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## PART II

# Views from Different Parts of the World



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## 5 A view from Africa

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*Compared with other continents, Africa has contributed the least to climate change, while its impacts on the continent have been and will continue to be the greatest in the future. Africa generally has the least capacity to adapt. Thus, it should be the continent with the most interest in addressing the climate change problem and would benefit the most if the problem were to be addressed successfully through global cooperation. As Africa is growing fast, starting from a low base, this is also an opportunity to develop a climate-friendly infrastructure. Achieving the required mitigation and adaptation objectives will require external financial support. Given the difficulty of achieving an efficient and equitable solution to this global problem, African countries need to work towards the conclusion of a feasible, inclusive, effective and equitable climate agreement that considers Africa's situation in the identification of mitigation and adaptation options. Addressing climate fund governance issues and increasing the availability of climate funds will be key to success. Africa should also be supported in capacity building, technology development and transfer, and institutional reform. Meeting these objectives will require efforts at the global, national and local government levels.*

In this chapter, I present a view from Africa of how I see the climate change problem and the role that African countries should play in addressing it. Section 1 compares Africa with other continents in terms of contributions to climate change, of vulnerability to extreme temperature rise and of expected damages in the coming decades. Section 2 deals with the role Africa can be expected to play in mitigation and the steps to be taken for adaptation. Section 3 deals with the required financing and criteria for its allocation. Section 4 concludes.

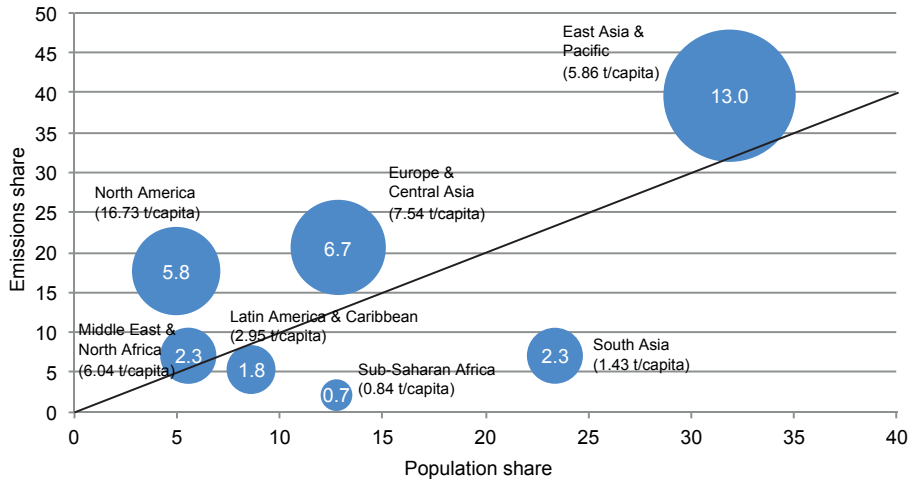
<sup>1</sup> I thank the editors for helpful input and Adrien Corneille and Vincent Nossek for research assistance.

## **1 Africa and climate change**

Evidence concurs that, compared with other continents, the impact of climate change on Africa (as a share of GDP) is generally the greatest and the continent generally has the least capacity to adapt (AfDB 2011, IPCC 2014, Mekonnen 2014). In spite of shortcomings in the estimates of impacts for various reasons including data limitations, a review of estimates suggests that “Africa stands to lose between 2-4% of its GDP due to climate change over the coming ten to fifty years” (Mekonnen 2014, citing Nordhaus and Boyer 2000, Tol 2002a and 2002b, Watkiss et al. 2010). Deeper consideration of the effects of climate change on poverty and income distribution also reveals that the poorer people in Africa would suffer even more (Hallegatte et al. 2015). For example, citing Winsemius (2015), Hallegatte et al. (2015) note that when large-scale floods hit the Shire River Basin in Malawi in January 2015, the poorest areas were the most exposed. In spite of progress over the last 15 years, with a poverty headcount (below US\$1.25 per capita per day in 2011 at 2005 prices) of 41%, Africa’s poverty rate is more than 20 percentage points higher than that of South Asia, and East Asia and the Pacific (Corneille et al. 2015).

On the other hand, relative to other continents and to the developed world in particular, Africa has contributed very little to climate change. Supposing that convergence towards equal CO<sub>2</sub> emission shares per capita is a relevant indicator, Figure 1 shows that Africa makes the lowest absolute contribution and, with 0.84t/capita, has the lowest per capita emissions. Also Africa is furthest below the 45° line, an indication of its low contribution in relative terms. The continent’s low emissions share also indicates that, even if the costs of abatement are low relative to other regions, its contribution will necessarily be marginal relative to the mitigation task especially if, as in Figure 1, emissions related to land use and livestock are not included.

**Figure 1** CO<sub>2</sub> emissions from fossil fuels and manufacture of cement by regions, 2011



Notes: Numbers in blue circles are in Gt and blue circles show position of region relative to 45° line

Source: Author's calculation from World Development Indicators 2015

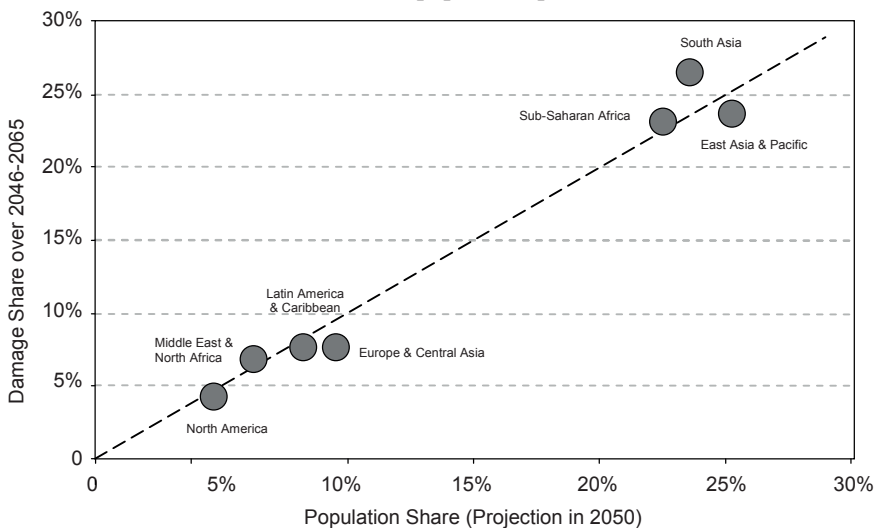
Because of its geography, Africa is also likely to be the region most strongly affected by climate change. About 43% of Africa's land area, 70% of its cropland, 80% of its livestock holdings and 50% of its population are already in drylands (including arid, semi-arid and dry-humid areas) (Cervigni and Morris 2015). African countries' projected reduction in agricultural yields due to climate change could be as high as 50% by 2020 (Boko et al. 2007, p. 435). As discussed below, the temperature is already high in most of Africa; projected above average increases in temperature for the continent due to climate change, combined with limited capacity to adjust, imply that adaptation is a huge challenge for Africa.

Using panel data over a 50-year period, Dell et al. (2012) estimate that a temperature of 1°C higher relative to trend in a given year reduces per capita income by 1.4%, but this holds only for poor countries. When the model is estimated with lags, this large effect is not reversed when the temperature shock is over, suggesting a negative effect on growth from the lower resilience in poor countries.

Predicted temperature changes can be used to estimate potential damage across continents. Drawing on Sauter et al. (2015), Figure 2 gives a very rough estimate of

the potential geographical damage from excessive heat towards mid-century using the A2 scenario from Randall et al. (2007). The estimate draws on projected extreme temperatures, viewing the planet as grid with 1° degree latitude and longitude intervals, where extreme temperatures are defined as the number of days when temperatures are above the 90th percentile of the temperature distribution, and the distribution of damage costs is simply the projected population share times the above measure of extreme temperature. While the estimate is rough because the population shares on the grid are for 2008, it is clear that damage costs are projected to be highest in Africa, South Asia, and East Asia and the Pacific, and above the respective population shares for South Asia and sub-Saharan Africa.

**Figure 2** Potential damage share and population projections in 2050, by region



Source: Author's calculation adapted from Sauter et al. (2015).

Summarising Africa's predicament, the latest report by the Africa Progress Panel (2015) states that "[n]o region has done less to contribute to the climate crisis, but no region will pay a higher price for failure to tackle it." The report also notes that "Africa is already experiencing earlier, more severe and more damaging impacts of climate change than other parts of the world".

## **2 Africa's role in adaptation and mitigation**

African countries are starting to address climate change in their domestic policies (Federal Democratic Republic of Ethiopia 2011, Republic of Rwanda 2011). The removal of subsidies on fossil fuels is a prime example of a policy with multiple gains. Though this is politically sensitive, research in developing countries has shown that such an action may not hurt the poor (Sterner 2011, Mekonnen et al. 2013). Ex ante measures, such as strengthening early warning systems and weather-indexed insurance in agriculture, are also important domestic policy measures to consider (see the chapter by Hallegate et al. in this book).

Africa's recent fast growth is an opportunity to avoid a development path relying on old, high-carbon technologies. This will contribute both to mitigation and adaptation. Starting from a low infrastructure base is also a late-comer advantage. This is particularly important for Africa, where the urban population is expected to triple by mid-century. In his chapter in this book, Bigio notes that emerging cities and small urban areas in developing countries – of which there are many in Africa – that are starting from a primitive infrastructure base have the greatest potential for avoiding lock-in to long-lived, high-carbon urban infrastructure. As Africa is expected to continue growing rapidly, the opportunity is there to invest in activities that are climate friendly.

Such a development path requires leapfrogging into modern technologies including reliance on clean renewable energy technologies such as hydropower, solar and wind, for which there is a huge potential in Africa. The costs of technologies to enable the use of renewable energy sources such as solar and wind are going down. If assisted by measures that keep a significant amount of fossil fuels unextracted, as suggested by Collier (2015) in his chapter in this book, the shift to clean renewable energy technologies would be faster, although, as noted below, this poses a problem of burden sharing. There are also opportunities for Africa in other areas – such as forestry and agriculture – where development, mitigation and adaptation could be combined.

Such a strategy will provide several climate-related benefits. First, the construction of infrastructure will be less carbon-intensive (e.g. cook stoves with higher thermal efficiency; see the chapter by Kaudia in this book). Second, the operation of that infrastructure will also be less carbon-intensive. Third, the infrastructure will be better

adapted for temperature rise. Fourth, there will be co-benefits in terms of improved health and livelihoods in general.

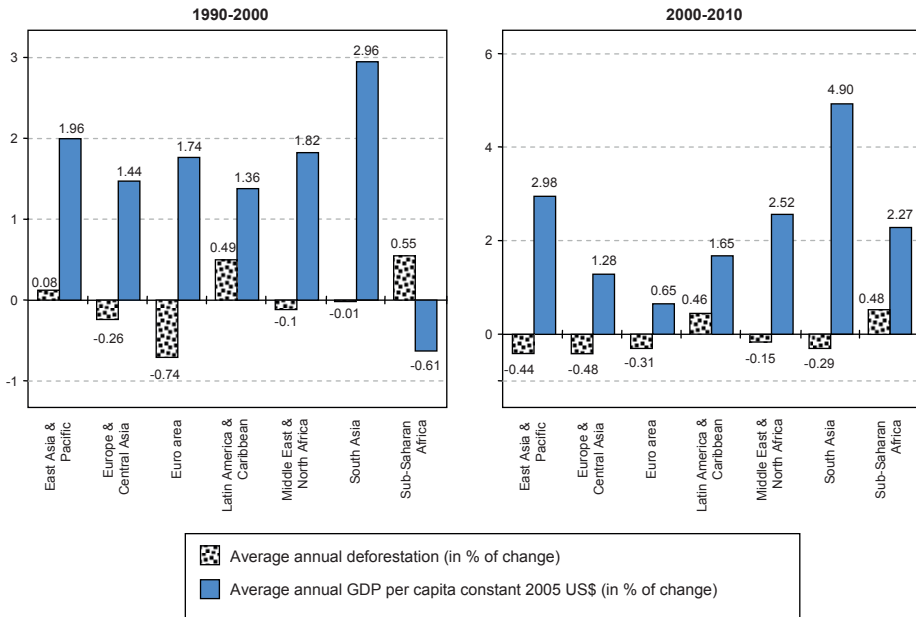
Mitigation being a global rather than national public good, it is globally beneficial if mitigation takes place where it is least costly. As discussed by McKinsey (2009), GRICCE (2009) and the World Bank (2010), Africa has negative or only small abatement costs for a number of mitigation options. The most important area for mitigation for Africa is forestry, but it has been excluded from the Kyoto Protocol and hence from the Clean Development Mechanism (CDM), the main instrument for increasing the efficiency of mitigation activities.

