitoring, reporting and verification in the EU

All EU countries are required to monitor their emissions under the EU's greenhouse gas monitoring mechanism.[20] This sets the EU's own internal reporting rules on the basis of internationally agreed obligations. Member states are required to submit their inventories of greenhouse emissions and

[19] Remarks made by Jos Delbeke at 'Looking Back at Ten Years of the EU ETS: Lessons Learnt and Future Perspectives', workshop held at the Florence School of Regulation (2015). Note that compliance by member states is not the same as compliance by individual operators of installations who are regulated under member state implementing laws.

[20] This is detailed in three pieces of legislation: Regulation 525/2013 on the greenhouse gas monitoring mechanism; Regulation 749/2014 on the requirements for national reporting; and Regulation 666/2014 on the requirements for the EU inventory system.

removals by sinks annually. These are then compiled into a single EU inventory by the European Commission's Directorate-General for Climate Action (DG Climate), in collaboration with the European Environment Agency (EEA). The EEA provides independent information on environmental issues and is further supported by the EU Joint Research Centre (JRC) and Eurostat, the EU's statistical agency. The Commission's work is also assisted by the Climate Change Committee,[21] composed of representatives of the member states and chaired by a representative of the Commission.

Box 6. Monitoring, reporting and verification rules under the EU ETS

Under the EU ETS, the 'operators' of the covered installations are primarily responsible for monitoring and reporting emissions from their installations, and procuring third-party verification of their reports. Verification is typically undertaken by specialised private firms, who must be accredited by the member state. Member states determine the MRV rules to which operators and verifiers are subject, including the penalties for non-compliance, in line with criteria and guidance set out under EU law (the sanctions applied differ across member states (Larkin et al, 2015). Member states also monitor, review and enforce compliance by private parties with their obligations under the domestic laws.

In Phase III of the EU ETS, Commission regulations have further harmonised implementation standards, and strengthened market oversight arrangements (van Zeben, 2014). However, the capacity of the member states to comply with these standards varies. Notably, it is in the member states that have the weakest enforcement capacity where the market abuses are most likely to arise (ibid). This suggests that ensuring the compliance of private entities may continue to involve challenges at EU level[22] and highlights the importance of law-centred process and strong, independent regulatory agencies to provide oversight.

The European Commission also collects information from the member states on their individual policies and on emission projections every other year (Regulation 525/2013). This includes a description of national policies to reduce greenhouse gases, their status of implementation and progress over time. Where available, member states are also required to provide quantitative estimates of the effects of their policies on emissions, and their costs and benefits. The Commission in turn verifies the data provided and compiles it into annual progress reports to the European Council and the Parliament, and biennial reports and national communications to the UNFCCC.

The main phases on the MRV process are shown in Figure 7.
Figure 7At the national level an important component of the information system used for the member states' greenhouse gas inventory is the national emissions registry of individual industrial plants, compiled annually. National emissions registries cover:

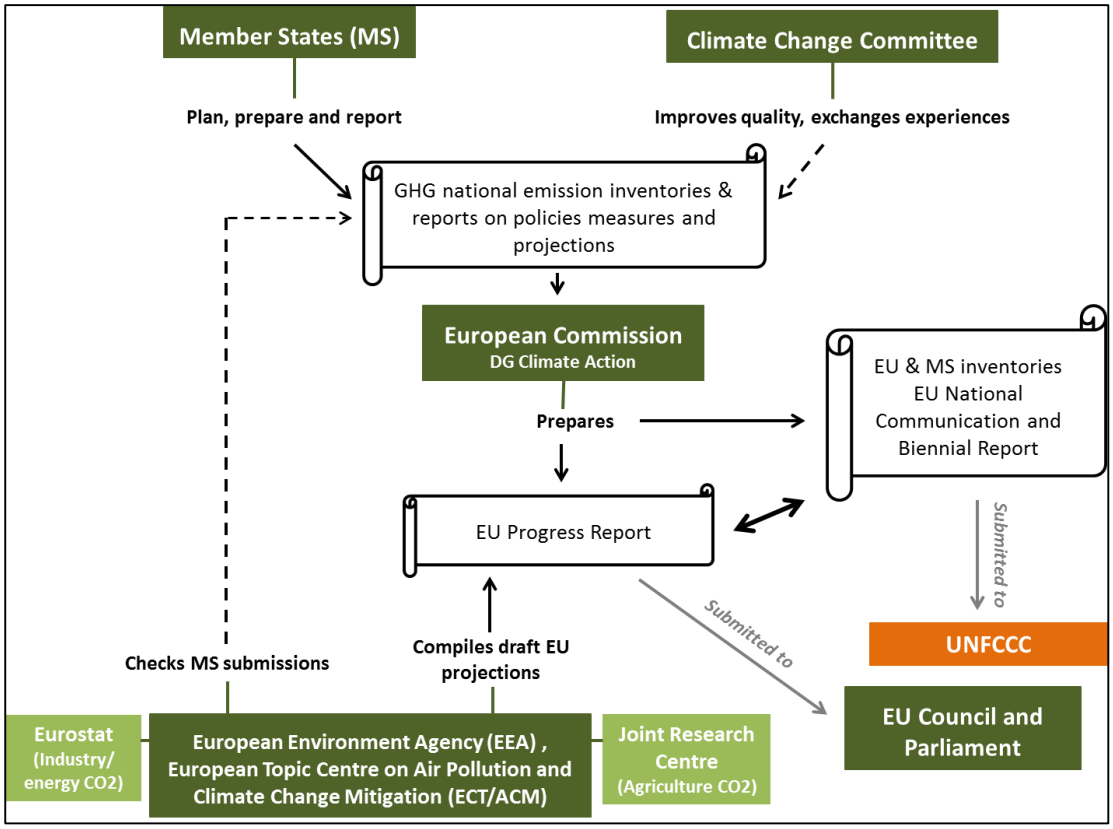
- Entities covered by the EU emissions trading scheme[23]
- Large combustion plants[24]
- Maritime transport[25]

[21] Established under Article 3 of Regulation (EU) No 182/2011.
[22] For example, the market abuses of the second phase originated in national markets where enforcement capacity was relatively low compared with other member states (van Zeben, 2014).
[23] The EU ETS is currently regulated by Directive 2004/101/EC, establishing a scheme for greenhouse gas emission allowance trading within the Community. Monitoring, reporting and verification for EU ETS emissions are regulated by two pieces of legislation: Regulation 601/2012 on the monitoring and reporting of greenhouse gas emissions, and Regulation 600/2012 (European Commission, 2012c) on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers.
[24] Directive 2001/80/EC of 23 October 2001, on the limitation of emissions of certain pollutants into the air from large combustion.
[25] Regulation (EU) 2015/757 of 29 April 2015 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport, amending Directive 2009/16/EC.

- Passenger cars[26]
- National air pollutant inventories
- The European Pollutant Release and Transfer (EPRTR) Register[27]

The MRV of emissions from installations regulated under the EU ETS is particularly complex and involves multi-level dynamics, with guidelines set at the European level and powers decentralised to member states and private entities (see Figure 7).

Figure 7. The EU's system for greenhouse gas inventories and reports on policies, measures and projections



Source: Based on European Commission (2015) and European Commission (2013)

3.4 Public opinion, interest groups and party politics in the EU

The development and implementation of climate policy in the EU is influenced by the motivations, interests, behaviours and relative power of the actors that fill this multi-level and multi-polar space: specifically, member states, EU political parties, interest groups, elites and the general public.[28] The influence of each of these groups is described below.

Member states' greatest influence on the EU's climate policy is via the Council of the European Union (not to be confused with the European Council). Since voting power in the Council of the European Union is roughly proportional to population size, the most populous, economically

[26] Regulation (EC) No. 510/2011 for vans and Regulation (EC) No. 443/2009 for passenger cars requires a member state to record information for each new car registered in its territory. Based on these data the EEA estimates the emissions.
[27] Regulation (EC) No. 166/2006 of 18 January 2006, concerning the establishment of a European Pollutant Release and Transfer Register.
[28] While the various public agencies in the EU's institutional structure could legitimately be analysed here as 'actors' (see for example Schreurs & Tiberghien, 2007), we have chosen to address these in the discussion on public institutions.

advanced member states (e.g. Germany, UK and France) tend to be the most influential drivers of climate action, and typically vote on climate policy in coalition with smaller, economically advanced members (e.g. Austria, Belgium, Denmark, Finland, Luxembourg, the Netherlands and Sweden). Poland, the most populous of the less economically developed member states and a country with large coal reserves, tends to be the most influential blocker of climate policy due to concerns about the economic costs of action. It typically acts in coalition with other smaller eastern member states such as Romania, Estonia and Bulgaria.

However, tensions between the two voting blocs have been moderated through the application of internal EU principles relating to 'effort sharing' that weigh mitigation obligations towards the higher income countries. Ten lower income countries receive concessions such as allocations of free EU ETS allowances for their industries and 2 per cent of the total revenues from EU allowance auctions via the Modernisation Fund (Zachmann, 2011), as explained above. These states also tend to have less stringent obligations in non-ETS sectors. Individual member states have additional influence on the EU's climate agenda when they hold the presidency of the Council of the European Union (Schreurs & Tiberghien, 2007).

Political parties in the EU influence climate policy mainly through their representation in the European Parliament. Members of the European Parliament (MEPs) are elected via national elections and sit in ideologically aligned coalitions of national parties in the Parliament. The two largest groups are the European People's Party (centre-right) and the Progressive Alliance of Socialists and Democrats (centre-left). Together with the Alliance of Liberals and Democrats and the Greens, these parties represent the political centre. Since these parties tend to be relatively supportive of climate action, the Parliament tends to be a driver of climate policy.

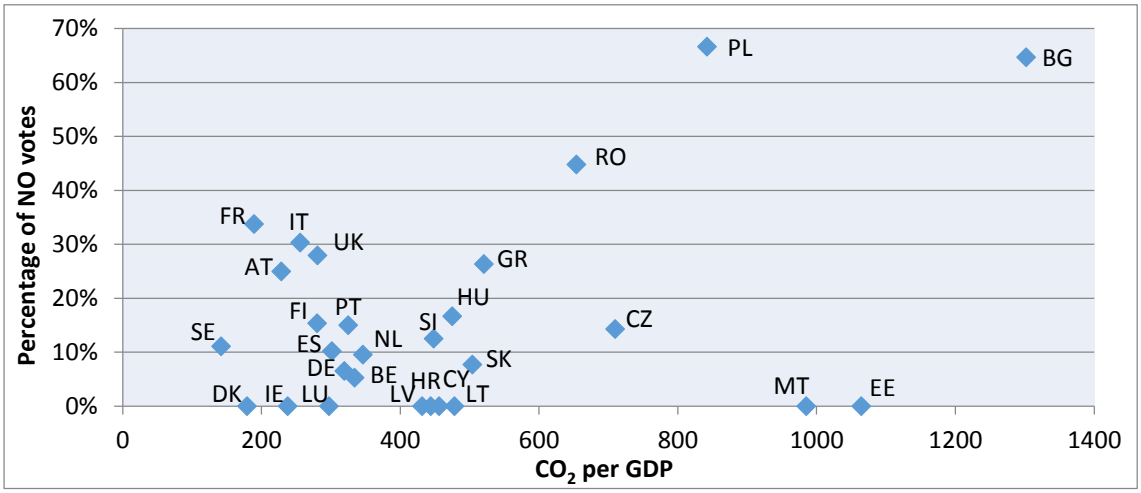
However, there are two complicating factors. First, while the two central parties still dominate, the May 2014 Parliamentary elections resulted in changes to the balance of smaller parties. Notably, nationalist and euro-sceptic parties emerged strongly, obtaining 11 per cent of parliamentary seats,[29] whereas green and socialist parties performed relatively poorly.[30] Eurosceptic parties tend to focus on issues other than climate and environment, but since many of them are ideologically opposed to any kind of broad EU regulation, the European Parliament's support for climate policy might become less reliable in the future.

