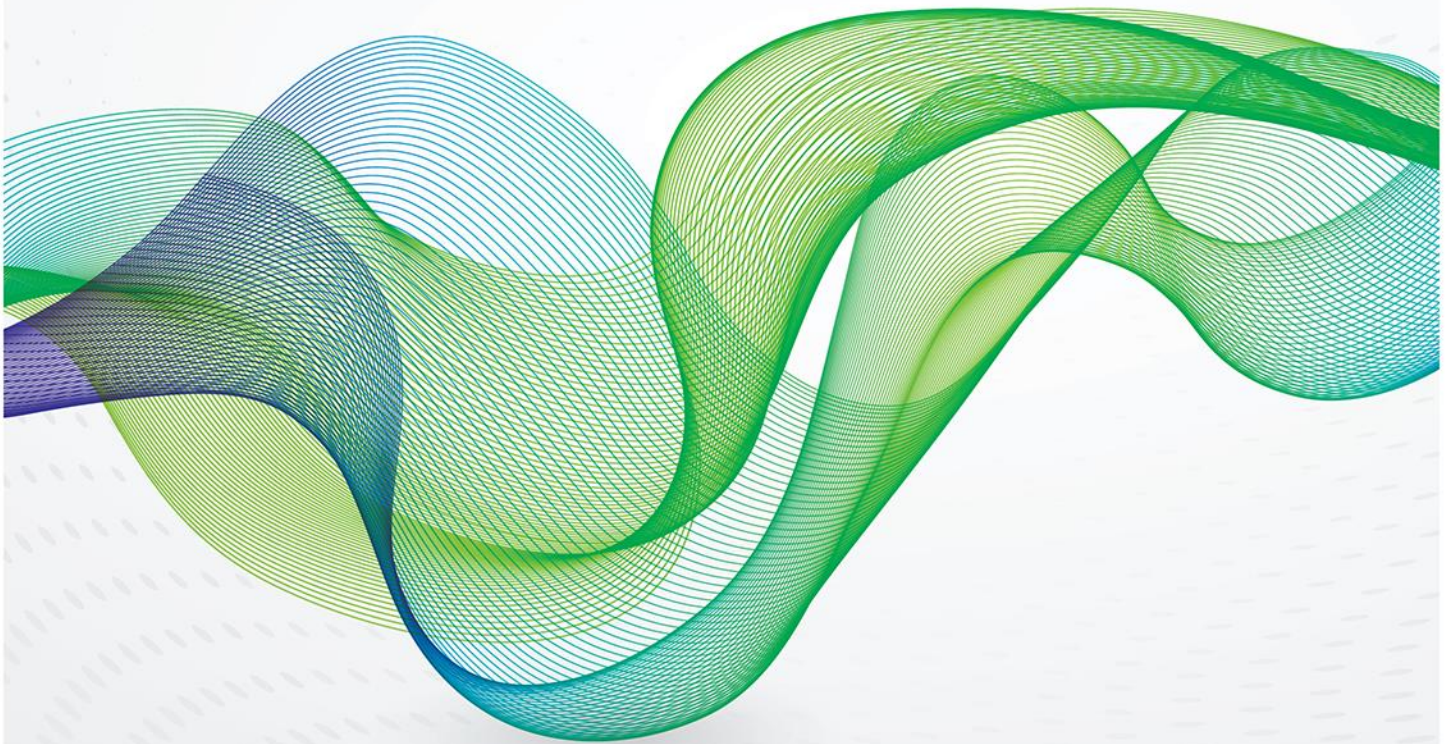


February 2015

Paris 2015: just a first step



Introduction

The 20th session of the Conference of the Parties to the UN Framework on Climate Change (COP 20) recently concluded in Lima, Peru. It was the last COP before the Paris Climate Change Conference, to be held in December 2015, when the parties are expected to sign a universal agreement that would take effect from 2020.

The first part of this article explains the pessimism about reaching a meaningful agreement in Paris, with a particular focus on mitigation¹. Part two summarizes the reasons why an agreement is widely anticipated in spite of this pessimism. Of course, the point is not just to reach an agreement and to let the negotiators declare victory, but to make a meaningful contribution to combatting climate change; part three of this article identifies some of the key negotiation issues that will determine the level of ambition, the structure of the agreement and, indeed, whether there will be any agreement at all. Part four identifies some of the initiatives that are required to bridge the gap between the mitigation called for by the science and the pledges that are expected in Paris. It argues that the currently low price of oil offers an opportunity for governments to eliminate fossil fuel subsidies, introduce carbon taxes, and pay owners of fossil fuels to leave their resources in the ground; all tangible ways of combating climate change. However, successful decarbonization also requires action by civil society and business, particularly technological innovation, improved energy efficiency, widespread implementation of low-carbon technologies, and the adoption of transformative and profitable low-carbon energy business models.