Africa has not participated much in mitigation activities under the Kyoto Protocol as the Clean Development Mechanism was not adapted to Africa's situation, not only because activities avoiding deforestation were not allowed, but also because the requirements for qualification were too stringent for African countries. Of the 8,592 CDM projects submitted and registered over the period 2004-2015, the bulk (6,343, or 74%) went to China, India, Mexico and Malaysia, and only 238 (2.8%) to Africa. An analysis of the determinants of qualifying projects shows that high tariffs on environmental goods imports and burdensome procedures to start a business were negatively associated with the likelihood of a technology transfer (Schmid 2012). Proposed reforms to increase participation in CDM projects by African countries would include mitigation in forestry, agriculture, and other land use projects (ACPC 2011, Haites 2011, Gebreegziabher et al. 2012).

Regarding GHGs, by 2030, Africa's comparatively low-cost mitigation potential is estimated to be close to two-thirds, or 2.8 GtCO<sub>2</sub>e, of its projected GHG emissions under a business-as-usual scenario (4.2 GtCO<sub>2</sub>e) (McKinsey 2009, exhibit 3.2.1). GRICCE also suggests that mitigation in Africa could focus on forestry (including REDD+, afforestation/reforestation and forest management), agriculture (including restoration of degraded land and reduced tillage) and energy (including hydropower, solar power, and energy efficiency programs), as well as transport. As shown in Figure 3, during the 1990s Europe reforested, and South Asia experienced an average per capita growth of 2.9% while avoiding deforestation. On the other hand, Africa experienced negative growth and the highest rate of deforestation. In the next decade, Africa's growth picked up, but deforestation continued at a similar rate to the previous decade.



**Figure 3** GDP per capita and deforestation (decadal averages)



Note: Negative values correspond to reforestation rates.

Source: Author's calculation using deforestation rates from Food and Agriculture Organization, Global Forest Resources Assessment and GDP per capita (constant 2005 US dollars) from the World Bank.

As discussed by Angelsen in his chapter in this book, there are local benefits from good management of forests, but given the multiple values of land-use conversion for local communities, financial incentives should be provided to compensate for the global benefits resulting from successful implementation of REDD+, as urged by the 'Lima Challenge' signed by 14 tropical forest countries, including the Democratic Republic of Congo, Ethiopia and Liberia.

As of August 2015, three African countries, Gabon, Kenya and Ethiopia had submitted their INDCs. Ethiopia's INDC includes reducing GHG emissions in 2030 by 64% compared with a BAU scenario, assuming sustained double digit growth in the economy up to 2030. If the assumption of growth at or above 10% for such a long period is realistic, this would be an example of very significant intended action by an African Least Developed Country (LDC), as the required investment is projected to be over US\$150 billion by 2030.

### **3 Financing requirements in response to climate change**

Of the 48 LDCs, 34 are in Africa. This category is highly vulnerable to natural and external economic shocks. As forcefully argued by Guillaumont in his chapter in this book, concessional funding should be formula-based and the allocation of funds should take into account a country's vulnerability. This implies that Africa should be receiving a sizable share of concessional financing for the Sustainable Development Goals (SDGs) recently agreed by the UN. Such a formula-based approach towards allocating funds should also be applied to climate funds, taking into account vulnerability to climate change. This would lend transparency and address the issue of equity in the allocation of funds.

Though insufficient, recent efforts to increase the relative importance of adaptation funding are to be commended. These include the Green Climate Fund's decision to allocate 50% of funds for adaptation and 50% for mitigation, which should be maintained. Unlike mitigation, the benefits of adaptation go to those who are adapting and are specific to a country, or even to a locality within a country. Using such criteria for the allocation of funds to adaptation would serve several purposes, including reducing transaction costs, supporting a results-based agenda based on measurable yardsticks, and supporting mutual accountability through transparency in allocations (Barr et al. 2010, World Bank 2010, Mekonnen 2014).

As has been learned from the aid evaluation experience, where multiple sources of financing and competition among donors hindered evaluation, facing the problems of fragmentation in climate funding will require commitment by donors and recipients alike to incorporate the key tenets of ownership, alignment, harmonisation, results orientation, and mutual accountability into their development activities (World Bank 2010). Recent developments in this regard, with the establishment of the Green Climate Fund (GCF), should be strengthened (Bird et al. 2011). For example, this could help address issues of fragmentation. At the regional and country levels, this requires strong leadership, capacity building/strengthening, good governance and institutional reforms.

In a new global deal on climate change, more attention also needs to be paid to issues of power, responsibility and accountability between recipient and traditional contributor countries (Ballesteros et al. 2010). This would involve introducing a power balance

while also ensuring that developing countries take responsibility and are accountable. A complementary source of transfer, proposed by Collier in his chapter in this book, could be to proceed with staggered closing of coal mines, starting with developed countries (i.e. the US, Germany and Australia) while not freezing new carbon discovery in low-income countries (about 80% of known coal reserves should stay stranded to reach the 20 target). Not only is controlling carbon emissions easier at the point of extraction than at the point of consumption, and developed countries would move first, but oil producers in developed countries would also have to buy rights for increasing emissions in coal mines in middle-income countries that would be scheduled to close. At the same time, low-income producers would have more time to close and capture some rents, and low-income users could exploit alternative sources of energy. Bottlenecks and power shortages are estimated to cost Africa 2-4% of GDP annually (Africa Progress Report 2015).

#### **4 Concluding remarks**

Africa is still the poorest continent, with a poverty rate double that of the next poorest regions in the world (South Asia, and East Asian and the Pacific). Since the poor are generally the most vulnerable to climate change, as they have limited capacity to adapt, Africa has the greatest need to carry out adaptation activities, which will require financing beyond that available domestically. Africa is also the continent that has contributed the least to climate change, while it is the continent that will be the most severely affected by global warming. External funding will be needed to carry out adaptation and mitigation activities. Because Africa is also characterised by a great degree of heterogeneity across geographical, economic and institutional dimensions, indicators of vulnerability to climate change should be used to allocate external funds.

Beyond these general observations, for a start, actions such as REDD+ should be supported financially by the international community. This is a clear potential 'win-win' situation because, if properly designed, these actions provide global benefits including to the countries participating if the financial compensation is adequate, as suggested by Angelsen in his chapter in this book. In this regard, while Ethiopia, Liberia and the Republic of Congo are signatories to the Lima Challenge involving 14 tropical-forest countries, greater participation by other African countries should be encouraged.

In general, African countries should work more closely towards ensuring commitment to financial and technical support for low-income countries. As indicated in other contributions to this book, together African countries need to exert pressure on the global community to commit to reducing emissions by a 'sufficient amount' (keeping global warming within the 2°C threshold) with compliance mechanisms that should be enforced (see the chapters by Flannery and Wiener in this book). Individually, African countries should work towards addressing the climate change problem by designing appropriate policies, strategies and policy instruments, and implementing them. This should include paying attention to institutional reforms, policy reform, capacity building, research and good governance. Examples of measures that could be taken in the near future and that are beneficial in addressing climate change include the removal of fossil fuel subsidies, land use policies, and increasing the share of renewable energy.

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# 6 A view from China

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*The Paris climate conference is approaching. The concept of Intended Nationally Determined Contributions (INDCs) not only shifts the Paris agreement to a bottom-up approach built on national pledges, but also links international climate pledges with the domestic interests of Parties. Seeing a country's INDC submission as being rooted in its domestic interests provides the means for understanding ways in which it can be enhanced in the future. In this chapter, we provide a view from China on the factors that shape its climate pledges and policies. The three major pillars of China's climate policy are economic development, air quality, and energy security. Mitigation actions were traditionally framed as necessitating a sacrifice in China's economic development. The changing narrative is more positive, focusing on the benefit that China obtains from its own climate actions. China is not only adjusting its pledges but also its policies and measures in response to its changing economic and political circumstances. In particular, market-based policies will replace command and control regulation.*

## **1 Introduction**

China was the first emerging economy to submit its Intended Nationally Determined Contribution (INDC) – it did so on the last day of June 2015 (Government of China 2015). China's submission includes four key points: first, China's emissions level is to peak by around 2030, which is consistent with the joint announcement China made with the US in November 2014 (White House 2014); second, China's carbon intensity (emissions per unit of GDP) is to fall by 60-65% from the 2005 level by 2030; third, China's share of non-fossil fuel primary energy (including nuclear, renewables and hydro) is to rise to around 20% by 2030; and, finally, China's stock of forests is to increase by around 4.5 billion cubic metres by 2030.

China's position in the climate negotiations is unique. It is the biggest emitter, accounting for 26% of world emissions in 2014. However, China's per capita emissions and per capita cumulative emissions are still lower than the OECD average. China's income per capita has increased in recent decades, but even in eastern China, where the level of development is much higher than the national average, income per capita is still well below that of developed countries. According to most indicators, China remains a developing country, but because of its scale, China's emissions exceed those of every *developed* country. The world will not be able to limit climate change without China's active engagement, so it is important for other countries to understand the context in which China is developing its own climate policies.

## **2 Key policy context to understand China's climate policy**

### 2.1 Growing China's economy is still at the top of political agenda

The government of China continues to maintain a growth-first economic model. This is due to several pragmatic reasons. First, China still needs rapid growth to alleviate poverty, despite three decades of miraculous development. As of 2011, nearly 6.3% of the total population – approximately 85 million people – was still living on less than US\$1.25 (2005 PPP) a day, i.e. below the poverty line drawn by the World Bank (World Bank 2015). Second, local governments in China, especially in the western provinces, need to maintain high growth in order to generate sufficient revenue to cover the costs of various responsibilities required by upper level governments. These responsibilities include, but are not limited to, social security, education, medical care, public security, environmental protection, and rural and urban infrastructure. The current taxation system is very effective at concentrating the majority of tax revenue in the budgets of the central government, but the existing system of transfer payments is not particularly effective or efficient at distributing financial resources to where they are needed. It has been an open secret that local governments have to generate their own revenue by encouraging business growth and investment as well as infrastructure development. Finally, local government officials are highly motivated to expand the economy rapidly because their promotions are closely linked to the growth rate. However, there is increasing recognition that the goal of economic growth may conflict with that

of environment protection, including climate mitigation, suggesting that the current economic model must somehow be changed.

## 2.2 Ongoing urbanisation and industrialisation processes will have long-term implications for China's emissions trajectory and energy consumption

Industrial production coupled with economic growth has boosted China's massive urbanisation to a rate and scale unprecedented in the world. Each year, millions of rural workers move into cities, motivated by the prospects of higher wages. In 2011, China's urban population exceeded its rural population for the first time; by 2030, close to another 330 million people are expected to move into cities. These new urban residents will increase the demand for infrastructure, building materials and consumer goods. Consequently, more energy will be consumed and more carbon will be emitted. On average, an urban resident consumes more than three times the energy of a rural resident in China (see the chapter by Bigio in this book). There are long-term implications for climate policy from these trends in urbanisation. The investments in capacity necessitated by rising urban demand may lock in energy-intensive infrastructure and industrial arrangements that will be difficult to alter in the near future. In parts of western and central China, where the growth has been particularly strong in recent years, this ossification of energy and emissions standards is already taking place.

## 2.3 How to balance energy security and environmental protection is a significant challenge for China's energy system

China's energy system faces many problems, among which three are particularly prominent: (1) difficulties in the adjustment of the energy structure; (2) the dilemma of fossil energy's growth; and (3) increasing dependence on foreign energy.