Secondly, MEP voting behaviour on climate policy tends to be strongly correlated with the carbon intensity of the member state they represent (see Figure 8). For example, most MEPs from Poland or Bulgaria, which are among the most emissions-intensive economies, voted against the EU ETS Market Stability Reserve (see section 3.3 above). This suggests national interests and pressures play a strong role in MEP voting behaviour on climate policy, while an MEP's party orientation plays a stronger role for the parties at the margins of the political spectrum.

[29] Studies had identified a decline of specifically anti-European parties in the period up to 2009: see Hix & Marsh (2011).

[30] This may be explained by the fact that parties which lead national governments are often 'punished' in European elections (Hix & Marsh, 2011).

Figure 8. Relationship between countries' anti-Market Stability Reserve votes and emissions intensity of GDP



Notes: AT / Austria; BE / Belgium; BG / Bulgaria; CY / Cyprus; CZ / Czech Republic; DE / Germany; DK / Denmark; EE / Estonia; ES / Spain; FI / Finland; FR / France; GR / Greece; HR / Croatia; HU / Hungary; IE / Ireland; IT / Italy; LT / Lithuania; LU / Luxembourg; LV / Latvia; MT / Malta; NL / Netherlands; PL / Poland; PT / Portugal; RO / Romania; SE / Sweden; SI / Slovenia; SK / Slovakia; UK / United Kingdom

Source: Authors based on EP

The EU political parties receive most of their funding from the EU rather than from private entities. The funding takes the form of an operating grant, which can cover up to 85 per cent of the eligible expenditures of a party, while the rest must be covered by internal resources such as membership fees and donations. This suggests MEPs may be more shielded from third party financial influence, such as from incumbent industries, compared with countries like the US. However, MEP election campaigns are typically organised by national parties, which have quite different funding sources and are subject to different national transparency rules on party-financing (Mulcahy, 2012), with the result that some national representatives may be more subject to third party pressures than others.

Special interest groups – in particular, businesses, industry groups and environmental NGOs – are able to exert influence over EU climate policy development through a variety of channels. These include formal representation on the Commission's advisory bodies and participation in stakeholder consultations on Commission proposals and associated analysis (e.g. impact assessments); lobbying individual MEPs or member states; producing and promoting publicly available research and analysis to influence opinion among elites and the public; advertising; industrial action; contributions to political parties in relation to EU elections and general party operations; strategic litigation; and similar actions at the national level. The Commissioner for Energy and Climate and the Director Generals of DG Energy and DG Climate are among the most lobbied officials in the European Commission (Panichi & Ariès, 2015).

Overall, the EU is home to many large and powerful carbon-intensive industries, and sizeable and growing low carbon industries who are very effective at lobbying the European institutions. They lobby individually and collectively via trade and industry associations and specialist sectoral and sub-sectoral bodies. The business community has been largely supportive of EU-wide emissions reduction targets and other high-level policy objectives. However, contrary to the preferences of the Commission (and Parliament), companies that were to be regulated by the ETS successfully lobbied for the scheme caps to be determined primarily at member state level, and for grandfathering to be the default approach to allowance allocation, in the first two phases of the scheme (Anger et al,

2008; Skjærseth & Wettestad, 2008; van Zeben, 2014). This was only reversed in the third phase of the ETS.

There is also an active environmental NGO community in Europe. Their influence has been greatest in setting the agenda for climate action and, to some extent, on setting targets for emissions reductions, renewable energy and energy efficiency. Their influence has been lesser on specific policy design and implementation issues (Gulbrandsen & Andresen, 2004). The influencing strategies of environmental NGOs tend to be focused on providing information and analysis, and making representations to the EU institutions in the agenda-setting and policy-design process, particularly to the Commission. Yet most recently climate NGOs are getting increasingly more concerned with the legislative agenda in Brussels and get involved in lobbying on particular policy design.

Many environmental NGOs are active at national level, where the strategies and tactics adopted to influence policy are more varied, and in some countries their influence is relatively large. For example, in Germany, well-funded NGOs such as Agora Energiewende are successfully shaping energy policy through research reports, grassroots demonstrations and lobbying through high-level political contacts. The court system is also being used in some member states. In the Netherlands, some 900 plaintiffs brought a successful action against the government by arguing that its plans to cut emissions by just 14–17 per cent compared to 1990 levels by 2020 were unlawful, given the scale of the threat posed by climate change (Neslen, 2015).

Public opinion in Europe has been strongly in favour of environmental protection and climate action, and this support grew from the 1990s and throughout the 2000s. EU public opinion 'forms an important necessary condition' that enables reinforcement of actions by actors that support climate policy at various levels of policy-making (Schreurs & Tiberghien, 2007). A major driver of the generally positive public opinion towards climate policy in the EU is the media. For example, a survey of newspaper headlines in the wake of President Bush's decision not to ratify the Kyoto Protocol shows that both left- and right-leaning newspapers strongly condemned the decision ibid).

A cross-country survey of public opinion conducted by Gallup in 2007–2008 (Lee et al, 2015; Pelham, 2009) suggested that climate change awareness was relatively high in the EU, although interestingly not as high as in the US. Averaging the results across the 23 member states surveyed, 90 per cent of the respondents claimed to know 'something' or a 'great deal' about climate change, as opposed to 98 per cent in the US. Significant variations, however, were recorded across the member states, with percentages ranging from more than 95 per cent in Finland, Germany, the Netherlands and Sweden, to less than 85 per cent in Italy, Malta, Poland and Romania. European citizens appeared on average more concerned about the causes and the seriousness of climate change than their American counterparts. About 59 per cent of the respondents aware of climate change also attributed its causes to human activities, but again with large variations – from more than 90 per cent in Italy and Greece, to less than 50 per cent in the Czech Republic, Denmark, Estonia, Finland and Latvia. An average of 69 per cent considered it a serious threat to their personal life, ranging from more than 80 per cent in Greece and Portugal to less than 40 per cent in Czech Republic, Estonia, Finland and Latvia.

More recent surveys collected in the *Special Eurobarometer* report on climate change (Commission, 2014) suggest that the sense of urgency for action on climate change may have increased among EU citizens since 2011. According to the Eurobarometer, nine out of 10 Europeans thought that climate change was a very serious or a serious problem, and four out of five agreed that fighting climate change and using energy more efficiently could boost the economy and jobs in the EU. While economic issues have taken higher priority since the global financial crisis of 2007–08 and subsequent Eurozone crisis, public support for climate change action provides an important lever for the development and implementation of climate policy in the future. Yet there is a further need to improve awareness of climate change, in particularly in Eastern and Southern Europe.

3.5 Future outlook for the EU

The success of the EU's climate policy is dependent on the ability of the EU to manage the various crises that challenge its institutional integrity. The Eurozone crisis and the threat of a Greek exit from the Eurozone or even the EU, the British referendum on EU membership in 2016 and the refugee crisis (which is already severely testing the resilience of the EU's rules on freedom of movement) are all undermining European unity.

The immediate impact of these crises on EU climate policy is that it is treated with lower priority. The crises might delay processes, result in less ambitious compromises (as ministers and not heads of state are negotiating deals) and could mean that fewer financial resources or less human capital will be devoted to climate and energy policies. Another, more severe yet less likely, threat is that the crisis could potentially tear apart the EU. Were this to happen, transferring powers back from Brussels to the member state capitals could not only lead to a scale-back of ambition in some central and eastern European member states that always needed to be compensated for their unloved climate commitments, but could also make climate policy in other countries less ambitious due to fear of carbon leakage.

Member states are divided over how ambitious the EU should be in its climate policies after 2020. The EU 2030 climate policy package – which commits the EU to reduce its emissions by at least 40 per cent, increase energy efficiency by at least 27 per cent and increase the share of renewables to 27 per cent of the energy mix – remains vague and legislation for its implementation needs finalising. Countries such as Germany and France are in favour of more stringent policies while Poland pulls in the opposite direction. How and whether these divisions can be bridged will determine the future ambition of EU climate and energy policy. The main potential risk is that this dynamic could result in the EU focusing on its current commitments until 2020 while delaying decisions on increasing post-2020 ambitions in order to appease member states opposed to more ambitious action.

However, increasing ambition and developing more stringent policies at both the EU and member state level are crucial. The EU will need to increase its current ambition in order to meet its 2030 targets, as outlined below. This will require a number of challenges in the implementation of the climate and energy package to be overcome, in addition to coping with the wider EU crises outlined above. Two recent studies from the Climate Action Tracker (CAT, 2016) and the European Environmental Agency (Dejean et al, 2015) highlight that if the EU relies only on the success of its current policies it will exceed its 2030 emissions target by about 5–10 percentage points. According to Dejean et al (2015) the EU will need to at least double the annual rate of emission reductions from 2015 onwards to meet the 2030 target. This points to the need for not only ensuring successful implementation of the current policies, but also to increasingly ambitious policies in the future. The focus should lie on reducing emissions especially from power generation, industry, transport and buildings.

The EU is expected to meet its renewable energy targets (CAT, 2016; Dejean et al, 2015) with continued decarbonisation of the power sector through fuel switching and investments from coal to renewable sources. Up to half of the EU's power generation capacity is expected to come from renewable energy by 2030 (IEA, 2015). With a quarter of this capacity coming from variable sources (wind and solar), the EU will need to work through the Energy Union to smooth our variability of supply, requiring greater interconnections between national energy markets, and investment in capacity markets and demand-side management (IEA, 2015). While emission reductions in the power and industry sectors are seen as the major means for meeting the EU's 2030 targets, improving clarity on the accounting rules for land use, land use change and forestry (LULUCF) and stepping up efforts in this sector to reduce emissions and increase removals could make an important contribution to meeting 2030 and 2050 targets.

However, implementing the EU's 2020 and 2030 energy efficiency targets will be more challenging (CAT, 2016; Dejean et al, 2015). For example, lowering emissions from transport will require overcoming high capital costs of electric vehicles and addressing sustainability issues around biofuels, to encourage greater decarbonisation from this sector (IEA, 2015).

Another challenge is whether the EU will finalise policies under the Effort Sharing Directive (EDS) to ensure greater efforts in emission reductions not covered by the EU ETS. Twenty-four member states are projected to meet their national targets under the ESD until 2020 domestically, while four member states are expected to need additional measures to reach their targets (European Commission, 2016d). For the 2021–30 period the reduction target of -10 per cent until 2020 will be raised to a considerably more stringent target of -30 per cent. This means that the EU and member states will need to develop new, additional measures for the transport, buildings, agriculture and waste sectors (Graichen et al, 2015).