Reasons why expectations for a meaningful agreement are low

There is an understandably high level of skepticism about the UNFCCC² negotiation process, which has been underway for some 20 years now, for four main reasons. First, looking backwards, the process has not delivered a reduction in greenhouse gas emissions, or even any evidence of a slowdown in their growth. One could argue that the Kyoto Protocol, which was signed in 1997 and entered into force in 2005, did deliver emission reductions in some countries. However, total absolute increases in anthropogenic greenhouse gases (GHG) rose faster between 2000 and 2010 than between 1970 and 2000, despite Kyoto and a growing number of climate change mitigation policies.³

Second, looking forward, there is no prospect of an agreement where mitigation commitments are binding in the same way they were supposed to be under Kyoto, wherein a failure to meet the original mitigation targets was to be reflected in tighter targets in later commitment periods. The Kyoto approach obviously failed; several countries, including Canada, basically ignored their targets and left the protocol, saying that circumstances had changed. As explained below, the approach currently under negotiation is even weaker in terms of enforcement. Although governments may be willing to make ambitious commitments in Paris, it is unlikely that targets will be met if their attainment turns out to be more difficult than expected. The judgement seems to be that it is better to have (almost) everyone signing up to an agreement, even if the agreement is unenforceable. That is very different from the philosophy behind Kyoto, where it was more important to get some sort of binding agreement that could eventually embrace everyone. In economic terms, we're talking about a public good; we need some sort of enforcement or coordination mechanism to stop everyone trying to free ride. The new approach emphasizes

¹ Adaptation is another key objective of the UNFCCC negotiations, but not the focus of this paper.

² UNFCCC is the United Nations Framework Convention on Climate Change.

³ IPCC, Climate Change 2014: Synthesis Report, Headline Statements from the Summary for Policy Makers, page 4. http://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_SPMcorr1.pdf (last consulted, 15 January 2015)

participation rather than strict rules, which may be a realistic way to achieve an agreement, but it is far from obvious that it will encourage countries to meet their commitments.⁴

Third, a related debate distinguishes between a top-down global agreement on mitigation, such as Kyoto, and a bottom-up approach that emphasizes national commitments from most countries (along with international agreements on transparency and accountability) and a gradual tightening of those commitments. The US is a particularly strong proponent of the bottom-up approach, which appears to be gaining strength in the negotiations, though the debate is far from over. The main concern with this approach, apart from the absence of an enforcement mechanism, is that there is no guarantee that the aggregated national commitments will add up to the mitigation required to avoid dangerous climate change.

Finally, there is a growing recognition that these negotiations are a dangerously complex game and that a small number of influential countries hold most of the power. There are almost 200 nations represented, along with thousands of non-state actors from business, sub-national government, and civil society (NGOs, academics, citizens, and more) who have no formal voice in the process, but do influence negotiations. Leaders of the negotiating countries have domestic political agendas that heavily influence international negotiating positions and the creation of coalitions. It is hardly surprising then that consensus is difficult to achieve. Nor is it surprising that when agreements are reached, they usually reflect the interests of the most powerful countries with the highest absolute levels of emissions, and that these agreements sometimes amount to a step backwards in terms of ambition and enforcement.

Reasons to expect an agreement in Paris

Given the complexity of the negotiations and the disappointing progress since 1992, in particular the outcome in Copenhagen in 2009, it may seem surprising that the world is expecting an agreement in Paris. Nevertheless, I think that most experts do expect some sort of agreement, however inadequate it may be, and below are seven reasons why.

First, the scientific evidence is increasingly compelling about the causes and effects of climate change. Recent IPCC reports⁵ concluded that climate change is 'extremely likely' to be the result of human behavior. The reports also argue that urgent action is required to reduce global GHG emissions in order to avoid dangerous interference with the climate; that is, to stop global mean temperatures from rising more than 2°C above pre-industrial levels this century, though many scientists argue that 1.5°C is a more appropriate limit. Without a change in policy, world temperatures this century are expected to rise well above these thresholds, causing irreparable harm. In the words of the IPCC:

'Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptations, can limit climate change risks.'⁶

⁴ For a US perspective, see Bodansky, Daniel and Elliot Diringer, 'Alternative Models for the 2015 Climate Change Agreement', FNI Climate Policy Perspective 13, October 2014. <http://www.fni.no/doc&pdf/FNI-Climate-Policy-Perspectives-13.pdf> (last consulted 15 January, 2015).