China's total energy demand continues to grow. Although investment in renewable energy and energy conservation has developed rapidly in recent years, overall energy demand has increased even faster, leading to increases in the consumption of coal, oil and other fossil fuels. Growth in fossil energy has caused serious problems for the environment, which has attracted more and more attention. The thick fog and haze that fills the air of Beijing, Tianjin and Hebei Province contains dangerous levels of

particulate matter (PM<sub>2.5</sub>) and is caused by both coal combustion and vehicle exhaust emissions. China's growing energy demand has also caused the country to rely more and more on foreign sources of energy. By 2020, the share of imported oil is expected to reach 70% and the share of imported natural gas 50%, creating problems for China's energy security (New Climate Economy 2014). Conflicts and geopolitical tensions in energy-supplying countries could cause a temporary shortage in supply and price rises, thus posing a risk to the stability of China's economy. China could reduce its dependence on foreign energy by producing more coal domestically, but this would be detrimental to health and to the environment.

#### 2.4 Air quality has become the number one cause of social instability in China, and the way in which China controls its air pollution will have significant impacts on efforts to address global climate change

China's poor air quality has become the number one cause of social unrest and a threat to political stability. It is also causing millions of premature deaths every year and billions of dollars in environmental damages. Fine particles — including soot, organics and sulphates — have a severe effect on human health and are implicated in climate change. They are emitted by combustion and industrial processes, and formed from the reactions of gaseous pollutants. If China's proposed air quality standard were achieved everywhere in the country, there would be far-reaching benefits: in addition to protecting human health, air and mercury pollution in the Northern Hemisphere would fall and global warming would slow.

To improve air quality, coal consumption must fall. Coal currently accounts for about 60-70% of PM<sub>2.5</sub> (primary and secondary particulate matters) emissions in China, leading to 700,000 premature deaths every year (Teng et al. 2015). Coal also accounts for 83% of China's carbon emissions due to the combustion of fossil fuels. Efforts to improve air quality by reducing coal consumption will therefore also deliver significant climate benefits. For China's emissions to peak by around 2030, coal consumption will need to be stabilised before 2020 and then to decline after 2020 (He 2014). The external environmental cost of coal consumption is about \$40/tonne, but only a small share of this external cost is reflected in current prices (Teng et al. 2015). To reduce air pollution in China, the external environment cost of coal must be internalised further.

Many local governments in coal-rich provinces view coal-to-gas technology as an option for reducing air pollution, but the heavy water demands of this technology make the central government cautious. Although only few coal gasification plants currently operate in China, around 50 projects are being planned and some of these are under construction. If all of the planned coal gasification plants are built and in operation, they will emit another 1 billion tonnes of CO<sub>2</sub> every year. Thus, the way in which air quality is controlled in China will affect global climate change, but in complicated ways. On the one hand, reducing soot emissions by cutting coal use or using cleaner stoves will lessen radiative forcing and thus limit warming, benefiting both the climate and public health. Stricter emissions standards for diesel vehicles, which emit soot, is another win-win solution. On the other hand, reductions in SO<sub>2</sub> emissions from power plants would reduce atmospheric sulphate concentrations, thereby increasing radiative forcing, which has a short-term detrimental effect on the climate. Consideration is therefore needed of how the various pollutants and their sources should be best controlled. Clearly, a multi-pollutant abatement strategy must be developed (IPCC 2014).

## 2.5 International and domestic drivers for further action

Emissions of atmospheric pollutants pose a serious challenge to China's economic and social sustainable development. Besides the domestic drivers, international drivers are also impacting China's climate change policies. The relationship with the US is the most important bilateral relationship for China. The BASIC (Brazil, South Africa, India and China) ministerial meeting and the Like-Minded Developing Countries (LMDC) are the two most important plurilateral processes influencing the country's position in the climate negotiations. China faces two sources of pressure: on the one hand its volume of emissions requires it to take more ambitious action to shoulder its responsibility; on the other hand, China also has to stand with its developing country friends to safeguard their common interests (such as common but differentiated responsibilities, or CBDRs). The IPCC and UNFCCC are the two multilateral processes that have a notable scientific and political influence on China's decision-making process. But compared with other goals, climate change is not a high priority for Chinese political leaders. China's mitigation actions are largely driven by domestic drivers, not international pressures. Thus the best

way to strengthen China's mitigation ambition is to align this goal with China's top domestic priorities, that is, growth, energy security, and environment quality.

### **3 The way forward**

#### 3.1 Change of narratives: Not only cost, but also benefit

Traditionally, the climate issue has been closely linked with development in China. The 'carbon space' has been interpreted as a development space, which may limit the development of China's economy. The costs associated with carbon emissions reductions have gained more attention from both researchers and decision makers. However such old thinking is now changing in China due to combined pressure from a slowing down of economic development, more serious energy security concerns, and the challenge of improving air quality (Li 2015). The slowing down of growth makes China interested in new driving forces for its economy. The new energy industry and low-carbon infrastructure has been considered an emerging industry that can drive future growth. Reflecting these new priorities, China has become the world's top investor in wind turbines, solar PV, nuclear energy and high-speed rail systems. Those technologies are all linked with a low-carbon transition that may bring more business opportunities for Chinese enterprises. The promotion of a low-carbon transition is no longer regarded as a costly effort, driven mainly by international pressure. Instead, it is considered as an opportunity – a means for propelling China's growth and for avoiding the middle-income trap. The increasing preoccupations with air quality and energy security are also causing decision makers to hedge those risks by improving energy efficiency and reducing dependence on fossil fuel.

#### 3.2 Responding to changing policy circumstances

The thinking about climate action has changed in China. Addressing climate change is no longer seen as a threat to development, but rather as an opportunity for better growth. However, it is unclear how China can achieve the required transition towards a low-carbon growth. China has been transitioning to a market economy, but still has many regulations. The challenge faced by the Chinese government in the future will be how

to make the market play a constructive role in bringing about a low-carbon transition, reducing the need for command and control regulation.

With a powerful central government, the Chinese government favours the command and control regulation and allocates different targets to local government, then to companies and enterprises. Such policies and measures perform well because the government controls project approval and state-owned companies dominate the energy-intensive industries. But in recent years, the government has started to streamline administration and to delegate power to lower administrative levels. At the same time, the liberalisation of the energy market is attracting more private companies into energy-intensive industries. Those private companies are driven more by economic than political considerations. The effectiveness of command and control policies in China is decreasing, but the economic and political costs of such measures are significant. To respond to China's new circumstances, market-based policies (taxation and cap and trade) and measures should replace the traditional command and control regulation.

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## 7 A view from India

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### **E. Somanathan**

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*India's primary concern in the climate negotiations is to avoid having to make commitments it may come to regret. While this is a concern for all countries to some degree, it is much greater in a low-income country because the human and political cost of slowing economic growth is enormous at low income levels.*

*Fortunately, the need for secure energy access, and to a lesser extent, local environmental concerns, are driving Indian policy in the direction of a massive expansion of renewable energy. While continuing to exhort richer countries to own up to their responsibilities to finance mitigation and adaptation, India can be expected to propose mitigation actions that are consistent with domestic policy priorities. These include ambitious near-term renewable energy targets that have already been announced.*

*India should also announce gradually rising taxes on coal and oil. These would be an extension of existing programmes such as the coal tax and of policies aimed at fiscal rationalisation such as the recent elimination of the subsidy to diesel and its replacement by a net tax. Revenue from the coal tax should be used to create a flagship programme to replace power subsidies to farmers with capital subsidies for solar-powered pumps. Rich countries should be asked to meet their financial obligations for mitigation assistance by contributing via offsets from their carbon trading programmes. The creation of a credible mitigation programme to which funds can flow makes it much more likely that developed countries will be motivated to make good on their promises of financial assistance.*

## **1 India and the 'like-minded' countries**

India's policy towards an international climate agreement has historically been largely defensive. Climate change has not been an issue that has arisen from domestic concerns. It is one that India has reluctantly engaged with in response to demands made upon it in international fora. India's stance was that it would be iniquitous to expect poor countries to slow their development by restricting emissions when the rich countries were responsible for most of the excess stock of carbon dioxide, and could much more easily afford to pay for mitigation. This position was acknowledged in the UN Framework Convention on Climate Change in 1992 when it referred to "common but differentiated responsibilities", and further enshrined in the Kyoto Protocol.

India's approach was developed in the 1990s when the cost of mitigation actions was thought to be very high. This was never entirely true, of course. In fact, some mitigation at negative economic cost via elimination of subsidies to fossil fuels was always available. This was not taken up because it would require political energy to implement reforms, and because there was no significant action by the developed countries and, therefore, little pressure to act. Instead, India allied with a group of 'Like-Minded Countries' including many developing countries, China, and several fossil fuel exporters in resisting any mitigation actions at all by developing countries.

This approach has gradually become untenable with changing circumstances. The rich countries, with their vastly greater influence over the news media, successfully framed the debate in terms of their positive promised percentage emissions cuts against the developing countries' unwillingness to act, while downplaying their vastly higher per capita contributions to the stock of greenhouse gases. The fact that the Like-Minded Countries included some very wealthy oil exporters helped to take India down from the moral high ground. Gradually, developed country rhetoric began to be translated into action, for example, with the starting of the EU Emissions Trading System in the mid-2000s. The recent pledge by China that its carbon emissions will peak by 2030 and possibly earlier has increased the international expectations from India. Finally, awareness of climate change and its adverse consequences has grown in India and this has contributed to the sense that some action is needed.

## 2 India's ambitious pledge to reduce carbon intensity

Anxious to escape the obstructionist label pinned on it by the northern news media, India developed a National Action Plan on Climate Change in 2008 that included eight National Missions. None of them has amounted to much except for the National Solar Mission, which has been a dramatic success. The Government of India and some state governments auctioned long-term contracts for the purchase of electricity from private developers of large-scale solar PV plants. Prices in the auctions have fallen rapidly over the last four years as investment in the sector has grown rapidly. By the time of the most recent auctions (in July and August 2015), solar electricity prices had fallen considerably. They are now only 10-25% higher than the price of power from new coal-fired plants. India has reached 3.5 GW of capacity in solar PV from a starting point of virtually zero in 2010.

At the Copenhagen meeting in 2009, India pledged to reduce the carbon intensity of GDP by 20-25% from the 2005 level by 2020. A carbon-intensity target rather than a target for total emissions is appropriate for India because GDP growth is expected to be high and uncertain. Most recently, at the December 2014 meeting in Lima, the government confirmed the domestic policy announcement of a target for installed capacity of renewable energy of 175 GW by 2022, of which 100 GW is to be solar and 60 GW wind.

How ambitious are these targets? Are they likely to be met? Should India go further in this direction, or has it promised too much already? Should it take a different approach?

These *are* ambitious targets. Emission intensity tends to rise rapidly with per capita income at low levels of income, and then more slowly at higher levels.<sup>1</sup> By way of example, in 2013 India's carbon intensity was 139 kg CO<sub>2</sub>/US\$1000 while PPP GDP per capita was \$5,200. China was approximately twice as rich with a per capita GDP of \$11,500 and a carbon intensity of 229 kg CO<sub>2</sub>/\$1,000. The US was ten times as rich with a per capita GDP of \$51,300 and a carbon intensity of 334. Thus, India has promised to

<sup>1</sup> This can be seen from the [EDGAR database](#) from which the following numbers are taken. GDP numbers are in 2011 PPP US dollars from the World Bank.

deviate from this pattern. It has had some success so far, with carbon intensity falling by 10% between 2005 and 2013.<sup>2</sup> It is, however, far from clear that this will continue without strong policy measures.

Turning to the renewables targets, there is no doubt that they are ambitious. Global installed capacity of solar PV is now 180 GW, of which India's share is only 3.5 GW. Moreover, India's entire electric power-generating capacity (mostly coal-based) is currently only 280 GW. To add 100 GW of solar PV in seven years, when PV is still not fully competitive with coal, will require strong policy action. Although wind power is competitive, 60 GW is still a very large capacity addition, given the time frame.

We can already see that these targets may not be met if circumstances are adverse or policy is not strong enough. It would, therefore, be a mistake for India to make further quantitative commitments by following the developed countries' announcements in terms of absolute emissions. It would also not be realistic to promise a peak year for aggregate emissions as China has done. It is safer to make promises about the more distant future, of course. But such promises would not be very meaningful or credible, because the capability to take action will depend to an enormous degree on how much India's per capita income rises in the next decade.