A major challenge is whether the reforms to the EU ETS will create high enough carbon prices to make industries switch to lower carbon sources. While the EU has agreed to tighten the EU ETS market beyond 2020 and has introduced the Market Stability Reserve, it remains to be seen if these measures will be effective to tackle the oversupply of permits and reducing emissions. At the same time, Poland for example is opposing reform of the EU ETS and has decided to mount a legal offensive against the emissions trading scheme reform (Euractiv, 2016). In contrast, other member states are increasing their own domestic low-carbon energy policies. On the one hand, this has expanded the deployment of renewable energy and energy efficiency; on the other, such domestic non-ETS policies have further undermined the EU ETS by increasing the surplus of emissions allowances, leading to yet stronger calls to reform the system.

This dynamic has brought the EU to a crossroads: will we see a continued nationalisation of energy policy with diverging decarbonisation trends between member states, or will the Juncker Commission's plans for a European Energy Union result in a deep Europeanisation of energy policy that provides long-term signals for low-carbon investment? The European Commission has recognised that the EU needs an integrated governance and monitoring process to make sure that energy-related actions at European, regional, national and local level all contribute to the Energy Union's objectives and is providing guidance to member states on the development of their national energy and climate strategies.

The resolution of this central question will depend on the ability of the European Commission to come up with a package of energy and climate policies that enables member states to compromise. For this purpose the initial Energy Union proposal was carefully crafted around five dimensions,[31] which could allow high-level compromises. For example, Germany might help its central and eastern European partners in the modernisation of their energy infrastructure, who in return might accept a continuation of the European decarbonisation ambition; France may cease its insistence on a strong public intervention into energy markets and prices if the price of allowances for the EU ETS is sufficiently high to make its nuclear power generators more competitive; and so on. The problem is that such a European package might unbalance delicate compromises between domestic stakeholders. Hence, the European Commission wants this agenda discussed at the level of heads of state and government rather than ministers of energy and environment, as the latter are often deeply entrenched in the national balances.

The potential risks to increasing climate policy ambition aside, the role of the European Commission cannot be ignored. A permanent bureaucracy with a long record of climate leadership, the European Commission has shown itself capable of driving the climate policy agenda across EU institutions and member states, even amid significant shocks such as the global financial crisis and its regional aftermath. Therefore, unless the institutional set-up of the EU itself is undermined by the crises, the

[31] Supply security, a fully integrated internal energy market, energy efficiency, emission reduction, low-carbon research and innovation.

EU will continue to play a significant role in shaping the climate policy of member states. In addition, however real the risk of diverging decarbonisation trends inside the EU might be, one must remember that the climate policies already in place lock the EU into a path of emission reductions. The constant annual reduction factor under the EU ETS will bring the issuance of new allowances to zero by 2067, for example; and the ETS Directive stipulates this does not cease to have effect after a specific date, unless further legislative action is taken. This can only be changed by qualified majority.

4 Factors affecting climate policy in the United States

Key findings for the United States

1. **Likelihood of achieving NDC targets:** In order to meet the target in its nationally determined contribution (decreasing annual emissions by 26 to 28 per cent below 2005 levels by 2025), the US will not only have to increase its ambition to reduce emissions from its power sector but will also need to introduce more ambitious policies for emissions reductions from its industry and transport sectors, among others.
2. **Executive branch action can drive climate policy:** The institutional system in the US has a high degree of separation of powers between the legislative (congress) and executive (President) branches, which makes alignment of different priorities between these two difficult. On the other hand, it also vests the executive with considerable powers to develop policies independently of congress. For instance, President Obama released the Climate Action Plan in June 2013, which directed federal agencies to take concrete steps to reduce emissions, and he proposed the Clean Power Plan, which aims to cut carbon dioxide emissions from the power sector by 32 per cent compared with 2005 levels by 2030.
3. **Subnational action as driver:** The states have considerable authority. In some areas, their authority extends beyond that of the federal government, and in other areas authority is shared between the federal and state governments. This means that many policy ideas are first generated locally, with much climate policy leadership coming from the states. For example, 19 states will continue to submit plans to comply with the Clean Power Plan and thus reduce emissions from their power sectors, despite the stay by the Supreme Court. Together they represent 36 per cent of the emissions reductions that would be delivered by the Clean Power Plan in the interim period (2022–2029), and 30 per cent of the cuts expected by 2030 and beyond.
4. **Risk of roll-back of climate policies post-election:** Donald Trump announced during the presidential campaign and in his America First Energy Plan that he would cut all federal climate spending by eliminating domestic and international climate programmes, withdraw from the UNFCCC Paris Agreement, repeal the Clean Power Plan, encourage use of fossil fuel resources and dismantle climate policy in general through executive action. This is unlikely to be a straightforward, quick or easy process. Firstly, under existing law the US Environmental Protection Agency, the climate policy administrator, not only has the authority to regulate greenhouse gas emissions, but also has an obligation to do so. Secondly, any change to regulations (including repeal) must go through the same type of rigorous public notice and comment process that the original regulations went through to become law: changing them would take significant political commitment over several years. Thirdly, the subsequent rule-making must take account of the administrative record compiled to support the original rule. In the case of the Clean Power Plan, this record includes hundreds of pages of technical documents and responses to 4.5 million public comments that were produced to support the final rule. A repeal or change to the regulations that does not adequately address the record that supported the regulations in the first place is more susceptible to being invalidated as 'arbitrary and capricious' by a reviewing court.

   Nevertheless, given that Donald Trump will appoint at least one Supreme Court justice, likely tilting the court towards conservatism, he could seek to repeal previous amendments to the Clean Air Act that brought greenhouse gases under the EPA's remit, and override or weaken the authority of the EPA. It has already been reported that Trump will appoint a climate sceptic, Myron Ebell, to run the EPA. It is difficult to predict

how quickly changes to climate policy will happen, but the Climate Action Plan and the Clean Power Plan will likely stall. Action on climate change would then depend largely on the states.

5. **Importance of energy-intensive industries:** The relative importance of energy-intensive industries to the US economy affects government willingness to implement ambitious policies to reduce emissions, and also gives industrial interests a strong voice in US climate policy-making. However, the economic importance of energy-intensive industries varies greatly between states, which means that there are leaders and laggards in climate policy at the state and local level. It remains true, nevertheless, that legislators from states with high concentrations of energy-intensive industries have actively tried to hinder more ambitious climate action in congress and through judicial rulings (the stay of the Clean Power Plan by the highest federal US court was one outcome of several groups suing the Environmental Protection Agency).

4.1 Status quo of climate policy in the US

The **Clean Air Act** (CAA) has shaped air pollution controls in the US since the 1970s. In 2007, the US Supreme Court ruled that greenhouse gases fell within the definition of an air pollutant under the CAA. In 2009, the Environmental Protection Agency (EPA) found that greenhouse gases contribute to climate change and pose a danger to public health and welfare. Based on this finding, the EPA has promulgated binding regulations for emissions reductions from light-duty vehicles, new power plants, existing power plants, heavy-duty vehicles and other sources of greenhouse gases. In 2010 the EPA in cooperation with the Department of Transportation was able to introduce the Light-Duty Vehicle Rule, which sets greenhouse gas emission standards, and raised corporate average fuel-economy (CAFE) standards for cars and light trucks produced from 2012 (Bassi & Bowen, 2014). New, more stringent standards, also including heavy-duty vehicles,[32] have applied since 2014 (Bassi et al, 2014); more are under development. (See Box 7 below for further details of the Clean Air Act.)

In June 2013, the Obama administration released the **Climate Action Plan**, which outlined the steps to be taken by federal agencies to reduce greenhouse gas emissions, prepare for the impact of climate change and lead international efforts to address global climate change.[33] The most far-reaching reforms are those being undertaken by the EPA under the Clean Air Act, including the **Clean Power Plan** (CPP). As a first step towards taking action under the Climate Action Plan, President Obama in 2013 proposed a CPP that would set standards for currently operating plants through federal guidelines and require individual states to implement performance standards with respect to carbon emissions. These should be outlined in state plans to be submitted to the EPA between 2016 and 2018. This aims to cut carbon emissions from the power sector by 32 per cent compared to 2005 levels by 2030 (and emissions from sulphur dioxide by 90 per cent and nitrogen oxides by 72 per cent compared to 2005 levels by 2030) (EPA, 2015a).

[32] Trucks, buses and coaches above 8,501 lbs

[33] More detail on the proposed actions is given in Appendix 1.

Box 7. The US Clean Air Act: regulating greenhouse gases as air pollutants that endanger public health or welfare

The Clean Air Act (CAA) in its present form was passed in 1970, before human-induced climate change was widely recognised as a threat (although global warming was identified as a potential problem in scientific studies submitted to the US congress as early as the 1960s). Thus, the CAA does not explicitly include carbon dioxide and other greenhouse gases as air pollutants. The CAA did, however, require the Environmental Protection Agency (EPA) to set standards that not only empowered the EPA to define new substances as pollutants, but required it to do so if the pollution may reasonably be anticipated to endanger the public. The clause leaving this determination to the administrator's 'judgment' leaves the executive branch with substantial discretion in determining what potential pollutants to cover.

In October 1999, a group of NGOs filed a petition with the EPA requesting it to regulate greenhouse gases under the CAA. In 2003, under the Bush administration, the EPA denied the petition, finding that greenhouse gases were not covered as pollutants under the CAA (which dealt primarily with local air pollutants), and that even if they were covered it would not issue standards because the science linking greenhouse gases to climate change was not sufficiently certain. NGOs challenged this finding in court.

In 2007, the Supreme Court ruled that the EPA was incorrect in its interpretation of the CAA and that it was obligated to determine whether greenhouse gases contributed to climate change and caused danger to public health or welfare. As a result, the EPA engaged in a process to determine whether greenhouse ages were a public danger. It made its 'endangerment finding' in 2009. Two subsequent legal challenges to EPA's greenhouse gas regulations have been heard by the Supreme Court, but the Court has confirmed that the EPA has the authority to regulate greenhouse gases under the CAA.

As a result of these court cases and the EPA's endangerment finding, under current law the EPA is *obligated* to regulate greenhouse gas emissions. To date, the EPA has issued regulations covering emissions from light duty vehicles, and new and existing power plants. It also continues to work on regulations for heavy duty vehicles, as well as the oil and gas sector (focusing on methane emissions).

However, in early 2016, the US Supreme Court put a stay on implementation of the Clean Power Plan until the court challenges filed by various states and industry groups are completed. While deciding to implement a stay on regulation pending judicial review was an unusual action by the Supreme Court, it does not question the validity of the CPP. Because the Supreme Court had never before stayed implementation of a regulation before judicial review occurred, many commentators, however, agree that it signals that the Supreme Court is likely to invalidate some (or all) of the CPP when it finally hears the case, which is expected sometime in 2017 or 2018, depending on how long it takes for the lower court to enter a decision on the merits of the case (Holden et al, 2016; Dlouhy & Stohr, 2016). The future of the CPP in the court challenge was then complicated even further when a vacancy arose in the Supreme Court following the death of one of the nine sitting justices. The process of filling this vacancy immediately became embroiled in the politics of the presidential election and it appears it may not be achieved until the next President takes office in early 2017 (Meyer, 2016).

Obama administration officials have continued to express confidence that the CPP is on a solid legal footing and will survive judicial review; section 4.3 below outlines some of the CPP's prospects in more detail.

The release of the Clean Power Plan added to other regulations the EPA had already made (jointly with the Department of Transportation) in setting efficiency standards for light-duty vehicles and to

ongoing efforts by the EPA to set standards for heavy-duty vehicles, and to reducing methane emissions from the oil and gas industry and from municipal landfills. These EPA regulations (the CPP in particular) will be key for the US to achieve the target of reducing emissions by 26–28 per cent below 2005 levels by 2025, as per its NDC to the Paris Agreement (The White House, 2015). The US also aims to increase its share of non-hydro renewables to 20 per cent by 2030 (ibid).