⁵ IPCC is the acronym for the Inter-Governmental Panel on Climate Change. The Fifth Assessment Report consists of three working group reports and a synthesis report. <http://www.ipcc.ch> (last consulted, 10 January 2015).

⁶ IPCC, Climate Change 2014: Synthesis Report, Headline Statements from the Summary for Policy Makers. http://www.ipcc.ch/news_and_events/docs/ar5/ar5_syr_headlines_en.pdf (last consulted, 10 January 2015).

As the science becomes more convincing, ignoring it becomes more difficult for political leaders to justify.

Second, the architecture of the new agreement looks likely to favour a bottom-up agreement, although there is still no consensus. Each country is expected to make nationally determined contributions, referred to as INDCs (Intended Nationally Determined Contributions). If adopted, this architecture may facilitate reaching an agreement and encourage more ambitious contributions, especially if countries do not need to ratify the agreement in their national parliaments and there are no legal or financial penalties for non-compliance. This is especially important for the US, given the current lack of support for President Obama in Congress and the possibility that a future president may decide not to comply with the INDCs pledged in Paris.

Third, the domestic political agendas of key countries are increasingly focused on climate change mitigation and adaptation. In particular, the governments of the US, China, and EU countries are taking domestic action to mitigate emissions. In a meeting between the leaders of China and the US, the two countries made the following commitments, as reported by the White House:

‘The United States intends to achieve an economy-wide target of reducing its emissions by 26%-28% below its 2005 level in 2025 and to make best efforts to reduce its emissions by 28%. China intends to achieve the peaking of CO₂ emissions around 2030 and to make best efforts to peak early and intends to increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030. Both sides intend to continue to work to increase ambition over time.’⁷

In addition, the EU has reinforced its commitment to de-carbonization, agreeing to reduce its emissions by 40 per cent (compared with 1990 levels) by 2030. The importance of these decisions is not in the numbers, but rather in the message: countries responsible for over 50 per cent of global emissions appear to be preparing the way to reach an agreement in Paris.

Fourth, the 2009 Copenhagen COP illustrated the potential for powerful countries to drive the negotiations and achieve outcomes, such as the Copenhagen Accord, even if there is no consensus. Copenhagen was widely considered to be a failure, at least in terms of the expectations that had been created that a legally binding global agreement would be reached. The Copenhagen Accord was written at the very end of the summit by a small group of countries and then put to the other countries for approval. It established the basis for making national mitigation pledges (for 2020) and moved the negotiations in the direction of an eventual bottom-up agreement. Seven countries – Bolivia, Sudan, Tuvalu, Nicaragua, Cuba, Venezuela, and later Pakistan – refused to accept the accord, which is non-binding.

Fifth, no country wants to be accused of being responsible for a failure in Paris. In Copenhagen, many accused China of being responsible for the failure to reach a comprehensive and binding agreement. Although I do not think that was a fair accusation, it has stuck. No country wants to leave Paris with the tag of ‘spoiler’, certainly not China and not the US.

Sixth, 27 countries (including seven developing countries) have agreed to contribute more than \$10 billion to capitalize a new financial instrument for developing countries, known as the Green Climate Fund (GCF). The developing countries that stand to benefit from this fund will not want to risk losing access. Although I am not aware of an explicit link between the fund and an agreement in Paris, it is easy to imagine that funding low-carbon projects will be helped by an agreement. For reasons explained later, however, the wider issue of financial support for developing countries could well be a deal-breaker.

⁷ White House, ‘US China Joint Announcement on Climate Change’, 12 November 2014. <http://www.whitehouse.gov/the-press-office/2014/11/11/us-china-joint-announcement-climate-change> (last consulted, 15 January 2015).