### **3 From targets to action: Towards carbon pricing...**

Should India then stop at what it has so far laid out? I believe we should not. There is more that can and should be done. Most importantly, it is becoming clearer than ever that climate change has hurt the Indian economy and can become extremely dangerous in the next few decades. Global warming has already lowered the yields of the two most important Indian crops, rice and wheat, by a few percentage points each (Auffhammer et al. 2006, Gupta et al. 2014) and lowered labour productivity in manufacturing by 3% (Somanathan et al. 2014). India, therefore, has a strong stake in a meaningful climate agreement.

<sup>2</sup> By way of comparison, China's carbon intensity fell by 29% while that of the US fell by 2.6% over the same period.

Rather than announcing *targets*, it would be much more helpful and credible for India to announce *actions*. First, India should announce a move towards carbon pricing that builds on recent domestic energy policy. Second, rather than only calling for more transfers from developed countries, India should call for transfers for specific programmes that credibly demonstrate mitigation and that can be scaled up with external finance. Some possibilities are spelled out below.

The Indian government has initiated carbon pricing in the oil and coal sectors in the last few years. Starting in 2013, the government decided to eliminate the implicit subsidy to diesel gradually by allowing state-owned oil companies to raise the price by a small amount every month.<sup>3</sup> This has been followed by increasing excise taxes on diesel and petrol over the last year as world oil prices fell. The result has been a move from a net subsidy for diesel of Rs 9/litre to a net tax of Rs 10/litre.<sup>4</sup> The resulting carbon tax is \$64/tCO<sub>2</sub>e (Ministry of Finance 2015). This tax is still well below European transport fuel taxes, while being well above that of the US. The gap between Europe and the US in fuel taxes has resulted in European transport sector CO<sub>2</sub> emissions being 50% lower than what they would have been if Europe had US tax rates (Stern 2007, Stern and Köhlin 2015), thus demonstrating the importance of fuel taxes for climate policy.

India's road and rail networks are highly congested due to chronic under-investment and policymakers recognise that there will be a substantial economic boost from improving them (Ministry of Finance 2015). In fact, it is impossible to imagine a scenario in which India doubles its per capita income in a decade without an enormous expansion in rail and road capacity and a reduction in congestion.

It makes sense, therefore, for India to couple the two objectives of raising revenue for transport infrastructure and reducing carbon emissions by announcing a continued steady hike in liquid fuel taxation until the resulting revenue can entirely finance the building and maintenance of roads as well as some local public transport and at least a part of the capital investment needed to expand the rail network. The experience so far

3 <http://timesofindia.indiatimes.com/business/india-business/Diesel-prices-to-be-hiked-40-50-paise-every-month-Veerappa-Moily-says/articleshow/18287874.cms>

4 1 US dollar is about 65 rupees.

shows the political feasibility of gradual price increases. Announcing this in the climate venue will help commit the government to the policy.

The government has put in place a tax on coal and raised it twice over the last two years to the current rate of Rs 200/tonne, about 8% of the current price of coal and equivalent to about 1.15 \$/tCO<sub>2</sub>e. Revenues have been earmarked for a fund for 'green projects'.

This policy should now be extended by announcing an annual increase in the tax by, say, 50-100 rupees per tonne, to be continued indefinitely. Part of the proceeds should be earmarked for removing one of the most intractable problems for the Indian electricity sector – free (but rationed) electricity for farmers for irrigation pumpsets. Agriculture accounts for 18% of electricity consumption in India (Central Statistical Organisation 2015) and very little of it is paid for. Removing the subsidy without compensation would be political suicide for any government. However, the proceeds of the coal tax can be used to subsidise solar PV powered pumps for farmers in return for getting their electricity connections metered at the commercial rate.<sup>5</sup> Farmers could also sell electricity back to the grid at a slightly lower rate to cover utility costs. The programme should be voluntary. This will help build political support for it.

From the point of view of domestic policy priorities, removing the un-metered and subsidised electricity for agriculture is a crucial step for putting an end to the chronic blackouts and under-investment that characterise India's electricity sector. This summer has been characterised by a shut-down of many power plants due to lack of demand even as the country reels under power blackouts. The parlous state of the public distribution companies' finances are the reason for this – they have no reason to buy power when they would have to give away substantial portions of it.<sup>6</sup>

5 Irrigation pumpsets are a natural source of demand for solar power because they do not require a 24-hour supply.

6 <http://gulzar05.blogspot.in/2015/06/more-on-indias-power-sector-woes.html>

#### **4 ...with mitigation financing via offsets from carbon trading programmes**

It would take decades for such a coal tax to raise enough revenue to buy out all the 18 million farmers with electric pumpsets.<sup>7</sup> However, India can ask the developed countries to make good on their promises to finance mitigation in developing countries by contributing to the solar subsidies. Emission reductions from the programme can be easily measured and so they can be priced. This will enable financing via offsets from carbon trading programmes, an option that developed countries are likely to find far more politically attractive than government-to-government transfers. By transparently laying out the domestic outlays for the scheme from projected coal tax revenues, disputes over baseline emissions can be avoided. This may actually engender some real international cooperation in an arena that has so far been characterised mostly by conflictual rhetoric.

The incentive effect of a gradually rising tax on coal will be very important in helping India make the transition away from (locally and globally) polluting coal to renewables. By lowering the prospective returns from investment in new coal plants, more investment will be forthcoming in renewable alternatives. By anchoring expectations without any abrupt shifts, it will make for an economically painless transition. In fact, it is clear that in order to increase renewable capacity by two orders of magnitude in less than a decade, the existing procurement policies will not do. The only viable route is by making investment in coal less attractive. So the renewable capacity target to which the government is already committed makes some policy of the sort proposed here almost inevitable if the target is to be met.

7 Not to speak of the 8 million farmers with diesel-powered pumpsets (<http://mnre.gov.in/file-manager/UserFiles/Scheme-for-Solar-Pumping-Programme-for-Irrigation-and-Drinking-Water-under-Offgrid-and-Decentralised-Solar-applications.pdf>).

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# 8 The view from different parts of the world: A view from Japan

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*In this chapter, we first review Japan's perspective on the Kyoto Protocol, focusing on the agreement's implications for flexibility, competitiveness, and the design and operation of the Clean Development Mechanism. We then analyse Japan's Intended Nationally Determined Contributions, taking into consideration the Fukushima nuclear accident. We also discuss the importance of accepting diversified views in implementing policy objectives, with restrictions on the financing of new coal-fired plants and voluntary initiatives given as examples. After this, we discuss the importance of technology innovations and diffusions, including the example of a sectoral approach, followed by a proposal asserted by Japanese experts on revisiting climate sensitivity, in order to make the Paris conference workable and effective. Japan recognises that its major role in effective global emission reductions is to deploy high energy-efficiency technologies in the world and to develop innovative technologies.*

## **1 The Kyoto Protocol: Japan's perspective**

Though the top-down style Kyoto Protocol was the first step to cope with climate change globally, it was not as effective as expected (IPCC 2014). In this chapter, we would like to discuss in particular Japan's view on the Protocol. There are three points: lack of flexibility, lack of competitiveness concern among developed countries, and bitter experience with the Clean Development Mechanism (CDM).

Several months after the Fukushima disaster caused by the tsunami on 11 March 2011, all 54 nuclear power plants including those in Fukushima were forced to stop operations. As of June 2015, the situation remains unchanged. As a result, Japan's energy-related

CO<sub>2</sub> emissions in 2013 were 1235 MtCO<sub>2</sub>, an increase of about 100 MtCO<sub>2</sub> compared to 2010. Annual average emissions for the first commitment period of the Protocol have slightly exceeded those of 1990. Because of the lack of flexible provisions to cope with such an unforeseeable situation in the Protocol, however, Japan had to comply with its commitment by purchasing 74 MtCO<sub>2</sub>eq. credits. It is our view that for the coming new accord in Paris, *clausula rebus sic stantibus* (the principle of changed circumstances) should be applied to all countries' pledges.

Only industrialised countries assumed emissions caps under the Protocol, though the US did not ratify it. There were several concerns among participating countries. These included, but were not limited to, equity with respect to their commitments and competitiveness issues among developed and developing countries. Throughout the first commitment period of the Protocol, Japanese energy-intensive sectors felt that they were disadvantaged. Take the global merchandise trade in 2013, for example. Japan competes fiercely with China and Korea in exporting to the US and the EU, and among the top five countries for Japan's exports, three (China, Korea and Chinese Taipei, representing 31.8% of Japan's exports) assume no emissions cap. In contrast, around 60% of Germany's exports go to European countries that assume a cap and the portion to China is only 6.1%. For the US, although China is its 4th largest export market, the share of US exports going to China is still rather small at 7.7% (WTO 2015).<sup>1</sup>

It is our view that, in evaluating each country's Intended Nationally Determined Contribution (INDC), the issue of competitiveness should definitely be taken into account.

The environmental and cost effectiveness of the CDM were not as high as expected due to controversy over additionality (baseline setting), leakage, transaction costs, and so on (Okazaki and Yamaguchi 2011, IPCC 2014). Here we focus on how Japanese industrial sectors were discouraged by this mechanism. Most of them are willing to contribute to reducing global emissions by providing state-of-the-art technologies to developing countries. What happened in reality, however, was quite different. Most

<sup>1</sup> Another example is that most models calculated that Japan's carbon price to implement the target under the Kyoto Protocol was higher than *those* of the US and the EU, as shown in IPCC Third Assessment Report.

projects were concentrated in one country and Japanese manufacturers were forced to compete with other developed countries' manufacturers to obtain credits. If they had been asked to transfer their technologies at reasonable cost, they would have been happy and very proud to do so. They never intended to develop and diffuse technologies to obtain credits (i.e. for short-term gain); rather, the intention was to strengthen their competitive edge and, by doing so, long-term profitability.

## **2 The Fukushima accident and its impact on Japan's energy and climate policy: Background and analysis of Japan's INDC**

The Fukushima nuclear power accident in March 2011 forced revisions to Japanese energy and climate policies, which had previously relied upon the expansion of nuclear power generation. As a result of much discussion after the Fukushima accident, the Japanese government formally decided on a new strategic energy plan in April 2014. This new plan seeks a balanced '3E+S' (economy, energy security, environment, and safety) approach. However, the plan did not specify an energy mix due to large uncertainties over perspectives on nuclear power plants, particularly regulatory and public acceptance issues.

The Japanese people fear that a return to nuclear power could invite another nuclear accident. However, it remains important for policy to evaluate different kinds of risks – not only the risk of a nuclear accident, but also the risks associated with increases in electricity costs (which can weaken industry's international competitiveness), energy security, and climate change – all at the same time. Very often, these risks conflict with each other. The government should clearly explain such risk-risk trade-offs to the people.

There are no operating nuclear power reactors in Japan as of June 2015, and as a result Japan's GHG emissions hit their worst record in 2013. Furthermore, additional costs for purchasing fossil fuels from overseas to substitute for nuclear power were 3.7 trillion yen in FY2013. Consequently, electricity prices are increasing. Renewable energy may be preferable for reducing CO2 emissions as well as to ensure energy security, but it is still very costly. In order to deploy renewable energies widely, the government

introduced the Feed-in Tariff (FiT) in 2012. The tariffs for solar photovoltaics have been reduced gradually, but in FY2014 they were still as high as 37 and 32 yen/kWh for residential and non-residential photovoltaics, respectively. The total capacities of photovoltaics applied for and approved by the government reached 70.2 GW by the end of November 2014 (total power capacity in Japan was about 290 GW in 2012), and the additional cost burden due to the FiT is expected to be 1.3 trillion yen annually from 2015 and to accumulate yearly. In addition, large installations of intermittent wind power and photovoltaics entail large additional costs to stabilise grids, particularly in Japan where the electricity grid is not connected to any of those in other countries due to its geography. In this situation, nuclear power, still competitive in Japan, is deemed to contribute to Japan's energy independence and is indispensable to emissions reductions.