At the end of 2015, as part of a broad spending package, congress passed five-year extensions to the tax credits that support wind and solar deployment. Although this was an extension of existing tax credits, it was still a substantial new development because previously the tax credits had been passed on a one- or two-year basis and/or lapsed for periods of time, creating an uncertain investment environment for these renewable technologies. Initial projections were that the five-year extension will result in an additional 40GW of solar and wind generation being deployed over the next five years (Randall, 2015).

In addition to the EPA's efforts, the Department of Energy (DOE) implements efficiency standards for appliances and equipment. Most recently it set standards for commercial air conditioners and furnaces, which was the largest efficiency programme it has created to date (US Department of Energy, 2015). DOE also operates a loan guarantee programme for innovative clean energy technologies under a series of statutes related to efficiency that began with the Energy Policy and Conservation Act of 1975, and existing statutes authorising loan programmes, including the Energy Policy Act of 2005. There are various other initiatives to promote deployment of renewables on federal lands or for federally assisted housing and to improve the energy efficiency of various federal government operations.

Several important policies and initiatives have also been implemented at the state and local level (see Box 8).

Box 8. Select examples of sub-national policies and initiatives in the US

California's AB32, the legislation which establishes the state's cap-and-trade system and requires California to reduce its greenhouse gas emissions to 1990 levels by 2020, has been widely lauded by environmental groups and is often seen as a blueprint for any broader cap-and-trade law (Environmental Defense Fund, 2016). In 2016, California extended this law to 2030 and committed to reduce its emissions to 40 per cent below 1990 levels (Morehouse, 2016).

Subnational authorities also engage in regional cooperation agreements where they collectively work with other subnational governments. For example, north-east and mid-Atlantic US states have teamed up to create the Regional Greenhouse Gas Initiative (RGGI) – a market-based regulatory programme that aims to reduce greenhouse gas emissions.

Thirty-seven states have renewable portfolio standards that require utilities to source a certain amount of energy from renewables and increase that amount over time. Ten states have signed on to the Under 2 MOU, committing to reduce greenhouse gas emissions to 85–90 per cent below 1990 levels by 2050.

Other key policies that are set primarily at the state or local level include: building codes, retail energy rates and net metering policies for distributed generation, and a variety of energy efficiency programmes and standards.

Some cities have also adopted emission reduction targets. Atlanta, Denver and Miami, for example, aim to achieve relatively modest reductions of 20–25 per cent compared with 2005–2007 levels by 2020 while others have set ambitious long-term commitments, such as Seattle's 100 per cent emission reduction target compared with 1990 by 2050.

4.5 Economic factors driving US climate policy

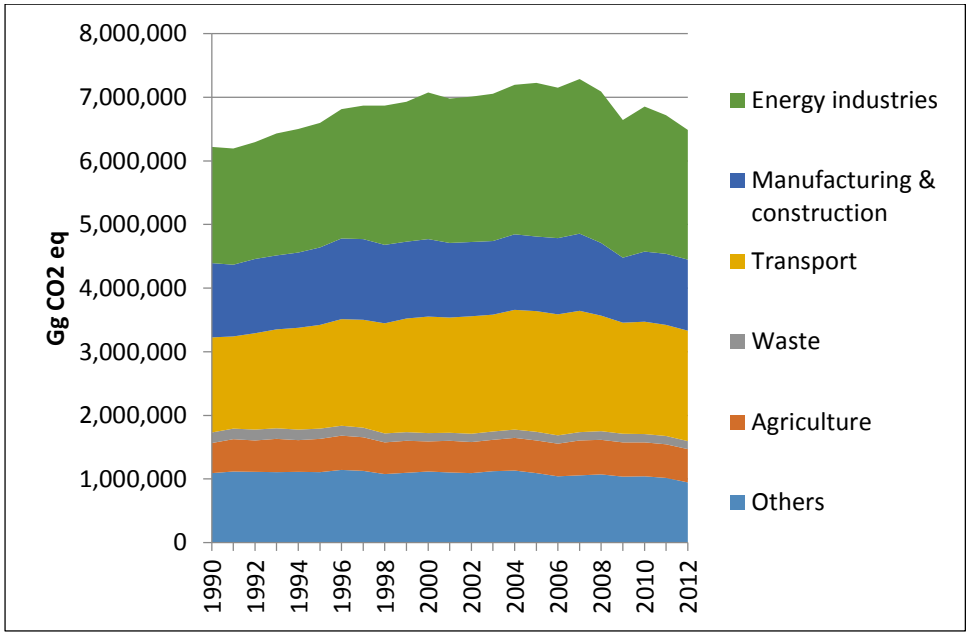
From the 1950s onwards the Unites States' post-war development was driven by a focus on mass employment, prosperity for a growing middle class and national security (Krugman, in Foot & Walter, 2011). While this has made the US a powerhouse of innovation, it has also led to suburban sprawl with high per-household car ownership and energy consumption, in turn contributing to relatively high greenhouse gas emissions per capita, which in 2014 at 16.5 tonnes (Olivier et al, 2015) were the world's third largest, after Saudi Arabia and Australia.

Following the 2008 global financial crisis, GDP in the US contracted for two years, then resumed growth at a modest, yet stable rate slightly above 2 per cent (World Bank, 2016a). The economic contraction, together with improvements in energy efficiency, led to sizeable reductions in greenhouse gas emissions (OECD, 2014).

Despite the economic slowdown, economic growth in the US has been stronger than the OECD average since 2011 (World Bank, 2016a). The economy as a whole has been gradually recovering, with favourable near-term prospects (OECD, 2014). As a result, job growth has been steady, unemployment has fallen and house prices are rising again, contributing to high levels of consumer confidence relative to other OECD countries (ibid). Overall, with a GDP accounting for 16 per cent of the world's total wealth[34] in 2014 (World Bank, 2016d), the US remains one of the top economic powers worldwide, together with China and the EU.

The economy is based largely on the service sector, which accounts for about 78 per cent of GDP. The industrial sector is responsible for about 21 per cent, in particular from energy-intensive industries such as petroleum, steel, motor vehicles, aerospace, chemicals, electronics, food processing and mining (Central Intelligence Agency (CIA), 2016a). Overall, key sectors responsible for the highest shares of greenhouse gas emissions, and therefore the ones in which mitigation policies are most needed, are electricity generation (about 31 per cent of 2013 total emissions), transportation (27 per cent) and industry (21 per cent). The contribution of individual sectors to domestic emissions is shown in Figure 9.

Figure 9. Greenhouse gas emissions in the US by sector (excluding LULUCF*), 1990–2012



*Note: *LULUCF = land use, land use change and forestry*
Source: UNFCCC (2016)

[34] In Purchasing Power Parity (current international $)

The relative importance of energy-intensive industries to the economy affects not only greenhouse gas emissions but also the strength of industrial interests (discussed in section 4.7), which in turn influence US climate policy-making. The economic importance of energy-intensive industries varies greatly across states. For example, the mining sector (crude oil, natural gas, coal and ore extraction) contributed only 2 per cent to total US GDP in 2013, but its share of GDP in some states accounts for more than 10 per cent – for example, Texas, Wyoming, Alaska and West Virginia (Energy Information Administration, 2014). These states also tend to have very high per capita emissions from the power sectors, as fossil fuels are used for generating electricity. States with high concentrations of energy-intensive manufacturing include Illinois, Michigan and Pennsylvania (Foot & Walter, 2010; Rabe, 2004).

Reliance on imported fossil fuels (particularly oil) in the past has led to strategic concerns about energy security. In 2007, oil imports made up over 60 per cent of annual petroleum consumption, a quarter of it coming from the Middle East. Such concerns have motivated legislation that has mandated larger use of renewable fuels in the transport sector (Leiby, 2007), notably the EPA's Renewable Fuel Standard programme (Earley, 2009).[35] However, the energy security argument has not proved sufficiently powerful to generate broader support for more stringent energy and climate policy (Bang, 2010).

Furthermore, energy security has become less of a policy driver thanks to the large-scale development of hydraulic fracturing and horizontal drilling. This has led to a steep increase in the domestic production of shale oil and shale gas and a corresponding decline in oil and gas imports. Forecasts by the EIA (2015) suggest that, as a result of the extraction from shale formations, total natural gas production will continue to grow in the coming decades, whereas crude oil production continues to increase but eventually declines in the 2020s in most scenarios.

The resurgence in oil and gas production has changed the landscape for natural gas prices in the US, boosting employment and competitiveness (OECD, 2014). This has benefited a number of states that are rich in shale oil and gas deposits, especially Arkansas, Colorado, Kansas, Louisiana, Montana, Nebraska, North and South Dakota, Pennsylvania, Texas and Wyoming. Growth in the production of natural gas, and its relatively low price, is also contributing to the expansion of several manufacturing industries, such as bulk chemicals and primary metals (EIA, 2015).

The rapid development of US shale gas resources has also led to a substitution away from coal to gas in electricity generation, helping to reduce domestic emissions (OECD, 2014). Notably, the coal share in the electricity mix decreased from 50 to 34 per cent between 2006 and 2015 (EIA, 2015).

However, uncertainty over the quantity of fugitive methane emissions from fracking sites means that the full extent of the net impact of shale gas on US greenhouse gas emissions is unclear. This issue should be mitigated by new rules set by the EPA, which from 2015 required all well operators to capture the fugitive methane (using so-called 'green completions' technologies) and make it available for use or sale (OECD, 2014).

A key question is whether natural gas can act as a bridge fuel to full decarbonisation, or whether its development may prevent emissions reduction past a certain level. In particular, there is a risk that the expansion of natural gas fired generation could hinder the future development of renewable energy. As of today, despite low natural gas prices, the production of renewable energy has expanded markedly: notably, wind and solar power both doubled in capacity between 2008 and 2014 (OECD). However, estimates (Huntington, 2013) suggest that after 2020, natural gas could begin to displace nuclear and renewable energy, rather than coal power plants, in the absence of adequate policies stimulating low-carbon generation. As a result, shale gas could have only modest impacts on carbon dioxide emissions in the future and undermine the US's long-term emission reduction trajectory.

[35] The increased use of bioethanol, however, has generated concerns over impacts on biodiversity and its role in raising food prices.

Another important channel through which economic development affects emissions and mitigation efforts is low-carbon innovation. The US has been a leader in innovation on energy efficiency technologies, although only about 1.8 per cent of government R&D is allocated to the environment and energy (OECD, 2014). Patent filings related to green growth have been steadily rising since 1990 and began outpacing the growth of total US patents from 2005 (OECD, 2014). The significant gains in energy efficiency witnessed over the past decades were partly driven by high energy prices, which drove innovation in energy-saving technology (Popp, 2002; Aghion et al, 2012). The low gas prices granted by the shale gas expansion, however, tend to remove this incentive and could lead to rebound effects, increasing energy use.