Last, important parts of civil society and of the business community are pressing negotiating parties to reach an agreement. In the concluding press conference in Peru, the organizers of the Lima and Paris conferences said that the presence of 400,000 people marching in the streets of New York during the UN Secretary General's Climate Leadership Summit in September 2014 had sent an important message to the UNFCCC negotiators: 'get the job done'. On the other hand, a similar presence of civil society in Copenhagen had little effect. Perhaps more important this time, there is a growing business constituency that supports the introduction of a well-defined global regulatory framework to address climate change. For instance, over 1,000 businesses and investors signalled their support for carbon pricing at the UN Climate Leadership Summit.⁸

Some difficult issues to resolve before an agreement can be signed

Almost any international agreement to tackle climate change would be better than no agreement at all. However, the aim should be to achieve widespread consensus and to make the agreement as ambitious and effective as possible, especially with respect to mitigation over a number of commitment periods. Here are some of the critical issues that need to be addressed.

Differentiation

The most problematic issue is the differentiation between industrialized countries and developing countries, known respectively as Annex I and non-Annex I countries in the UN Framework Convention on Climate Change of 1992. There are divisions within each of these groupings, but the original differentiation still influences negotiations on most of the key issues.

Contributions to the new agreement will most likely be built on the basis of INDCs for all countries, which implies a less stark distinction between Annex I and non-Annex I countries than in the Kyoto Protocol. There is a consensus on the need to retain the principle of 'common but differentiated responsibilities and respective capabilities'. This has always justified Annex I countries bearing the heaviest burden – both in terms of mitigating their own emissions and in terms of financing mitigation and adaptation in the non-Annex I countries. However, there is no consensus on how to retain this principle within the new architecture. Indeed, Annex I countries argue that the world has changed since 1992 and that the differentiation should as well. In Lima, some progress was made on this topic by stressing 'different national circumstances'. In principle, this should make it easier to distinguish between the poorest and most vulnerable non-Annex I countries and the wealthier ones.

Financial support to developing countries

According to most non-Annex I countries, the wealthier nations should include financial commitments in their INDCs, for instance to support mitigation and adaptation in non-Annex I countries. Developed countries have been unwilling to agree to this, arguing that this requires parliamentary support that cannot be guaranteed. The result is that the Lima Call for Climate Action, the conference ending document agreed by delegates, invites the developed countries to pledge financial support, but does not require it.

Practically all of the developing countries consider the initial GCF resource mobilization to be an insufficient basis for the Paris agreement. There is a serious lack of trust concerning the developed countries delivering on their promise of US\$100 billion per year by 2020 from public

⁸ '73 Countries and Over 1,000 Businesses Speak Out in Support of a Price on Carbon', The World Bank, 22 September 2014. <http://www.worldbank.org/en/news/feature/2014/09/22/governments-businesses-support-carbon-pricing> (last consulted 23 January, 2015).

and private sources⁹. Finance will be a major bargaining chip for the developing countries, many of which will likely argue, 'without more money, we will not sign up for Paris'.

Loss and damage

Non-Annex I countries want to include a specific section on loss and damage, but industrialized countries rejected this possibility, presumably for fear of having to pay compensation for their historic emissions. There are nuances here, however, as some developing countries want this much more than others and there are also differences among the developed countries, with the US being the fiercest opponent. The deletion from the draft negotiating text of a possible solution was a great disappointment for the least developed countries and the Alliance of Small Island States (AOSIS).

Mitigation

Some of the developing countries argue that only Annex I countries should commit to economy-wide targets for their absolute national emissions (tonnes of CO₂), as in the Kyoto agreement. Most of the Annex I countries argue that all major countries, including China, should set such targets at the national level, although at first these may be for carbon intensity (tonnes of CO₂ / GDP). As mentioned, the text agreed in Lima will make it easier to differentiate between the wealthier emerging countries like China and Saudi Arabia on the one hand, and the very vulnerable developing countries on the other. Nevertheless, the issue of burden sharing on mitigation remains a major source of disagreement and some large developing countries oppose the idea of setting a national emissions target.

Cycle of contributions for the NDCs¹⁰

On this topic, the disagreement cuts across the traditional lines separating Annex I and non-Annex I countries. The EU and a number of developing countries favour a longer time frame for commitments (10 years, with the first commitment period ending 2030) in order to provide investors with greater certainty. The US and other countries favour a shorter time frame (five years, with the first commitment period ending 2025) on the grounds that this will allow for future adjustments that reflect the science.

Although the exact time frame should not be a deal-breaker, the underlying structural issue is critical. With either time frame, it will be critical to ensure that the agreed structure of the agreement provides for a smooth process for raising commitments between periods.