In order to prepare Japan's INDC for submission to the Paris conference, the INDCs were discussed in the Joint Expert's Meeting of the Central Environment Council and the Industrial Structure Council (discussions were open to the public). The government proposed a detailed energy mix plan and a draft INDC for 2030 at the meeting at the end of April 2015, and decided them at the beginning of July 2015 (Table 1). The proposed GHG emission target in 2030 is a 26% reduction relative to 2013 (a 25% reduction relative to 2005). The emissions reduction target for the INDC was submitted to the UNFCCC in July 2015. According to our analysis using the RITE DNE21+ model,<sup>2</sup> the marginal abatement cost for the proposed 26% emissions reduction is about \$380 per tCO<sub>2</sub>, while those for reductions in the EU by 2030 and the US by 2025 are about \$166 per tCO<sub>2</sub> and \$60-69 per tCO<sub>2</sub>, respectively. It is considered that the estimated high abatement cost for Japan results from the large amount of energy saving required to achieve the target in a situation where high energy efficiency already widely prevails (Oda et al. 2012). Japan's emissions reduction target is very ambitious and one that will be extremely challenging to achieve (for discussions on the comparability of emissions reduction efforts across countries, see Aldy and Pizer 2015).

2 The DNE21+ model is a climate change mitigation assessment model that covers the whole world, divided into 54 regions, and treats over 300 kinds of technologies by bottom-up manner (Akimoto et al. 2010).

**Table 1** Japan’s energy mix and pledged target greenhouse gas emissions reduction for 2030

Primary energy	Electricity generation	Greenhouse gas emissions	
Share by source	Share by source	Relative to 2013	MtCO <sub>2</sub> (relative to 2013)
Oil: 32%	Oil: 3%	Total GHG: -26.0%	Total energy-related CO <sub>2</sub> : 927 (-308)
Coal: 25%	Coal: 26%	Energy-related CO <sub>2</sub> : -21.9%	Industry: 401 (-29)
Natural gas: 18%	Natural gas: 27%	Other GHGs: -1.5%	Commercial: 168 (-111)
Nuclear: 11-10%	Nuclear: 22-20%	Sink: -2.6%	Residential: 122 (-79)
Renewables: 13-14%	Renewables: 22-24%		Transport: 163 (-62)
			Conversion: 73 (-28)

*Notes:* Among industry and energy conversion sectors, major sub-sectors have individual commitments not formally included here. For example, emissions reduction targets by sub-sector are: iron & steel – 9 MtCO<sub>2</sub> from baseline; chemicals – 2 MtCO<sub>2</sub> from baseline; paper & pulp – 2.86 MtCO<sub>2</sub> from baseline; cement – energy-intensity improvement of 49 MJ/t-cement relative to 2010. These are voluntary commitments under the Japan Business Federation’s (*Keidanren*’s) ‘Commitment to a Low Carbon Society’.

*Source:* Document submitted to the Government Committee on Japan’s INDC, 30 April 2015.

### 3 The importance of accepting diversified views: The ideal versus the reality

Here we argue that for any policy to be effective and feasible, it is necessary to pay full attention to the diversity of each country’s situation, values, and culture. Pursuing the idealistic situation may not necessarily lead to the expected outcome. We also stress the importance of balanced views between combatting climate change and satisfying basic human needs.

#### 3.1 Analysis of the restrictions of financing for new coal-fired power plants

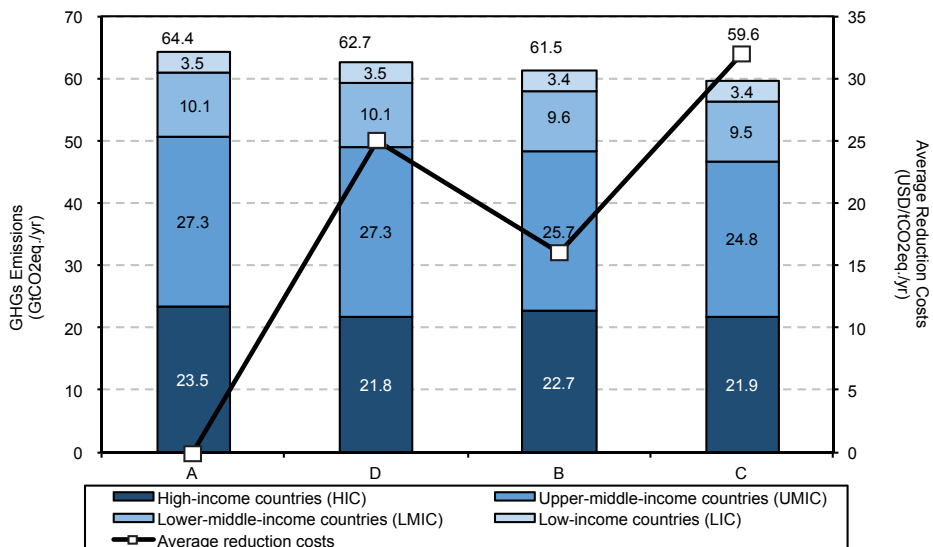
In June 2013, President Obama called for an end to US public financing of new coal power plants overseas that emit more than 500 gCO<sub>2</sub>/kWh (White House 2013). This was a de facto ban on public financing for any new non-CCS coal power plant, excluding in the least developed countries. Several European countries and international institutions, including the World Bank, followed suit. The US, jointly with the UK and the Netherlands, proposed almost the same kind of restrictions on public financing of

new coal plants to the OECD (White House 2014). The purpose of this is to reduce global CO<sub>2</sub> emissions. The policy will be very effective in achieving the objective if it works well and if the reduction of emissions in developing countries is prioritised over keeping the lights on. This will not be the case in developing countries, so we need to look for the second-best scenario.

Nagashima et al. (2015), using the DNE21+ model (Akimoto et al. 2010), shed light on the efficacy and efficiency of this policy. The authors compared four different cases focusing on GHG emissions and average reduction cost (see the definition of scenarios in Figure 1). Under case A, no ban is imposed (all new coal plants are eligible for public financing). Under case B, only new, high-efficiency coal power plants such as ultra supercritical (USC) and integrated coal gasification combined cycle (IGCC) plants are eligible for public financing. Case C corresponds to the imposition of the proposed ban (all new non-CCS coal power plants are excluded from public financing). Under case D, it is assumed that the ban by developed countries will have no effect in developing countries, as upper-middle-income countries (e.g. China) and some lower-middle-income countries (e.g. India) can finance building new coal power plants for themselves as well as for lower-middle-income and lower-income countries.

Figure 1 shows the global GHG emissions in 2030 under the different scenarios ranked by descending order of total GHG emissions in 2030 by income group, along with the corresponding average reduction cost relative to the BAU scenario (case A). It is clear that global emissions in case C are the lowest, followed by cases B, D and then A. In this sense, the de facto ban on public financing by developed countries should be the most idealistic policy to reduce global emissions among the cases discussed here. Emissions for case C in 2030 are 4.8 GtCO<sub>2</sub>eq (a figure 3.2 times Japan's emissions in 2013) below those in case A. When it comes to cost, however, case C is the highest.

**Figure 1** GHG emissions and average reduction cost in 2030 for coal-fired plants under different scenarios



Notes: Country classification follows the World Bank classification, in which China is a UMIC whereas India is an LMIC. Scenarios are ranked by descending order of GHGs emissions. Case A: All new coal plants are eligible for public finance (BAU) Case B: Only new, high-efficiency coal power plants are eligible for public financing; Case C: Only new coal power plants with CCS are eligible for public financing; Case D: de facto ban by developed countries (i.e. case C) has no effect on new coal power plants in developing countries. In case D, it is assumed that developed countries will only build new coal power plants with CCS. Hence the emissions reduction of 1.7 GtCO<sub>2</sub>eq. in case D relative to case A (BAU) is solely realised by HICs.

Source: Nagashima et al. (2015).

What matters here is whether case C is realistic or not; in other words, will it be implemented as is? We have to note that maintaining economic growth and keeping the lights on are crucial needs, especially in developing countries. Yang and Cui (2012) found that three-quarters of new coal plants are expected to be built in China and India. They may be able to finance these by themselves if they wish, and China in particular may also be able to finance other coal power plants in other developing countries. In that case, it may be plausible to build less expensive, low-to-medium efficiency coal power plants to secure a stable supply of electricity, unless the China-led Asian Infrastructure Investment Bank (AIIB) follows the policy of developed countries on public funding, which is rather unlikely. Hence enforcing the de facto ban policy may result in case D above. In this case, from the viewpoints of both emissions reductions and average reduction cost, case B, which allows public financing for high-efficiency coal power plants, is better than case D.

The analysis shows that each country or region has its priorities, and enforcing an idealistic policy based on the views of developed countries may not be the best way to achieve the initial objective, let alone to confront the issue of equity as emphasised by Collier (2015) in his contribution to this eBook.

### 3. 2 Japan's experience with the voluntary initiative as a measure to respond to climate change

Japan, unlike other major economies, relied upon the voluntary initiative to implement its commitment under the Kyoto Protocol as far as emissions from energy and industry sectors are concerned. The initiative (called the Keidanren Voluntary Action Plan), in which 61 sectors participated, not only had no provisions for penalties but was also not a voluntary 'agreement' between the government and industry sectors. It was a unilateral commitment that industry as a whole committed to as an endeavour to stabilise its annual average emissions for 2008–2012 at the 1990 level, with each sector assuming its own target. This initiative was incorporated as one of the central measures into Japan's Kyoto Target Implementing Plan. In total, average emissions for the period were 12.1% (9.5% without credits) below 1990 levels. This does not necessarily mean that the initiative was environmentally effective, as various other factors affect emissions and we do not know what BAU emissions would have been without this policy.

Tokushige et al. (2015) analysed the emissions of major sectors and found that each sector had tried hard to implement its own target. While the energy intensity of many sectors was improved, there were a few sectors where emissions increased or energy intensity worsened. However, even in the latter case, the authors found that this was due to the impact of fluctuations of economic activity surpassing their efforts. In this sense, the voluntary initiative was environmentally effective, if not cost-effective, in Japan (see also IPCC 2014 and Purvis 2009). No other major country used the voluntary agreement as the central measure for industry in coping with climate change. As a matter of fact, voluntary agreements on climate change in the early days in Europe (e.g. German industry's voluntary agreement in 1995 and the UK's Climate Change



Agreement in 2000) did not work as expected, mainly due to lack of communication between industry and government (Yamaguchi 2012).<sup>3</sup>

Why, then, did the voluntary initiative without any legal penalty work in Japan? There are several reasons: information sharing between industry and the government (the key factor for evaluating whether levels of targets are challenging or not); regular reviews of compliance status by government committees; high efficacy of ‘name-and-shame’ in Japanese society; high willingness to avoid governmental intervention; and industry’s dislike of economic incentives (Yamaguchi 2012, IPCC 2014).<sup>4</sup> As a matter of fact, industry’s voluntary commitment will again be one of the major instruments for implementing Japan’s INDC.

The above experience shows that policymakers, in planning their domestic response strategies, should take into careful consideration their countries’ political, economic, cultural and traditional situations in order that they may work well. Likewise, they should also accept diverse values when evaluating other countries’ policies. The best policy in theory does not necessarily end up with the best outcome.

#### **4 Japan’s contribution to tackling climate change: The ‘Action for Cool Earth’ initiative for technology development and diffusion**

In order to stabilise the temperature at any level, we have to achieve near-zero emissions in the long run. According to the IPCC Fifth Assessment Report (AR5), in order to limit the GHG concentration at 430–530 ppm CO<sub>2</sub>eq., which almost corresponds to a 2°C

3 Take the UK’s Climate Change Agreement that started in 2000. A total of 44 sectors entered into agreement with the government with ‘challenging’ targets for 2010. In 2002, only two years since the scheme started, 13 sectors had already achieved their 2010 target. If the government knew each sector’s real emissions figures, this may have never happened. Also note the steep decline of the price of carbon in the EU Emissions Trading Scheme (EU ETS) when actual emissions figures were disclosed.