The US economy has therefore provided mixed signals to climate policy. Significant emission reductions have been achieved in the past decade via non-policy drivers, in particular the substitution of coal to gas in power stations thanks to shale gas abundance and the economic recession. However, with a welcome reprise of the economy, low gas prices and reduced energy security concerns, the economic incentives for innovation and deployment of low-carbon sources now appear weaker. Nevertheless, the Obama administration has argued that investment in energy efficiency and renewable energy will boost the US economy. In his last state of the union address, in January 2016, President Obama restated the US commitment to develop clean energy sources, emphasising the opportunities for the US business sector 'to produce and sell the energy of the future' (The White House, 2016). Analysis by Brookings (2011) indicates that the aggregate US low-carbon economy already employs more people than the fossil fuels and biotech industries. Notably, the most dynamic low-carbon energy sectors – wind energy, solar photovoltaic and smart grids – doubled and tripled in size in the last decade. Several challenges, however, remain.

Despite having a few fast growing sectors, the US low-carbon economy remains relatively slow-growing on balance. Furthermore, evidence suggests that the scale-up of new technologies has not been maximised due in part to policies that have left domestic demand weaker than it might be, financing harder to obtain, and the innovation pipeline unsecured for the future (Brookings, 2011). Current policies, such as the five-year extension of the tax credits for wind and solar, should give an additional boost to the renewable sector. Initial projections indicate that these could incentivise an additional 40GW of wind and solar over the next five years (Bloomberg New Energy Finance, 2015; Randall, 2015). The future of clean technology investment, however, will remain strongly dependent on policy choice in the absence of strong economic signals. The US therefore appears particularly vulnerable to possible sudden changes in government priorities following the presidential election in November 2016.

4.6 Institutions in the US

4.6.1 Key public institutions and allocation of authority

Political authority in the US is divided horizontally at the national level between the legislative (congress), executive (Presidency and executive agencies) and judicial (Supreme Court and inferior federal courts) branches. Congress is composed of the House of Representatives (lower house) and the Senate (upper house). Authority is also divided vertically between the federal government and the 50 states. Both climate policy development and implementation are affected by each of these divisions.

One attribute of the US federal government that distinguishes it from other forms of parliamentary governments, but also other presidential systems, throughout the world is the high degree of separation of powers between the legislative and executive branches. The election of the President is independent of the election of legislators (that is, the President as the head of the executive branch is not selected by the prevailing party or coalition in the legislature). Similarly, the officials that oversee the executive branch agencies in the federal government are not members of the

legislature, hence they are not elected. Rather, the President appoints them, with approval of the Senate. As a result, the same political party that is in control of congress does not necessarily hold executive authority in the government. This is important because it impacts the way climate policy can be developed in the US.

In order for any legislation to pass, it must be approved separately by the two chambers of congress, the Senate and the House of Representatives, and then signed by the President. This means that each of those entities effectively has a veto on passing new legislation. Even when a single political party may control both the executive and legislative branches, there is likely to be less coordination and party discipline to pass legislation in the US system compared with parliamentary systems. Institutional theory gives a possible explanation for this. Lack of coordination and party discipline are due to the fact that the President is elected by voters across the US whereas legislators are elected by smaller subnational constituencies (Shugart & Haggard, 2001). In general, this can result in the President prioritising issues of national importance, while legislators tend to place higher importance on local interests. The degree to which executive and legislative primary concerns diverge depends on the electoral rules (ibid).

An important consequence of the high degree of legislative-executive separation is that when divergent concerns exist the two branches need to either compromise to get legislation passed or face gridlock. The potential to reach compromise between the presidential and legislator's priorities and to overcome the gridlock diminishes if parties are highly fragmented (having different priorities) or poorly disciplined (not voting uniformly) or if the President's party is a minority among ideologically polarised legislators (ibid). This certainly has been the trend in the US congress since 2010.

The President and other executive agencies have certain policy-making powers and responsibilities defined by the constitution and others established or delegated by legislation. In practice, these sources of authority vest the executive branch with considerable powers to develop policies independently of congress.

The judicial branch can invalidate legislation that violates the constitution, and can invalidate executive action that violates the constitution and/or exceeds the authority established by legislation. In general, the Supreme Court can only overturn an action by an executive branch agency (i.e. the president or the EPA) if the agency is incorrect in its interpretation of the law, or if the agency has acted in an 'arbitrary and capricious' manner. Since the implementation of climate policy to date has come mainly in the form of regulations under well-established statutes (primarily the Clean Air Act), the court cases to date have focused on agency authority under those statutes.

Political authority in the US is also divided vertically between the federal government, the 50 states and other subnational actors (cities, counties and so on). The federal government does not have law-making authority of unlimited scope; rather the scope of its powers is limited by the US constitution. Each state has its own legislature and executive exercising powers relating to policy development, albeit with variations in detail from state to state. The states have considerable authority, in some areas extending beyond that of the federal government. In other areas authority is shared between the federal and state governments. The federal government can legislate when issues affect inter-state commerce.

4.6.2 Development and adoption of climate policy in the US

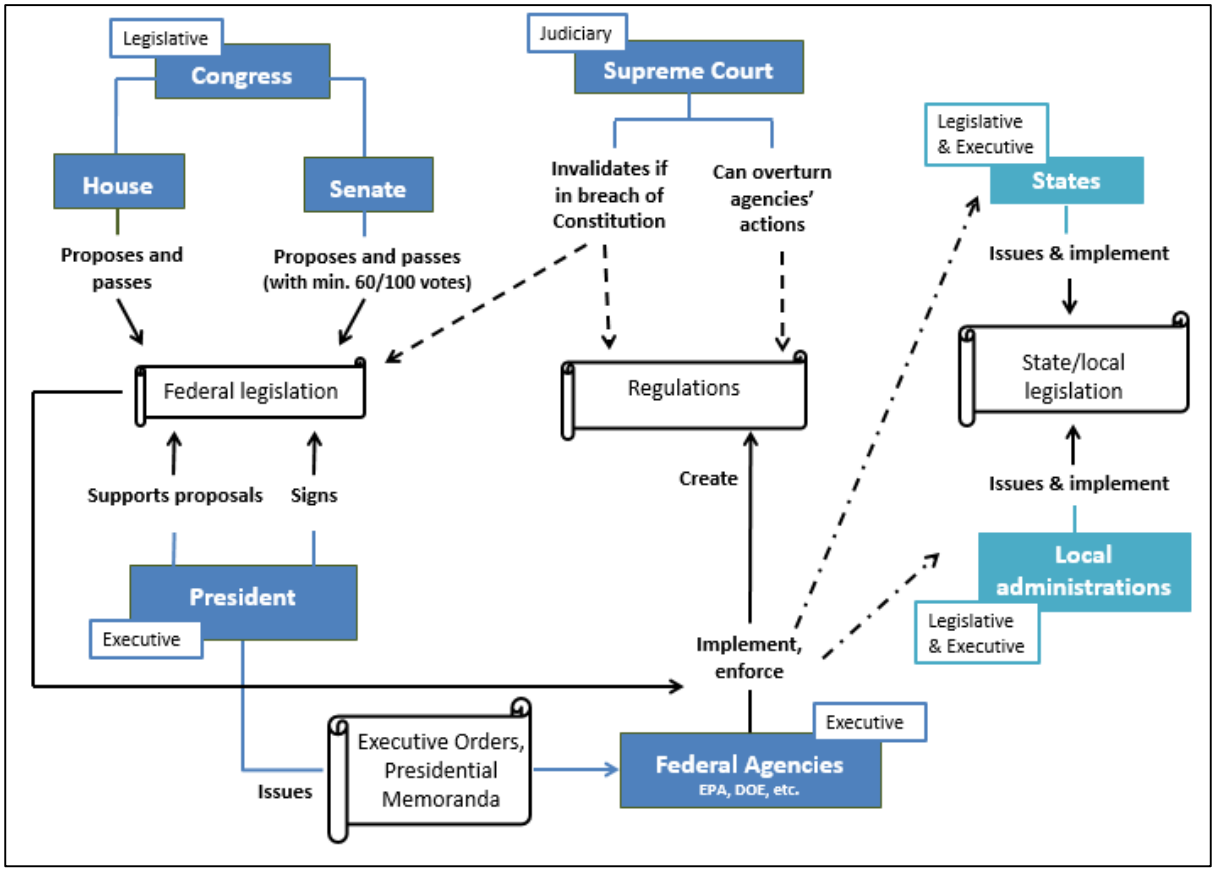
Based on the horizontal separation of authority discussed above, at the federal level climate policy can be developed either by congress through the legislative route or through executive branch actions directed by the President (executive route). The President may also issue 'executive orders', which are directives to executive branch agencies in how to conduct their business. Such executive orders do not create new law. Because the executive actions (whether done by regulations or

executive order) can be done solely by the executive branch, such actions are more susceptible to modification as the President – and especially their party – changes.

On the one hand, these divisions of authority have been an obstacle to adopting comprehensive climate legislation in the US, partially because they extend the power of the fossil fuel industry (Karapin, 2016). For example, the fragmentation meant that congress was able to dilute energy-saving plans from the Carter administration in 1978 and blocked Clinton's energy tax proposal in 1993, the Kyoto Protocol and several cap-and-trade bills (ibid). However, under the conditions of opposition to climate change policy in the congress, the division of authority has also enabled substantial climate policies to be developed by the President under his executive authority. In fact, because congress has opposed climate action, initiative from the executive branch has become more important as a driver for the past 10 years. At the same time, this system leaves the door open for an incoming president to use his or her executive authority to try to undo previous executive branch actions.

Significant powers are distributed also among subnational levels of government – at state and local level – where laws and policies can be developed and enacted as well. On the one hand, with respect to climate action, this distribution of powers results in many overlapping authorities that can become confusing. For example, reducing emissions from vehicles is impacted by regulatory practices at each level of government (federal, state and local). However, this distribution of authority means that many policy ideas are first generated at the local level (Schreurs, 2008) and has led to significant action at that state level.

Figure 10. Overview of main institutional actors involved in climate policy development and implementation



Source: Authors

Legislative route

A proposed piece of legislation (called a bill) needs to be sponsored/written by at least one member in both chambers of congress, must receive support in its originating committee (a subset of representatives or senators that have first consideration of bills in a particular subject area) and must pass in the entire chamber itself. Often, amendments are added to iterations of bills in each chamber that make the versions passed in each chamber starkly different.

The House and the Senate must then convene in a conference committee to agree on a united bill before it can be passed on to the President for approval. Furthermore, senators and representatives have a number of procedural tricks that they can use to prevent a bill even from being voted on, such as the filibuster in the Senate, which allows a senator to speak for an indefinite period of time, thus delaying or preventing a vote on a bill. A filibuster can only be overcome by a vote of 60 senators and it has become routine in the Senate to not advance bills at all for a vote unless there are 60 votes in support. In the current political climate, these procedural hurdles have made it difficult to pass major new legislation on any topic. Senators/representatives who vote in favour of legislation that might not be in the interest of their constituency – such as climate legislation for a coal-producing state – can be compensated by earmarking federal funding that is directly favouring this constituency (Varadarajan & Zuckerman, 2012).

An environmental law passed by congress will usually designate a federal agency responsible for implementing and enforcing the law. The law will also clarify when/where inter-agency cooperation is required, and will provide guidelines on how to cooperate with the states. Depending on the law, this can include giving states control over certain aspects of implementation or just keeping them informed of implementation measures.

Over the past decade there have been several attempts to pass new federal legislation on climate change that have failed due to opposition in one or both chambers. In 2009–2010 the Democratic Party controlled the Presidency and both houses of congress. Proposed climate legislation (cap-and-trade) was supported by the President, passed the House of Representatives, but was never put to a vote in the Senate. In the Senate there were competing bill proposals (including multiple bill proposals from different Democratic senators) and not enough evidence of support for any of them, so the Democratic leader of the Senate concluded he could not get the 60 votes necessary to override a Republican filibuster (Walsh, 2010).