4 Most industry leaders feel that promoting R&D and long-term investment is the key to coping with climate change, and complying with their obligations by purchasing permits or paying tax would work as a disincentive for this purpose. As this may be the cheap way to satisfy their obligation, this may impede R&D and long-term investment. This is a matter of comparison, but generally speaking Japanese industry leaders put more value on the long-term view than the short-term one.

rise by 2100, marginal abatement costs will be about \$1,000–3,000 per tCO<sub>2</sub> in 2100 (IPCC 2014, Figure 6.21). The high costs may be interpreted as meaning that the target will be extremely costly unless new innovative technologies, unknown at this moment, emerge and revolutionary change occurs within society.

Recognising the above, the Japanese government has already launched the Action for Cool Earth initiative that focuses on, but is not limited to, innovations and diffusions of climate friendly technologies. In line with the emphasis on technology innovations, Prime Minister Shinzo Abe initiated in 2014 the Innovation for Cool Earth Forum (ICEF). The Forum hosted the first international conference in Tokyo in 2014 and is scheduled to host one every year in Tokyo.<sup>5</sup>

As to diffusion of state-of-the-art energy-efficient technologies, Japan has advocated a so-called sectoral approach, one of the bottom-up approaches, for several years. High energy efficiency has been achieved in many sectors among energy conversion and energy-intensive industries in Japan (Oda et al. 2012), and these experiences will contribute to global energy efficiency improvements in various sectors through global and regional sectoral cooperation for this purpose. For example, the expected global emissions reduction potentials are about 2.1, 0.43, and 0.18 GtCO<sub>2</sub> in the power, iron and steel, and cement sectors, respectively, through the broad diffusion of high energy-efficient technologies throughout the world (Akimoto 2012). Large differences in marginal abatement costs across countries may act as an impediment to realising such emission reductions, as the situation will induce industrial relocation from Japan to other countries, which will result in increased global emissions. Fair and equitable emissions reduction efforts among participants are important also from this viewpoint (see Aldy and Pizer 2015). The sectoral approach focuses on the real energy-saving and emissions reduction activities of each sector, and this way of thinking is also essential for setting each country's INDC. Note that this is quite different from the sectoral crediting mechanism, in that credit acquisition is not the purpose of the activities. One of the early platforms to advance public/private sector-based partnership was the Asian Pacific Partnership (APP), which aimed to share best practices in targeted energy-

<sup>5</sup> See [www.icef-forum.org/](http://www.icef-forum.org/).

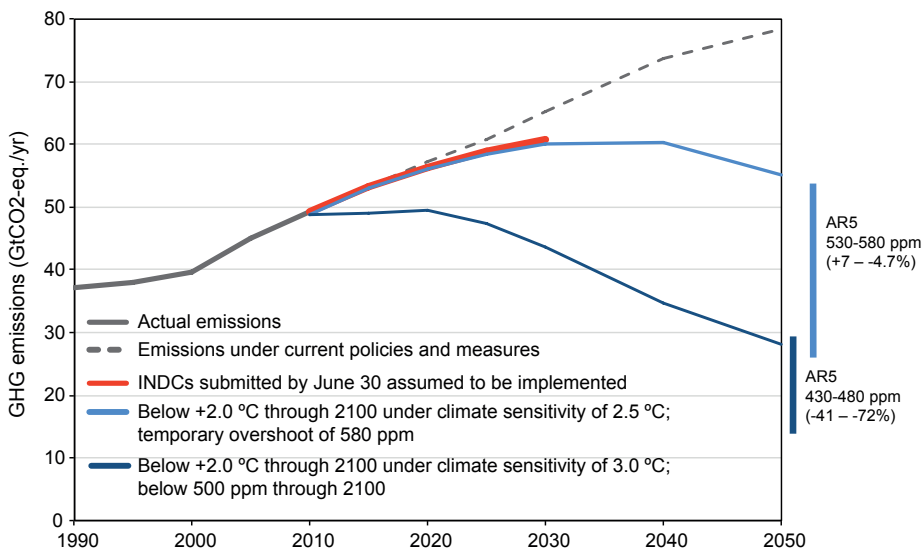
intensive sectors – such as iron and steel and cement – among seven countries, including the US, China, India, and Japan (Okazaki and Yamaguchi 2011). The Global Superior Energy Performance Partnership (GSEP) is now following many of the activities of APP. GSEP is working to accelerate energy-efficiency improvements in industrial and large building sectors. Other examples of the global sectoral approach can be seen in the marine and air transport sectors, i.e. in the International Maritime Organization and International Civil Aviation Organization (Yamaguchi 2012). The UNFCCC framework is important because it covers almost all countries, but multiple frameworks including the bottom-up approach for specific sectors will also contribute to effective emissions reductions.

## **6 The proposal of Japanese experts: Revisiting climate sensitivity**

As described in Section 1, the challenges to achieving the 2°C target are enormous, if not impossible, and imply that current emissions levels need to be reduced by 40–70% by 2050 (IPCC 2014). The Paris agreement, based on each country's pledge – including that of the US, China, EU, Japan, and so on – will never be enough for this purpose.

It is noteworthy, however, that there is implicit evidence (Rogelj et al. 2012, IPCC 2014, Schaeffer et al. 2015) that the 40-70% reduction suggested in AR5 was based on the assumption that a best estimate or median value of climate sensitivity was 3°C (the same value as AR4), even though the likely range of climate sensitivity was lowered to 1.5–4.5°C in AR5 (from 2–4.5°C in AR4) and experts could not agree on any value of best estimate in AR5 (it was 3°C in AR4). Recent observation-based studies on climate change, however, tend to show lower climate sensitivity and best estimates (IPCC 2013, Otto et al. 2013, Lewis and Curry 2014).

**Figure 2** Consistency of individual country’s INDCs and the path to the 2°C target



*Notes:* The figure shows estimated emission pathways toward 2050 by the DNE21+ model (a global model with 54 disaggregated regions and countries that seeks cost-effective measures on emission reductions) couple with the MAGICC climate model. The grey dotted line shows the emissions pathway under current policies, the light blue line shows the emissions pathway that limits the temperature increase below 2°C over the 21st century under a climate sensitivity of 2.5°C, which corresponds to the scenario of a slight temporal overshoot of 580ppm CO<sub>2</sub>eq. concentration. Temperature is expected to stabilise below 2°C in the long run. The dark blue line shows the emissions pathway that limits the temperature increase to below 2°C over the 21st century under a climate sensitivity of 3°C, which corresponds to the scenario under which the concentration stays below 500ppmCO<sub>2</sub>eq. up to 2100. Temperature is expected to stabilise below 2°C even under a climate sensitivity of 3°C. The red line shows emissions until 2030 based on the assumption that individual country’s INDCs (Canada, China, EU, Japan, Mexico, Norway, Russia, South Korea, Switzerland and US) known at the end of June will be implemented. In all scenarios, we assumed China’s emissions in 2030 to be 16.7 GtCO<sub>2</sub>eq. based on CO<sub>2</sub>/GDP improvement ratio of 65% and annual GDP growth ratio of 6.2%. The US pledge covers only until 2025 and comprises two targets, i.e. 26% and 28% emissions reduction relative to 2005. We assumed here that the 28% emissions reduction will be implemented by 2025, thereafter with a linear interpolation to 80% reduction in 2050.

*Source:* Research Institute of Innovative Technology for the Earth.

What will happen if the best estimate is less than 3°C? What we found with the RITE DNE21+ and the simple climate change model, called Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC), is that once the best estimate is selected (for example, 2.5°C), the 2°C target will be within reach with the pledge-based Paris agreement (see Figure 2), so the agreement will become workable and feasible. Under this situation, we propose revisiting climate sensitivity and its best estimate to reduce uncertainty in decision-making by global leaders. We also argue that we should decouple the 2°C target and the 40–70% reduction. Sticking to the 2°C target and the 40–70% global emissions reduction by 2050 based on 3°C climate sensitivity without

reviewing them would lead to a weak strong target that might collapse. We need a strong weak target that may be implemented as a second best policy to a strong strong target. And for this purpose, the promotion of technology innovations and diffusion will be the ultimate solution. This is the background to the initiation of ICEF.

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## 9 A view from Europe

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**Roger Guesnerie**

Collège de France and Paris School of Economics

*This chapter starts with an overview of the climate actions implemented in Europe as a response to the Kyoto Protocol, organised around the creation of the EU Emissions Trading Scheme. The discussion stresses the problems faced by the newly created carbon market and explains its disappointing outcome. The chapter then recalls the political and legal background of the initial European choice for an industry-limited market and briefly presents the intellectual debate on the relative merits of a ‘carbon market’ and a ‘carbon tax’ as a regional climate policy. The European story illustrates some of the general difficulties behind the implementation of an ideal global climate treaty. The discussion then evokes the solution by economic considerations alone, a kind of ‘super-Kyoto’ whose implementation would require the action of a powerful benevolent world planner. With utilitarian objectives, such a solution would go together with a strongly redistributive allocation of national quotas. This ‘grande rivière’ (‘big river’) is unfortunately utopian. What are the ‘petits ruisseaux’ (‘small streams’) that can be launched as partial substitutes? In between, can we expect ‘petites rivières’ in the form of climate clubs to emerge? The chapter concludes with a discussion emphasising the underlying difficulties, in particular (i) providing compensation and incentives to developing countries; (ii) making trade and environment policies compatible; and (iii) facing the possible occurrence of the ‘green paradox’, a reflection of the complex interactions between the markets for fossil fuels and climate policies.*

## **The European Union's climate policy: Some key aspects explained**

Under the provisions of the Kyoto Protocol, the European Union as a whole was committed to reducing its emissions by 8% by 2012, compared with 1990. Following a redefinition of member states' objectives, negotiated to be legally binding, a common policy was introduced.

This policy has several strands. On the one hand, the directives focused on 2020 and proposed targets relating to the role of renewable energy sources in the energy mix – 20% to be specific – and to improving energy efficiency. On the other hand, and this was the most dramatic innovation, a market for emissions allowances was established: the European Union Emissions Trading System, commonly known by its abbreviation, EU ETS. This trading system encompasses 11,000 industrial plants and power stations across 27 countries. It covers around 50% of the EU's CO<sub>2</sub> emissions<sup>1</sup> and is the world's largest carbon credits mechanism.

### EU ETS: Past and future

Following a pilot phase (Phase 1) launched in 2005, the mechanism entered into force. This was Phase 2, which coincided with the 2008–2012 commitment period of the Kyoto Protocol. A total allowance is divided between member states, who allocate their national allowances according to common criteria based on previous emissions and sector-specific facilities.

In Phase 2, allowances were, for the most part, allocated for free; a small proportion (5% in 2012) was sold via auction. Last but not least, the companies involved can also seek carbon credits from the Kyoto Protocol project mechanisms (such as, for example, the Clean Development Mechanisms, or CDMs).

Phase 3,<sup>2</sup> which will run from 2013 to 2020, introduces or will introduce a series of modifications, the main elements of which are outlined here. First, the process of

<sup>1</sup> And 40% of its greenhouse gas emissions.

<sup>2</sup> This is part of the approach to reduce emissions by 20% by the end of the period.

auctioning off allowances will be significantly expanded, but in principle adjusted for different sectors depending on their exposure to the risk of ‘carbon leakage’. Then, the total allowance at the European level is set to be linearly reduced each year. Finally, allowances may be placed in reserve or withdrawn, depending on the trends observed, particularly with regard to the economic situation.

This is a brief overview of the mechanism and planned developments, which take account of an experience which has been, to say the least, disappointing. Price trends on the market are, in this regard, illuminating. After reaching €30 per tonne of CO<sub>2</sub> at the beginning of the preliminary phase, prices inevitably fell to zero by the end of the phase. More significant changes were seen in Phase 2. Starting at €15 per tonne of CO<sub>2</sub> at the beginning of Phase 2, the price began to collapse from March 2011, often falling below €5 per tonne. This is not at all surprising if we consider the huge number of allowances, in millions of tonnes, held by companies in 2012: 2,049 million tonnes in free allocations and around 100 million tonnes auctioned off, to which must be added the Kyoto credits (almost 500 million tonnes), which greatly exceed verified emissions (1,867 million tonnes) (Gloagen and Alberola 2013).<sup>3</sup> It is therefore primarily the option of transferring allowances between periods that supports a positive price. Of course, what can be seen here must be termed a serious failure of the trading system – the incentive effect of a CO<sub>2</sub> price of €4 per tonne in terms of implementing significant ‘decarbonisation’ measures is close to zero. Indeed, existing studies suggest that the reduction in CO<sub>2</sub> emissions within the EU ETS area (which were down 12% during the period 2008–2012) could be explained firstly (up to 30%) by the post-crisis economic context (Gloagen and Alberola 2013), and secondly (50–60%) by the positive effects of the increased use of renewables and progress in energy efficiency.

How can this poor performance be explained? First of all, it is worth looking at certain aspects of the design of the trading system; here, the link established with the Kyoto Protocol project mechanisms. The link, no doubt already problematic in the initial Kyoto mechanism (which saw the establishment of a trading system between states), is even more questionable in the system that actually resulted. Control over the total number of allowances in circulation, a key element of the rationale behind the trading

3 Moreover, the gap has grown since 2008, and is likely to be 1,742 million tonnes over the period.

system if the manuals are to be believed, is becoming more uncertain. This is only part of the story; we must, of course, add the fact that allowances were allocated too generously and without taking account of the economic climate. And this is before we consider the unknowns surrounding the future of the quantities allocated on a longer-term basis, bringing even greater uncertainties with regard to prices.

The changes introduced in Phase 3, which have been briefly presented, seek to respond to these challenges, but without necessarily inspiring optimism. The issue is that in a market which is complex but limited to a subset of emitters, the problems of governance are more difficult to manage than it might seem, and this despite the introduction of an extremely unwieldy administrative structure which is also – there is no point trying to hide it – particularly opaque from the point of view of external observers.<sup>4</sup>

## **Why does the trading system exist? A look back at the beginning**

Given this experience, it is worth revisiting the choice that was made to establish a trading system.

Why a trading system rather than a carbon tax? The issue is considered here at the country level, or at the level of a group of associated countries. The analysis does not prejudge the relative merits of a trading system and a tax at the global level, a largely independent issue to which I will return shortly.

A carbon tax has and would have had, at the European level, obvious advantages. First of all, it encompasses all stakeholders, households and companies. The amount of the tax and its evolution over time can be made public, with a credibility which reflects the credibility, assumed to be good, of the authority which is implementing it. Last but not least, this option would guarantee a form of equalisation between countries of the efforts made, somewhat of a blind spot in the current policy,<sup>5</sup> which lacks clarity on both the procedures for the national allocation of allowances and the variations between the national policies which complement that allocation.

4 One example of this opaqueness is the allocation of allowances between sites and between countries.

5 Also the subject of a communications effort which has, to put it mildly, been poor.

Given the fact that all or the majority of allowances were allocated for free, the system is and has been popular with companies, and it is true that a system of differentiated exemption thresholds within the framework of a carbon tax, which would be able to mimic the effects on corporate profits of partly or completely free allowances, is difficult to implement. One point for the trading system, even if the completely free nature of allowances initially goes far beyond what economic expertise would advocate (see Guesnerie et al. 2012).

It is also worth noting that all else being equal, and in particular when the carbon tax and the trading system price are equal, the effects on the relative competitiveness of industries are identical. In both cases, the argument for putting in place border adjustment measures has the same force and raises problems which, while not identical, are not materially different.

To sum up, by its universal nature and apparently superior capacity to establish and better coordinate the price expectations of agents, a carbon tax could appear to be the solution, despite the probable preference of companies. I am one of those who believe this to be the case: at both the national and the regional level, a carbon tax solution is better than a market solution, even if it may be part of the broader framework of the Kyoto trading system (see also Cooper 2008, Gollier and Tirole 2015).

The reason why Europe adopted the trading system had nothing to do with an analysis of the relative merits of the two solutions, however. It reflects a legal provision (which ignores the close relationship that economic analysis ascribes to the trading system and the tax) whereby creating an EU-wide tax requires unanimity, while setting up a trading system can be done by majority. The choice was dictated by legal feasibility, but also indirectly reflects political feasibility. As we have noted, since the allowances are partly free, the trading system is strongly preferred by companies – and therefore by industrial lobby groups. And a carbon tax which affects consumers incites a great deal more hostility from the public than a trading system whose effect on prices is less direct and probably less noticeable in terms of redistribution. The fate of the French carbon tax is illuminating in this regard, and it can be assumed that there was fairly widespread resistance to a carbon tax approach in the various EU member states.

If we follow my argument, then, the creation of the EU ETS can be seen as the implementation of a second-best or even third-best solution, if we highlight the fact that it has been much more difficult than expected to get the system to operate effectively. This implementation reflects the favourable political context at the time that it was introduced, and the resilience of the system – when it is clear that many countries have only limited enthusiasm for implementing a climate policy – is worth noting.<sup>6</sup>

## **Climate policy around the world**

A great river – a utopian ideal?

The EU ETS is what one might call a ‘small stream’ contributing to the fight against climate change. Will the existing small streams, along with those which will be developed in the future, feed into a ‘great river’ able to support a climate policy which can meet the challenges we are facing?

At this point, it is worth revisiting the idea of what an ideal ‘great river’ would look like, including the requirements for economic effectiveness as well as for a degree of distributive justice between participating nations.

The objective here is to control emissions, i.e. quantities, and economic expertise advocates charting a path for global emissions levels over the long term, say 30 years, which are compatible with the IPCC analysis on limiting the temperature increase to 2°C.<sup>7</sup> To achieve this, economic expertise strongly suggests implementing a ‘cap and trade’ system: the global target for year  $n$  takes the form of a global allowance, broken down into allowances for each participant. The approach is therefore in line with that of the Kyoto Protocol, but with full participation (see also the chapters by Stavins and Sterner and Gunnar in this book).

All that remains is to define the procedures for this super Kyoto by allocating allowances to all countries. Let us allocate them from the point of view of a benevolent planner

6 It is probably worth examining the reasons for this resilience and the part played by the interpersonal skills and activism of the Commission – and perhaps also the opaqueness of the system!

7 A path which may be contingent on the gradual emergence of information.

who is sufficiently powerful to be able to impose these national allowances. It would make sense, in utilitarian logic, to set identical per capita allowances for all countries;<sup>8</sup> countries whose per capita emissions were less than the global average would be the sellers within the trading system and therefore overall beneficiaries, while countries with emissions above the global average would be the buyers. Everyone would see their efforts governed each period by the same global carbon price. Of course, this particular approach of equalising per capita allowances is up for discussion, but it is clearly a logical way of spreading the costs of climate change from a utilitarian standpoint.

Although I have previously advocated for a carbon tax, the solution recommended here is a global market rather than a global carbon tax, which could result in very unpredictable regulation of quantities, if only because of the uncertainties associated with the ‘green paradox’. There is no contradiction; again, this ‘super-Kyoto’ market would establish a carbon price through the trading between states. And this price would serve as a reference for a regional or national carbon tax, which, if one accepts the argument made previously, could – indeed *should* – be laid on top of a global trading system to take over and support it at the regional or national level.

Note that such a system would not be the answer to all problems, far from it, and the voluntary nature of quantities leaves it open to uncertainty regarding the carbon price. The equalisation of spot prices does not establish the desired coordination of expectations regarding the future scenario. The reason for this, of course, is that the scenario is contingent on how quickly new technologies emerge, but also remains subject to the vagaries of the ‘green paradox’, created by the uncertainties of the policy’s effects on the fossil fuel market, and particularly on the development of the income they generate.

Small streams...

So, having taken every possible care in my choice of words, this is what a very successful ‘great river’ might look like. While everything points to the fact that this would be

<sup>8</sup> This would apply all the way along the path. It should be noted that the proposal that Sterner and I made (Guesnerie and Sterner 2009a,b), regarding endorsing an ambitious objective for 2050 today by including a reference to equal per capita emissions rights in 2050, did not receive an encouraging response.

desirable, it is clearly entirely utopian, since the allocation of equal allowances for all countries would be rejected by the most powerful nations. Having described this river, can we say more about the ‘small streams’ that currently exist and will emerge in the future?

- First of all, why not link the existing small streams (see the chapter by Stavins in this book), specifically the EU ETS, with the Chinese market currently being created and a modest North American market which has been set up between some American states and Canada, and thus make not a great river, but certainly a bigger stream? However, even if we forget some of the shifts in the European market, objections immediately come to mind: the complexities arising from specific<sup>9</sup> and potentially contradictory considerations cannot easily be superimposed, and how can the risk of a race to the bottom among the member systems be avoided?
- Another idea: Why not use the global reference of per capita emissions not to allocate allowances, but to calculate the contributions of each country with above-average emissions to a green fund of one kind or another, which would provide aid to poor countries? This is the option preferred by the Climate Economics Chair at Paris Dauphine University (Perthuis and Jouvet 2015), and if it were accepted, it would amount to the implementation of a sort of global carbon tax at a low rate. The low rates are evidently a factor in making the concept acceptable, and if accepted, could be the beginning of a virtuous circle – a sort of prelude to a global carbon tax (see also the chapter by Hourcade in this book).
- Why not also come to an agreement today on the targets for 2050, and the allocation procedures?<sup>10</sup> Such an agreement would not be terribly binding in one sense, but it would be likely to anchor current discussions on what a desirable long-term future would look like.

9 As is happening with the assessment of the risk of leakage in Europe (see the chapter by Fischer in this book).

10 See note at the bottom of page 11, which refers to the Guesneric-Stener proposal, which is along these lines.



## What about small rivers?

To conclude, it is important to highlight the limits of an ever-increasing number of small streams. There are certainly some useful initiatives here, but in all likelihood, they leave us quite a long way from the approach strongly advocated by economic expertise: the progressive promotion of a single global carbon price.

Going beyond coordinated small streams, some small rivers could of course begin to emerge. The creation of climate coalitions involving several countries or regions adopting some kind of shared climate policy would fit into this category. So let us finish by talking about climate coalitions, their potential weaknesses, and the probable inevitability of a link between trade and the environment.

Both the cost and the effectiveness of a climate policy that is unilateral or still limited to one or more virtuous coalitions are open to debate. In the case of cost, this is due to the risks of carbon leakage: minor risks to the competitiveness of the economy when the carbon price within the virtuous coalition remains within the ranges reached by the EU ETS, and probably significant risks outside these ranges. Effectiveness is affected if, as a result of the green paradox and the difficulties of market regulation, results do not match expectations.

Seeking to link trade and the environment is not in itself a protectionist step, even though it may support such temptations (Guesnerie and Stern 2012, de Melo 2013).<sup>11</sup> Thus, border adjustment mechanisms, which are difficult to set up properly, constitute either a legitimate response or a legitimate and credible threat from a virtuous coalition establishing a meaningful price for carbon among its members. Specifically, this means the coalition restoring a certain accuracy to prices within its economic area. That Europe has not explored and raised this option in international negotiations is no doubt explained by the failure of the EU ETS to establish meaningful prices, but also illustrates the weakness of the EU in moving beyond its prejudices and realising its potential for diplomatic influence.

<sup>11</sup> See Guesnerie and Stern (2012) and Melo (2013).

Environmental protection through trade is good for the coalition in the sense that, in principle, it increases its stability. But it in no way increases the appeal of the coalition in question. To increase the appeal of the coalition to nations outside it, it is necessary to introduce a punitive dimension, but not border adjustment! In any case, this is the argument recently put forward by Nordhaus (2015),<sup>12</sup> which shows that the implementation of a measure that is much tougher than border adjustment – in other words, an undifferentiated tax on imports from members outside the coalition – would create, if this tax were high enough, the stable conditions for a system of climate coalitions. The argument and numerical simulations underlying the study are complex. But the sanction for the ‘stowaway’ escaping the virtuous coalition is clear: a loss of external revenue that can only be avoided by joining the coalition. This is not about restoring accurate prices within the coalition, as a border adjustment would do, but about sanctioning, through restrictions on trade not linked to the carbon content of the products traded, those who do not join the coalition. This study merits consideration. In the absence of the benevolent dictator sought above, adherence to a climate policy would involve retaliatory measures with an impact beyond the scope of the climate policy. There is a certain naivety in being surprised by this, even if there are questions regarding the plausibility of the emergence, should it be necessary, of such a confrontational policy, the benefits of which would be long term. And I will conclude on this point, which is moving from economic analysis to ‘realpolitik’, a subject which clearly deserves another contribution!