Executive route

When agreement cannot be expected from congress, the President has the ability to develop climate policies within the umbrella of the executive branch. Since the US does not have direct climate legislation, federal climate policies are being developed and implemented by the executive branch under existing legislative authorities, many of which do not explicitly address climate change (Columbia Law School, 2013). The President has the authority to direct federal agencies to adopt certain policies. These policies are then passed onto various agencies to implement (often by issuing new regulations) and ultimately down to state and local authority levels. For instance, the Climate Action Plan, which President Obama released in June 2013, directed federal agencies to take concrete steps to reduce carbon emissions, prepare for the impact of climate change and lead international efforts to address global climate change (The White House, 2013). The Climate Action Plan has thus become a central coordinating mechanism.

There are a number of existing laws that set out the core principles that enable the federal government to take action on climate change. Chief among these is the Clean Air Act (CAA). Other relevant laws include the Energy Policy Act, Resource Conservation and Recovery Act (RCRA), and the Energy Independence and Security Act (Mellon, n.d.; UNFCCC, 2015).

Local and state level

Subnational authorities (state agencies, city and county governments and so on) also have the power to develop climate policies, as noted above – as long as they do not violate national standards, such as creating laws that negate, are inconsistent with or fail to meet existing federal standards. Such policies are then implemented at the state/local level. These laws do not apply outside of their jurisdictions, but can influence action in other states or at federal level, for instance if they champion successful novel initiatives (Jensen et al, 2014).

Examples include California's AB32 legislation and the Regional Greenhouse Gas Initiative (RGGI) – described in Box 8, section 4.1 above, along with other examples of state and local initiatives. States may even cooperate with entities outside of the US, as demonstrated by California linking its emissions trading system with Quebec (and the plan to link with Ontario) (California Environmental Protection Agency Air Resources Board, 2013; Martell & De Souza, 2015). This international cooperation is permissible as long as a state does not attempt to enter into an agreement that is legally binding under international law and does not conflict with the Federal government's conduct of foreign policy.

4.6.3 Implementation and enforcement of climate policies in the US

The Environmental Protection Agency (EPA) has been charged with implementing the majority of the laws under the Clean Air Act, including the development of national greenhouse gas emissions standards for power plants (EPA, 2015a). The Department of Energy implements efficiency standards for appliances and the loan guarantee programmes for innovative clean energy technologies.

The states have the responsibility to implement the regulations and standards set by the EPA. For example, under the Clean Power Plant rule, the EPA established overall emission reduction targets for each state, but then each state could choose how actually to meet that target through a variety of policy options (EPA, 2014a). Many states also have their own requirements to reduce greenhouse gas emissions, to increase deployment of renewable energy or to promote similar mitigation actions. Moreover, local communities and states have the authority to regulate climate-related issues such as land use or building codes.

Each federal agency has its own specific enforcement mechanisms. For instance, under the Clean Air Act, the EPA (and/or each state) has the authority to enforce its regulations through direct administrative enforcement actions or through civil or criminal actions in court (EPA, 2007). If the EPA determines that a state plan for implementing the Clean Air Act requirements does not meet the necessary standards and/or that a state is otherwise not enforcing the Clean Air Act requirements, it may impose penalties on the state or take over direct enforcement in that state (ibid). However, such penalties in the past have proven to take a long time to enforce.

The Clean Air Act also has a provision authorising 'citizens suits' (Legal Information Institute, n.d.). This provision authorises citizens to bring a civil lawsuit against entities that violate certain provisions of the Act or even against the administrator of the EPA if the administrator fails to carry out a non-discretionary duty under the Act. In the climate change context, citizens (joined by several states and local governments) used this provision to compel the EPA to make its endangerment finding regarding greenhouse gas emissions (see Box 7, section 4.1 above). More recently, citizens (but not state or local governments) attempting to utilise this particular provision to compel specific state regulatory action (in that case over Washington State's oil refineries) have not been successful (United States Court of Appeals, 2013).

One of the most important elements of US climate action is the new Clean Power Plan Rule, as noted earlier. The rule would limit and reduce emissions from the US power sector, which accounts for 31 per cent of US greenhouse gas emissions. The plan has been politically contentious in the US, with strong opposition voiced by Republican politicians, particularly those representing major coal-

producing states. Box 9 briefly describes how the Clean Power Plan is implemented and the risks to its full implementation.

Box 9. Clean Power Plan rule implementation and prospects

In establishing the Clean Power Plan, the US Environmental Protection Agency used its authority under the Clean Air Act (CAA) to:

- Establish emissions rate standards for fossil fuel power plants (separate standards for coal and oil units, and for natural gas units)
- Set, based on the emissions rate standards, individual emissions goals for each US state, depending on its current generation mix

Each US state can choose from different policies to meet the goal established for it by the EPA, including the possibility of cooperating with other states and establishing emissions trading systems. If a state does not establish its own plan, then the EPA would directly implement a plan for that state.

Although the EPA finalised the Clean Power Plan rule in August 2015, there are still possibilities that the regulations may not be fully implemented over the next 15 years.

Risks to full implementation of the rule include:

- **Legal challenge** – Lawsuits have already been filed challenging the Clean Power Plan, arguing that the EPA has exceeded its authority under the CAA. Although the EPA's authority to regulate greenhouse gases under the CAA has been upheld by the US Supreme Court several times, the particular section of the CAA that the EPA relied on for the Clean Power Plan has not been frequently utilised. Thus, there is little judicial precedent on this issue. Early in 2016, the Supreme Court took the unusual step of staying the implementation of the CPP until the judicial review was completed. This was generally viewed as a sign that the Court is likely to invalidate at least some aspect of the plan. The subsequent death of one of the justices who had voted in favour of the stay (which had been approved by a vote of 5:4) has also impacted the outlook for the plan.
- **State refusal to implement the Plan** – Some opponents of the new regulations have advocated that states should refuse to develop plans to implement the Clean Power Plan. If the Plan otherwise survives legal challenge, this would not prevent it from being implemented in non-compliant states as the EPA would implement it directly.
- **Executive action to repeal the Plan** – President-elect Donald Trump in 2016 announced that he would repeal the Clean Power Plan through executive action. The following reasons mean that doing so would be very difficult but not impossible:
    - Under existing law, the EPA has not only the authority to regulate greenhouse gas emissions, but also an obligation to do so.
    - Any change to regulations (including repeal) must go through the same type of rigorous public notice and comment process that the original regulations went through, so changing them takes significant political commitment and several years.
    - The subsequent rule-making must take account of the administrative record compiled to support the original rule. In the case of the Clean Power Plan this record includes hundreds of pages of technical documents and responses to 4.5 million public comments that were developed to support the final rule. A repeal or change to the regulations that does not adequately address the record that

supported the regulations in the first place is more susceptible to being invalidated as 'arbitrary and capricious' by a reviewing court.

Nevertheless, since the President also appoints the head of the EPA, this could be another route to delay implementation even if the Clean Power Plan is not repealed outright.

- **Legislative change to the Clean Air Act** – Congress could pass amendments to the CAA to invalidate the regulations even after they take effect. Such a legislative change would be incredibly politically contentious and would likely only be possible if Republicans retained majority control in the House, gained the Presidency, and extended their majority in the Senate to 60 or more seats.[36]

4.6.4 Monitoring, reporting and verification in the US

In the absence of comprehensive climate change policy at the federal level, the MRV system of greenhouse gas emissions in the US has developed on the basis of the Clean Air Act and the domestic implementation of the international requirements under the UNFCCC.

Under the CAA, the EPA cooperates with state and local authorities to monitor air pollution emissions[37] from stationary sources. The EPA requires reports of emissions directly from large emitters. Under the EPA's regulations (US Government Publishing Office, 2016), facilities that emit over 25,000 metric tonnes of greenhouse gases per year are required to file an annual report on their emissions. The mandatory reporting requirements began in 2010. In 2013, approximately 8,000 direct emitters filed reports covering approximately half of total US greenhouse gas emissions that year (EPA, 2014b). Information from this reporting programme is available from the EPA on a facility-by-facility basis (ibid). The monitoring under the new Clean Power Plan rule would utilise these same CAA mechanisms (EPA, 2015). For emissions from mobile sources, the EPA monitors compliance by conducting inspections at engine manufacturing facilities, auto dealers, auto-parts dealers and emissions laboratories (EPA, 2016a). The EPA also receives information from state or local automobile inspection facilities.

In developing the greenhouse gas reporting rules, the EPA decided against requiring third-party verification of the emissions reports. Rather, verification is achieved through a combination of pre-submittal and post-submittal checks. These checks examine the data submitted against a variety or parameters – such as whether the reports are within the expected range for that type of facility compared to other facilities (and compared to other years for that facility), and whether the data reported is consistent with other reports the facility makes not directly related to the greenhouse gas reporting programme like those to the Department of Energy (EPA, 2015b). The EPA then follows up manually on any errors or anomalies in the data identified through these checks (ibid). Lastly, the facilities must maintain records on their monitoring plan (including information on the quality control and quality assurance methods utilised to ensure monitoring is done correctly) (ibid). The facilities must maintain records for three years and these records can be inspected by the EPA (ibid).

The emission data is compiled into an annual inventory of greenhouse gas emissions, which is also used for international reporting (EPA, 2016b). The EPA prepares the inventory based on national statistics on energy use, agriculture and other data (ibid), much of which is being collected by federal agencies for purposes other than greenhouse gas monitoring and reporting. For example, energy production and use statistics are collected by the Energy Information Administration (EIA) through

[36] The 60 seat majority would be required because under current Senate rules, 60 votes are typically necessary to close debate on a bill and bring it to a vote. Neither political party has held a reliable 60 vote majority in the Senate in modern times.
[37] Sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead and particulate matter.

regular surveys distributed to the energy industry,[38] from states and localities. Much of the data is collected at operator or facility-level.

4.7 Interest groups, party politics and public opinion in the US

Party politics, namely the interplay between the positions of the two main parties (Republican and Democratic) and their relative power at a given point in time (e.g. which holds the Presidency, controls the House and the Senate),[39] are the key factors in the development and implementation of climate change policy in the US. This is particularly important given the high degree of separation of powers discussed earlier.

US electoral institutions enable various economic interests, including corporations, special interest groups (e.g. trade associations and business think tanks) and wealthy individuals to exercise considerable influence over the political process. A number of such economic elites have used their wealth to influence public debate and policy in their preferred direction, including on climate change. One of the most powerful channels is through the use of campaign money to influence officials from both major parties. For example, the Koch Brothers – the owners of a large oil and chemicals conglomerate – used their political action committees to elect to congress and state legislatures many Republicans who tended to oppose climate policies (Greenpeace, 2010), while others such as George Soros and Tom Steyer have used their wealth to support pro-climate policy candidates (Restuccia & Schor, 2015).

The defining feature of the campaign by the economic elites against climate change policy in the US and one that has affected the overall stance of the country on climate policy has been the use of the sceptical opinion towards climate change, including its origins, impacts and the necessity to act (Dunlap, 2013). The US has seen a more organised effort to question the science behind climate change than most other countries (ibid). This effort began in the 1990s and included a loose coalition of fossil-fuel interests, industry groups, think tanks and conservative not-for-profit foundations (Conway & Oreskes, 2010; Dunlap, 2013). studies have found that the climate denial effort has been at least partially successful and has contributed to the increased political polarisation of public opinion on climate change in the US since 2000 (McCright & Dunlap, 2011). Over the past decade many of the large corporations that most vocally supported these efforts in the 1990s claim to have disengaged (Goldenberg, 2015; McCright & Dunlap, 2011), although it is not clear that they have ceased such practice.

Scientific elites (such as research universities and think tanks) often publish research on climate change directed at policy-makers that contributes to shaping policy, as noted earlier. Climate change research at the US Global Change Research Program is an example of government-sponsored climate change research targeted at and disseminated to policy-makers. Furthermore, environmental advocacy organisations, as well as – increasingly – faith communities, play an important role in influencing public opinion and the political orientation of the main parties. Yet, companies in the oil, coal and gas industries have consistently outspent pro-environment organisations in lobbying for representatives and senators (Mackinder, 2010).

Strong polarisation among the main political parties with respect to both climate science and climate policy is an important feature of American climate politics. The lobbying efforts of climate sceptics fed into and reinforced a general trend in the Republican Party over the past 30 years of becoming increasingly opposed to any type of government intervention and regulation (Collomb, 2014). Despite polls showing most Americans (including approximately half of Republicans) believe climate

[38] http://www.eia.gov/survey/

[39] While these two parties dominate the political landscape, there are also various smaller parties that advocate for specific issues. Occasionally, their candidates may play a critical role in elections by taking away potential voters from the main parties. For example, the Green Party and its candidate for President Ralph Nader took away many votes from Democrat Al Gore in 2000. The Libertarian Party is a recent example of a small right-wing party.

change is occurring, all of the main Republican presidential candidates in 2016 denied that major action needed to be taken on climate change (and many continued to deny climate change is occurring at all). The UNFCCC was negotiated and adopted under a Republican President in 1992 and the Clean Air Act was able to be used to successfully implement a cap-and-trade scheme, with bipartisan support, in the 1990s to address pollutants causing acid rain; however, attempts in 2008–09 to develop a federal cap-and-trade scheme for greenhouse gases was strongly resisted by the Republican Party[40] (Congressional Research Service, 2009; Kaplun, 2009). Even when compared with conservative parties in other countries, for instance in Canada or the UK, Republicans tend to emphasise the significance of free markets more fervently (Båtstrand, 2015).

On the other hand, the Democratic Party broadly tends to favour more government intervention and regulation to address societal problems than does the Republican Party (though less so than its counterpart centre-left parties in Europe). Democratic voters see climate change as a more urgent issue than their Republican counterparts (see Box 10 below), and so the Democratic Party has been more active in building a platform that contains climate policy and seeking voters that are concerned about climate change (McCright & Dunlap, 2011).

Political polarisation on the issue of climate change does not mean that Republican Party officials have done nothing to address climate change (particularly at the state or local level). Nor does it mean Democrats are uniformly supportive of taking action on climate change. In late 2015, 11 Republican members of the House of Representatives and four Republican senators publicly stated that climate change was a significant issue that needed to be addressed (Leber, 2015). Conversely, Democratic senators representing states that are large producers or consumers of coal have tended to be less supportive of climate action (Silva, 2014).

Given the strong polarisation in US politics, independent voters often play a critical role in determining electoral outcomes. Accordingly, the major parties may adapt their policy platforms to court independent voters. On climate policy, however, independent voters do not appear to be a major factor affecting party positions. A 2013 study, for example, demonstrated that independent voters still held mixed attitudes towards climate change (Wright, 2013). This reality perhaps allows both parties to 'play to their base' for now, though this may change in future, for example as a result of more severe climate impacts or changes in the relative prices of low- and high-carbon energy sources.

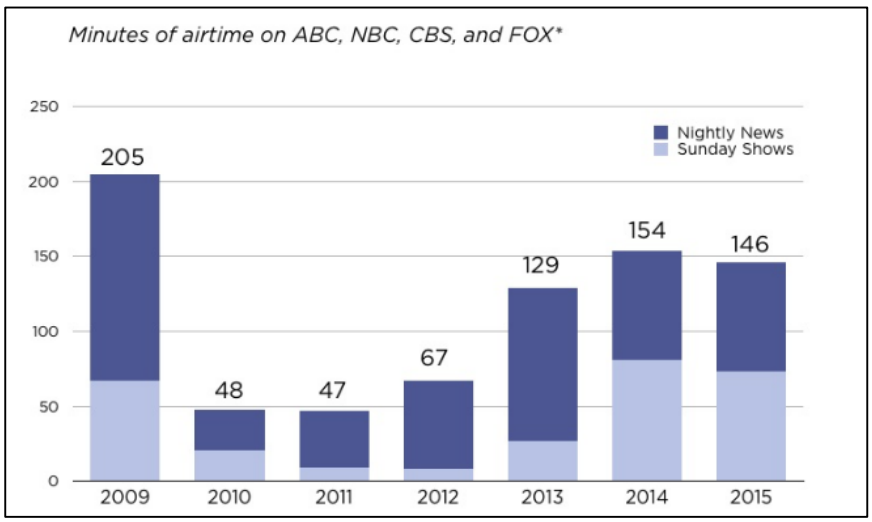
While overall awareness of climate change among the general public in the US seems to be quite high, the need for action is not regarded a priority. Elite cues and structural economic factors, which to a large extent are reflected in the media coverage of the issue, have been shown to have the largest effect on the level of public concern about climate change in the US (Brulle et al, 2012). For example, according to a Gallup poll conducted in 2007–2008, about 98 per cent of citizens interviewed declared to know at least 'something' or a 'great deal' about climate change (Lee et al, 2015; Pelham, 2009). Of these, however, only 49 per cent attributed climate change to human activities, and 64 per cent considered it a serious threat to their personal life. Yet according to the Gallup poll's measure of the 'most important problem', over the past 40 years environmental issues have rarely exceeded 3 per cent of the vote, with global warming or global climate change usually being at the bottom of other environmental concerns (Brulle et al, 2012).

This is to some extent reflected in the way the media covers climate change in the US. In general, coverage has been declining since 2009 (see Figure 10 below) despite more actions being taken on climate change internationally and in the US, especially in 2015. Broadcast networks also generally have not focused on the impacts of climate change on the national economy, national security or public health, have largely ignored the Clean Power Plan and have continued to give climate change

[40] The Waxman-Markey Bill that would have established a variant of an emissions trading plan similar to the EU's emission trading scheme was only supported by eight Republicans in the House of Representatives in 2009.

denial a platform, with more airtime given to climate sceptics and far fewer scientists in 2015 compared with 2014 (Media Matters for America, 2016).

Figure 10. Broadcast news coverage of climate change in the US



*Note: *FOX does not have a nightly news programme*
Source: Media Matters for America, 2016

Box 10. Voter preferences on climate change by political party

According to a poll conducted in January 2015 by Stanford University, Resources for the Future and the *New York Times*:

- 48 per cent of Republicans say they are more likely to vote for a candidate who supports fighting climate change.
- 67 per cent of respondents (including 48 per cent of Republicans and 72 per cent of independents) said they were less likely to vote for a candidate who said that human-caused climate change is a hoax.
- There is broad recognition (83 per cent of Americans, including 61 per cent of Republicans and 86 per cent of independents) that if nothing is done to reduce emissions, global warming will be a very or somewhat serious problem in the future.
- 74 per cent of Americans said that the federal government should be doing a substantial amount to combat climate change, with this support greatest among Democrats and independents.
- 91 per cent of Democrats, 78 per cent of independents and 51 per cent of Republicans said the government should be fighting climate change.

Source: Davenport & Connelly (2015)

The relatively consistent split between the Democratic and Republican Parties at the national level is not reflected in polling data about US public opinion on climate change. While Republican voters are not as likely to prioritise climate change policy as a key electoral issue, that does not necessarily translate to them being against climate change policy or in favour of candidates denying climate change as a problem (see Box 10). The role of climate policy in the election campaign also varies starkly for elections of different political offices. The more localised an office is, the more the candidates will play to the concerns of the local population. Elections for seats to the House of Representatives, which are based on local congressional districts, are more likely to focus on the

impacts of climate policy (or climate change) within the relevant district. Senate elections tend to focus on state-wide impacts, and so on.

4.8 Future outlook for the US

The future of the federal climate policy in the US in the near term, and to a large extent the ability of the country to meet its NDC target, strongly depends on the political developments (in particular the consequences of the election of Donald Trump as US president) in the coming 12 months (2017).

Recent studies (CAT, 2015; Belenky, 2016; Larsen et al, 2016; WRI, 2015) demonstrate that in order to meet its NDC commitment to reduce emissions by 26 per cent compared with 2005 the US will need to ensure that all the policies announced in 2015, including the Clean Power Plan (CPP), and the targets decreed by Executive Orders from the Climate Action Plan (CAP), are implemented within their proposed timelines. Three of these studies also suggest that meeting the NDC commitment will require existing policies and targets to be strengthened (CAT, 2015; Belenky, 2016; Larsen et al, 2016).[41] According to all four studies the most significant share of reductions would come from the CPP which commits states to cut emissions from 2022 onwards. As discussed earlier, the final decision over the CPP is likely to come some time in 2017 or 2018 – close to the deadline by which states are meant to submit their plans to meet CPP targets. Therefore the US's ability to meet its NDC in 2025 is dependent on these states being ready to start implementation in 2022.

The uncertainty created by Donald Trump about the future of the CPP makes it questionable as to whether all US states will comply or whether efforts under the CPP will stall. According to E&E's (2016) assessment of states' responses to the Supreme Court stay on the CPP, however, there are 19 states that will continue to submit their CPP plans, despite two of these states (Colorado and Louisiana) suing the EPA over the CPP (Environment Energy Publishing, 2016). Based on the state targets that are set by the EPA, these 19 states represent 36 per cent of the emissions reductions the CPP is set to deliver in the interim period (2022–2029), and 30 per cent for 2030 and beyond.

Despite the urgency of action, it is likely that federal climate policy under Republican President Donald Trump will become significantly less ambitious, based on his comments during the election campaign and his campaign manifestos (Trump, 2016 a, b). For example, in addition to his vow to repeal the Clean Power Plan, Trump has announced that he would cut all federal climate spending by eliminating domestic and international climate programmes, withdraw from the UNFCCC Paris Agreement, encourage the use of fossil fuel resources and dismantle climate policy in general through executive action. The section on institutions above shows that the new President would face time-consuming hurdles in scaling back major climate policies, but that it would not be impossible for him to do so.

Given that Trump will also likely appoint at least one Supreme Court justice, likely tilting the court towards conservatism, he could seek to repeal previous amendments to the Clean Air Act that brought greenhouse gases under the EPA's remit, and override or weaken the authority of the EPA. It has already been reported that Trump will appoint a climate sceptic, Myron Ebell, to run the EPA (Bravender, 2016). It is difficult to predict how quickly changes to climate policy will happen, but the Climate Action Plan and the Clean Power Plan will likely stall.

Apart from the outcome of the presidential elections, some interesting coalitions could form the basis for cross-party climate action. Elements of the most conservative tea party faction of the Republican Party support distributed solar and wind generation because these promote individual independence from state and private monopolies in the electricity sector (Ryan, 2016). Some

[41] The different projections of the studies on the shortfall in the greenhouse gas emission reductions to achieve the NDC target can be attributed to the level of emission reductions that were estimated to be achieved from existing policies, and the assumptions on the extension of tax credits for wind and solar farm investment.

conservatives believe that a carbon tax would be an effective policy if it were paired with substantial reform of US tax policy overall (Plumer, 2015).