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# 10 A view from the United States

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## **Matthew J. Kotchen**

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*The US plays an important role in international negotiations on climate change. Fortunately, the role of the US has evolved from that of laggard to leader. Having reduced emissions significantly in recent years, the US is promising substantially more and encouraging other countries to do the same as part of the next international agreement. In this chapter, I provide a high-level view on the state of climate-change affairs from the US perspective. My aim is to briefly cover selected topics that help explain progress, opportunities, and challenges for the US. The topics include public opinion and domestic politics; trends in domestic emissions and policy; the US's Intended Nationally Determined Contribution (INDC) and the importance of matching ambition; climate finance; and expectations for success in Paris.*

The US plays an important role in international negotiations within the United Nations Framework Convention on Climate Change (UNFCCC). Representing the world's largest economy as measured in unadjusted GDP, and the largest historical emitter of greenhouse gases, buy-in from US is critical for a workable and effective climate regime. Fortunately, the role of the US has evolved from that of laggard to leader. Having reduced emissions significantly in recent years, the US is promising substantially more and encouraging other countries to do the same as part of the next international agreement.

In this chapter, I provide a high-level view on the state of climate-change affairs from the US perspective. While other chapters in this eBook cover specific topics in detail, my aim here is to briefly cover selected topics that help explain progress made by the US as well as opportunities and challenges facing the country. The topics include public opinion and domestic politics; trends in domestic emissions and policy; the US's

Intended Nationally Determined Contribution (INDC) and the importance of matching ambition; climate finance; and expectations for success in Paris.

## **1 Public opinion and domestic politics**

A view from the US must begin with observations about American public opinion. This is important not only because the US is a representative democracy, but also because of sharp differences between the two major political parties, the Democrats and Republicans. The differences shape the current dynamic between the executive and legislative branches of the US government, as well as the approaches being undertaken to address climate change both domestically and internationally.

A recent poll found that about two-thirds of American registered voters think that global warming is happening, support laws to increase renewable energy and energy efficiency, support setting emission limits on coal-fired power plants, and think the US should reduce greenhouse gas emissions regardless of what other countries do (Leiserowitz et al. 2014). Although climate ‘sceptics’ or ‘deniers’ often capture media attention, the majority of Americans believe that climate change is real and warrants political action.

Beneath the majority view, however, is political polarisation. According to the same poll, 81% of Democrats are ‘worried’ about global warming, compared to only 30% of Republicans. Some 69% of Democrats think global warming is caused by human activities, whereas only 31% of Republicans think the same. When it comes to support for political action, 60% of Democrats say the federal government should be doing more to protect people from global warming, while the comparable number is 21% for Republicans. Among self-identified conservative Republicans, the view is even quite different: 42% think the federal government should be doing even less than it is now.

President Obama has identified climate change as a top priority for the remainder of his term in office, and his Democratic administration is taking the lead on a range of domestic and international initiatives. At the same time, the Republican-controlled Congress, including both the Senate and the House of Representatives, does not support the initiatives and, in many cases, is aggressively seeking to prevent the agenda

from advancing. This dynamic has shaped the particular ways that climate policy has progressed in the US, and the political landscape appears unlikely to change in the near future. Current electoral forecasts are for the Democrats and the Republicans to maintain control of the White House and Congress, respectively.

## **2 US emission trends and domestic policy**

As part of the 2009 Conference of the Parties to the UNFCCC in Copenhagen, the US pledged to cut its CO<sub>2</sub> and other GHG emissions to 17% below 2005 levels by 2020. How are things progressing towards that goal?

### 2.1 Emission trends

Energy-related CO<sub>2</sub> emissions, which comprise the vast majority of all emissions in the US, are the lowest they have been for 20 years. Actual emissions in 2013 were 10% below 2005 levels (EIA 2015a). This reduction is more than half way towards the 2020 commitment and, importantly, it occurred over a period when energy-related CO<sub>2</sub> emissions worldwide have increased by 20% (EIA 2015b).

One reason for the significant reduction in US emissions since 2005 is the Great Recession that began to take hold in 2008. This was the most significant economic downturn since the 1930s, and forecasts predict the US economy will not return to potential levels for years to come. A clear consequence has been lower emissions. One estimate attributes about half of the emissions reduction through 2012 to the recession (CEA 2013). Unfortunately, while helping to achieve emission goals in the short term, lower economic activity is not a strategy for lower emissions in the future.

Another important factor has been a lowering of the carbon content of energy, primarily due to the increased supply of domestic natural gas. The technological combination of horizontal drilling and high-volume hydraulic fracturing has significantly increased the amount of economically recoverable natural gas in the US. Most of the gas has been used for electricity production, crowding out production from more carbon-intensive coal-fired power plants. This shift is responsible for about 28% of the US emission reductions since 2005 (CEA 2013). Also playing an increasingly important role are

non-hydro renewable sources of energy for power generation. The US now produces 7% of its electricity from non-hydro renewables, compared to just 2% in 2005 (CEA 2015).

A third factor contributing to lower CO<sub>2</sub> emissions in the US is economy-wide energy efficiency. One measure of efficiency is energy intensity, which captures the amount of energy used to produce a dollar's worth of GDP. For decades, US energy intensity has decreased by more than 1.5% per year, and this alone accounts for an estimated 8% of the emissions reductions between 2005 and 2012 (CEA 2013). While market forces are a critical factor affecting energy efficiency, as well as the carbon content of energy, government programmes also play an important role.

## 2.2 Major domestic policy

In June 2013, President Obama announced his Climate Action Plan. Among the Plan's broad range of initiatives, two major policies are designed to reduce emissions in the transportation and electricity sectors. The federal government finalised national standards to double the fuel economy of light duty cars and trucks by 2025, and the rules are expected to reduce total CO<sub>2</sub> emissions over this period by the equivalent of one full year of current US emissions. The just realised final version of the Clean Power Plan calls for a reduction in emissions of 32% below 2005 levels by 2030 (see also Burtraw 2015). This target would imply a further reduction of 20% beyond what has already occurred since 2005.

Most aspects of the Climate Action Plan are taking place under the executive authority of the president and therefore do not require Congressional authorisation. While this has been – and will continue to be – politically controversial, it means that climate policy in the US is being pushed along further than the Republican-led Congress would itself support. Unfortunately, it also raises questions about whether the policies will withstand legal challenges, changes in political leadership, or both. Not only does the uncertainty make planning for future compliance more difficult, it also undermines the confidence that other countries have in US climate commitments.

Not all significant climate policy in the US takes place at the federal level; there is a wide range of policies taking place at the state, regional, and local levels. The most



prominent example is California's state-wide goal of reducing emissions to 1990 levels by 2020. At the regional level, nine northeastern states participate in a cap-and-trade programme to reduce emissions known as the Regional Greenhouse Gas Initiative (RGGI). Together, California and the RGGI states account for more than half of the US economy. Additionally, many other states and municipalities have policies and programmes in place that are achieving real emission reductions and serving as policy 'laboratories' for future expansion and refinement.

### **3 The US's INDC and matching ambition**

Most countries are in the process of submitting and refining their climate action commitments to cover the post-2020 period. These plans are the official INDCs that will form the basis of the UNFCCC agreement in Paris. The US made its submission on 31 March 2015.

The overarching US commitment is to reduce economy-wide GHG emissions to 26-28% below 2005 levels by 2025. Meeting this commitment will require a 9-11 percentage point reduction beyond the Copenhagen commitment to 2020 (see also Aldy and Pizer 2015). It also represents a significant reduction from business as usual (BAU), which accounts for what would otherwise be increasing emissions until 2025. From one BAU forecast, the US commitment is to reduce emissions by between 18% and 25% from 2014 levels by 2025 (C2ES 2015). At this stage of the process, the US commitment is generally perceived as representing a reasonably high level of ambition.

It remains to be seen how the US commitment compares to those of other key countries. Many of the most important submissions are still outstanding and reliable comparisons will require careful analysis, which takes time. Yet the outcome of this analysis will be critical to ensure a meaningful agreement in Paris – one with broad participation, substantive commitments, and sufficient matching ambition for all countries to follow through.

Indeed, the best way for other countries to allay concerns about whether US climate commitments will withstand domestic political pressures is to submit and maintain equally ambitious INDCs. Over time, the greatest challenge to advancing an ambitious

climate agenda in the US will not be domestic politics, for this is changing along with the majority of public opinion. Instead, as the realities of climate change become ever more certain, the greater concern in the US will be that other countries – especially the large and growing developing countries – will not seek to reduce their own emissions. Without commitments from these countries, it will be difficult to defend a climate agenda in the US that does little to bend the curve of worldwide emissions, yet has adverse consequences for US jobs and competitiveness in a global economy.

#### **4 Climate finance**

Climate finance is as an increasingly important aspect of UNFCCC negotiations. Developed countries have made ambitious commitments, and there is a significant need for resources to help developing countries implement mitigation strategies and adapt to inevitable climate changes. One channel of finance that has become a focal point is the Green Climate Fund (GCF). Established in 2009 as part of the Copenhagen Accord, the GCF is open for business with initial pledges totalling more than \$10 billion.

President Obama pledged \$3 billion from the US. As the first instalment, his administration has requested \$500 million for the GCF in this year's budget cycle, but the appropriation requires Congressional authorisation. Many countries are looking closely to see if the US will deliver on this commitment. Developing countries in particular are focused on the GCF, viewing robust contributions as somewhat of a *quid pro quo* for submitting plans to cut their own emissions.

At the time of this writing, the Obama administration is pushing hard to obtain GCF funding, and Congress is threatening to not provide it. While the near-term prospects are uncertain, and could quite possibly fall short this year, it would be unfortunate if the Paris agreement were to falter as a result. The US budget process is notoriously unpredictable year-to-year, and the world's emission targets in the post-2020 period should not hinge on this outcome.

Other countries should nonetheless have reasonably high confidence in US contributions to the GCF over time. Beyond short-term political flashpoints, both Republicans and Democrats have long recognised the value and impact of climate-related assistance

to poor countries. It was under two Republican presidents – George H.W. Bush and George W. Bush – that the US helped create the Global Environmental Facility (GEF) and the Climate Investment Funds (CIFs). The GCF is the intended extension, and followers of the process may recall that it took a couple years for US appropriations to begin for the CIFs.

Although not taking centre stage in UNFCCC negotiations, other areas of climate-related finance in need of reform and international coordination are the phasing out of fossil-fuel subsidies and of public financing for coal projects overseas. The International Monetary Fund estimates perverse fossil fuel subsidies to equal 6.5% of global GDP (Coady et al. 2015), and global public assistance for coal has averaged about \$9 billion per year since 2007 (Bast et al. 2015). While US-led efforts in these areas have focused on the G20 and across multilateral and bilateral assistance channels, greater integration into the UNFCCC process would be a positive development.

## **5 Success in Paris**

The Paris agreement will not provide a great fix to the world's growing problem of climate change – not even close. The bottom-up approach of basing the agreement on INDCs is certain to fall short of setting sufficiently high global ambition. This is a straightforward and predictable implication of economic incentives on the part of countries voluntarily providing a global public good. So how should we define a successful outcome in Paris?

From the US perspective, there are two key elements. The first is that all major emitting countries, regardless of whether they are developed or developing, submit reasonably ambitious INDCs. The 'common but differentiated responsibility' distinction between developed and developing countries that has defined the UNFCCC process for decades must give way to a more inclusive approach whereby all countries – not just developed countries – seek to reduce emissions. An agreement that does not include emission reductions from the large and fast-growing developing countries simply does not match the future reality of the problem. The recent bilateral announcement between the US and China represents significant progress, and a successful outcome in Paris would be to have other developing countries set similar goals.

The second key element for broad success in Paris is to explicitly recognise the agreement as the beginning of a process, rather than something to be completed so that climate change can fall off the international agenda. The agreement must establish clear pathways towards transparency and regular reporting of emissions, because accurate information is critical to evaluate progress and fairness. And in addition to post-2020 goals, the agreement must also find ways to keep up pre-2020 ambition – the next four years are an important window in which significant progress should be made.

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