States also play a key role in developing and implementing climate policies. The implementation of several federal policies, particularly the regulations under the CAA, is primarily undertaken by the states. In addition, states also have the power to develop climate policies under their own authority – as long as they do not infringe on the authority of the federal government or conflict with federal laws. California, in particular, has been a leader in implementing policies to combat climate change. Although these initiatives only cover some of the US, they are still significant. This means that continued emission reductions at state and local level might be seen even if efforts on the federal level lag, although these would have less impact than concerted efforts on a national scale.

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Appendix 1. The US Climate Action Plan

The US Climate Action Plan included the following measures:[42]

- Reduce carbon pollution:
    - Directs EPA to establish carbon pollution standards for both new and existing power plants;
    - Makes up to $8 billion in loan guarantee authority available for advanced fossil energy and efficiency projects;
    - Directs the Department of Interior to permit enough renewables project–like wind and solar – on public lands by 2020 to power more than 6 million homes;
    - Sets a new goal to install 100 megawatts of renewables on federally assisted housing by 2020;
    - Expands Better Building Challenge, focusing on helping commercial, industrial and multi-family buildings cut waste and become at least 20 per cent more energy efficient by 2020;
    - Sets a goal to reduce carbon pollution by at least 3 billion metric tons cumulatively by 2030 through efficiency standards for appliances and federal buildings;
    - Proposes standards for Medium and Heavy-Duty Vehicles which, if finalised as proposed, will reduce 1 billion tons of carbon pollution;
    - Leverages new opportunities to reduce pollution of hydrofluorocarbons;
- In February, as part of the President's 2016 budget, the POWER+ Plan was launched to invest in workers and jobs, address important legacy costs in states with high incomes from coal, and drive the development of coal technology. The Plan dedicates new resources for economic diversification, job creation, job training, and other employment services for workers and communities impacted by layoffs at coal mines and coal-fired power plants and provides new tax incentives to support continued technology development and deployment of carbon capture, utilisation and sequestration technologies.
- Prepare for climate change impact by increasing efforts in climate resilience
- Lead global efforts:
    - States the US will seek an ambitious, inclusive, and flexible agreement in 2015 in the UNFCCC (which it did); while also noting efforts to address climate change in other international for a such as the Montreal Protocol and the International Civil Aviation Organization;
    - Commits to expand major new and existing international initiatives, including bilateral initiatives with China, India, and other major emitting countries;
    - Calls for the end of US government support for public financing of new coal-fired powers plants overseas, except for the most efficient coal technology available in the world's poorest countries, or facilities deploying carbon capture and sequestration technologies.

[42] List is paraphrased from: https://www.whitehouse.gov/the-press-office/2013/06/25/fact-sheet-president-obama-s-climate-action-plan and https://www.whitehouse.gov/the-press-office/2015/08/03/fact-sheet-president-obama-announce-historic-carbon-pollution-standards

Appendix 2. Assessing target performance in China

Assessing target performance and implementing corresponding rewards and punishment based on assessment results in China[43]

Assessment and evaluation of target responsibility is quantitative (full credit is 100 points) and composed of two parts. Part 1 is about the assessment of annual target performance. If the target is fully met, a total of 40 points are awarded, and a bonus is warranted for outstanding performance. Part 2, which is about the assessment of local governments' implementation of energy conservation measures, is worth 60 points in total. The assessment process of target performance for provincial governments is illustrated in Table A.1.

Table A.1 Provincial government energy conservation target responsibility assessment scoring table

Assessment indicators		Assessment content	Score	Scoring standards
Energy conservation targets (40)	1	Decrease in energy consumption per unit of GDP (tce/10,000 RMB)	40	If the annual target is met: 40 points If 90% of the target is met: 36 points If 80% of the target is met: 32 points If 70% of the target is met: 28 points If 60% of the target is met: 24 points If 50% of the target is met: 20 points If less than 50% of the target is met: 0 points Every 10% additional decrease in the energy intensity indicator is awarded by an additional bonus of 3, up to 9 bonus points in total. This indicator is a binding target: as long as this target is not met, then the contractor is considered to have failed the energy conservation responsibility assessment.
Energy conservation measures (60)	2	Organisation and leadership of energy conservation	2	1. Establish the accounting, monitoring, and assessment system of the energy consumption per unit of GDP, 1 point 2. Establish coordination mechanism for energy conservation action, specify responsibilities and division of labour, periodically hold meetings, and investigate significant problems, 1 point
	3	Disaggregation and implementation of energy consumption targets	3	1. Disaggregate energy conservation targets level by level, 1 point 2. Inspect and assess energy conservation target performance, 1 point 3. Periodically publish energy consumption indicators, 1 point
	4	Adjustment and optimisation of industrial structure	20	1. Increase of the share of value-added by the tertiary sector in total GDP in the region, 4 points 2. Increase of the share of value-added by high-tech industry total industrial value-added in the region, 4 points 3. Draft and implement energy conservation assessment and inspection for fixed assets investment projects, 4 points 4. Meet the annual target for the phase-out of obsolete production capacity, 8 points
	5	Energy conservation investment and the implementation of key projects	10	1. Create special fund for energy conservation and ensure its full fully funded, 3 points 2. Share of energy conservation special fund in total fiscal revenue increases from year to year, 4 points 3. Organise and implement key energy conservation projects, 3 points

[43] For more details on the evaluation process of the Target Responsibility System (TRS), see Li, H., Zhao, X., Ma, L., Qi, Y., 2013. Policy implementation: energy conservation target responsibility system, in: Qi, Y. (Ed.), *Annual Review of Low-Carbon Development in China* (2013). Social Sciences Academic Press, Beijing. English version of the chapter is on file with the authors upon request.

	6	Energy conservation technology development and promotion	9	1. Include energy conservation technology R&D in annual science and technology plan, 2 points 2. Share of energy conservation technology R&D fund in total fiscal revenue increases from year to year, 3 points 3. Implement energy conservation technology demonstration projects, 2 points 4. Organise and promote energy conservation products, technology and energy services mechanism, 2 points
	7	Energy conservation management in key enterprises and industries	8	1. Meet annual energy conservation targets for key energy consumption enterprises (including Top Thousand Enterprises), 3 points 2. Implement annual energy conservation monitoring plan, 1 point 3. If binding energy efficiency standards compliance (%) for new buildings meets annual target, 4 points; if 80% of the target is met, 2 points; if less than 70% of the target is met, 0 points.
	8	Enforcement of laws and regulations	3	1. Enact and refine complementing regulations for the Energy Conservation Law, 1 point 2. Implement energy conservation supervision and inspection, 1 point 3. Enforce energy consumption quota standards for energy-intensive products, 1 point.
	9	Implementation of energy conservation fundamentals	5	1. Strengthen capacity building of energy conservation supervision staff and agencies, 1 point 2. Improve energy accounting system and strengthen accounting infrastructure, 1 point 3. Provide energy measurement equipment as mandated, 1 point 4. Carry out energy conservation advocacy and training, 1 point 5.Implement energy conservation rewards mechanism, 1 point
Total			100	

Source: Attachment 1 of the Implementation plan of the assessment system of energy consumption per unit of GDP (State Council, 2007b)

Assessment of target performance of administrative departments follows similar procedures. For instance, before the central government conducts on-site assessment of Shandong Province's target performance and implementation of energy conservation measures, administrative departments of Shandong Provincial Government must file a self-assessment report, prepare supporting documents, and submit the hard copies and electronic copies of the materials to the provincial ECO by deadline. ECO will submit the materials to provincial leaders to examine and approve the reports and supporting documents.

Based on assessment results, local governments designed rewards and punishment schemes (Table A.2). Departments in charge of cadre appointment and management also use assessment results for evaluation of CPC and government leaders. Assessment results from the TRS are taken into account when the department in charge of cadre management to evaluate and assess leaders of local party and governments. The national *Implementation plan of the evaluation system of energy consumption per unit of GDP* requires that evaluation results of provincial governments be submitted to the department in charge of cadre management to serve as an important reference for the assessment of provincial government leaders according to the requirement in the *Interim procedures for comprehensive assessment and evaluation of local leading groups and leading cadre of CPC and governments embodying the scientific outlook on development* (hereafter referred to as the 'Interim Procedures').

More importantly, the assessment of TRS follows the 'one-ballet-veto' principle. This means that if the government or an enterprise fails the energy conservation target, then no matter how well it performs in meeting all the other targets, the government or enterprise is considered as having

failed the target. The Interim Procedures is the fundamental document for assessing local leaders of the CPC and governments in China, and is used for assessment of local leading groups of CPC and governments during the change of the term of office, and in individual promotion of members of the leading group.

Table A.2 Rewards and punishment based on Target Responsibility System assessment results

Assessment result	Rewards and punishment to local governments	Rewards and punishment to local government leaders
Target IS met or exceeded	Commend and reward the government in national energy conservation award ceremonies	
Target is NOT met	Central government agencies stop approval of new energy-intensive projects in this region Rectify energy conservation performance within a time frame	Government leaders are denied the eligibility for annual awards and honours and are called to account if rectification is unsatisfactory

It is very difficult to provide a quantitative weighting of energy and climate indicators in the performance evaluation matrix of local officials and party cadre. In relative terms, we would say they might still not weigh as much as economic indicators. However, we have empirical evidence that local officials and state-owned enterprise leaders are taking their mandatory energy-saving targets much more seriously than before and that the TRS has had promising performance. Before the TRS took effect in 2007, there was some research revealing that enhancing local economic development (which provides employment to maintain social stability and opportunities for extra-budgetary and off-budgetary revenues) clearly trumps energy conservation in the eyes of some municipalities (Zhao & Ortolano, 2010). But under the influence of TRS since 2007, local governments reinforced enforcement of energy conservation policies (Li et al, 2013). First, local governments strengthened energy conservation government agencies by establishing energy conservation leadership and coordination agencies,[44] supervisory and law enforcement agencies,[45] as well as energy accounting and monitoring divisions within statistical bureaus.[46] Second, local governments created special funds for energy conservation[47], and increased funding over the years. Last but not least, local governments attempted policy innovations in areas such as EPC and energy audits. Governments guided enterprises in energy conservation through incentive, restrictive and informational policies, which altogether increased enterprise leaders' awareness of energy conservation. As a result, enterprises strengthened energy conservation management and redirected funding towards energy conservation (Li et al, 2013).

Zhao et al (2015) provide an in-depth case study that revealed the effect of TRS on energy-saving activities at the enterprise level.

[44] All provinces, municipalities and counties have established energy-saving and emission-reduction leadership groups.
[45] By the end of the 2010, there were 606 energy-saving supervision (monitoring) agencies, among which 32 are provincial agencies, 227 municipal agencies and 347 county-level agencies. By 2012, the total number of energy-saving supervision (monitoring) agencies in China had reached 881, 45 per cent higher than in 2010. All 31 provincial governments, 15 sub-provincial municipal governments (the administrative ranking of these 15 municipalities are between provincial level and municipal level) , 68 per cent of municipal governments and 12 per cent of county governments in China have created energy-saving supervision agencies (Li et al, 2013).
[46] All provinces, municipalities and counties have established energy accounting divisions within their statistical bureaus.
[47] Fiscal expenditure on energy conservation by subnational governments in China amounted to 52.9 billion RMB in the 11th Five Year Plan period (Yu, 2013).