The review component of the agreement

A number of countries, including the EU nations, favour an *ex ante* assessment of the INDCs, with the aim of ensuring that the agreement will be sufficiently ambitious to avoid dangerous interference with the climate. Under such an agreement, the combined commitments would move the world from a forecast 3-4°C increase in temperature this century to a forecast increase of 2°C or less. Many non-Annex I countries also favour an assessment of whether Annex I countries are making sufficient effort in their INDCs. Though there was no agreement in Peru on either of these, the Lima Call for Climate Action does, nevertheless, call for the preparation of an assessment of the INDCs received by 1 October 2015, in order to compare the aggregate mitigation of the INDCs with the mitigation required according to the scientific evidence. This assessment should be

⁹ According to one estimate, approximately \$10 billion per year of 'climate aid' was provided by the developed countries between 2010-2012, but measuring private funding to date is problematic. See 'Fight over Global \$100 Billion Aid Stalls Climate Deal', Bloomberg, October 25, 2014. <http://www.bloomberg.com/news/2014-10-24/emissions-link-to-100-billion-in-climate-aid-snarls-un-talks.html> (last consulted 24 January, 2015).

¹⁰ The term 'NDC' is usually used (at least in the EU and Brazil) for national contributions once the agreement is in force and 'INDC' to the initial offer.

published one month before the Paris conference, leaving insufficient time for serious scrutiny. Nevertheless, a pessimistic assessment might encourage some countries to raise their commitments during final negotiations.

Legal form

The legal form of an agreement is still unclear. At the end of the Lima conference, the *Ad Hoc* Working Group on the Durban Platform for Enhanced Action (ADP) was instructed to make available 'a negotiating text for a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all parties before May 2015'.¹¹ In practice, the draft text must be agreed in a meeting to be held in February, with INDCs submitted by the end of March, or as soon as possible.

I have listed some of the key areas of disagreement to be addressed in the draft, but there are many other difficult issues, such as those related to adaptation. The task of reaching an agreement is enormous and total failure is obviously a possibility. However, for the reasons stated above, I think some sort of an agreement will be reached, leaving no one entirely satisfied but at least avoiding the consequences of having no agreement at all. From the perspective of climate change, the real problem with the likely agreement is the expected low level of its ambition, which will mean that a huge extra effort will be required later to avoid a global temperature rise above 2°C and to address the needs of adaptation. This explains the importance of an agreement that ensures a smooth process of raising commitments over time. However, it also underlines the importance of thinking about what else can be done, independently of a possible Paris agreement, in order to address the challenges of climate change.

What can be done to bridge the gap between science and mitigation pledges?

The main objective of the UNFCCC negotiations is to avoid dangerous climate change. In practice, this requires reducing the gap between current mitigation plans and the mitigation required according to the latest scientific findings. However, it is now almost inevitable that the gap will be large, with or without an agreement in Paris. Indeed, the gap could grow as a result of lower oil prices, which encourage greater consumption of fossil fuels and make some zero-carbon energies less competitive with fossil fuels. When oil prices fall, as one oilman was quoted as saying to a renewable provider, 'we cut costs and you go bankrupt'.

This section is divided into four parts: the first is related to policies aimed at reducing fossil fuel production and consumption; the second, to the importance of innovation to develop low-carbon technologies that are competitive with fossil fuels; the third, to financial support for developing countries; and the fourth, to the role of business and civil society in furthering de-carbonization.

Reducing fossil fuel production and consumption

The starting point is recognition of the need to limit the production and use of fossil fuels, or at least the emissions associated with them. According to some studies, to have a 50 per cent chance of keeping temperatures from rising more than 2°C during the 20th century, the cumulative CO₂ emissions between 2011 and 2050 should not exceed 1,100 GT CO₂: also known as the carbon budget. The implication is that a share of these fossil fuels should be left in the ground if the aim is to avoid dangerous climate change, unless technologies are developed that can successfully capture, permanently store, or use the CO₂ emissions. One study suggests that 80

¹¹ Ad Hoc Working Group for Enhanced Action Under the Durban Platform, Second Session, Part 7, Lima 2-11 December 2014, Agenda Item 3, Implementation of all the elements of decision 1/CP.17, page 2: <http://unfccc.int/resource/docs/2014/adp2/eng/l05.pdf> (last consulted 15 January, 2015).

per cent of coal, half of natural gas, and a third of remaining oil reserves must be left in the ground.¹² Any limitation of this magnitude, or even a substantial proportion of it, would obviously have huge implications for the owners of fossil fuels, as well as for users and potential investors.

There are at least five incentives that could lead to a reduction in the production of fossil fuels: falling fossil fuel prices for producers; a reduction in hydrocarbon subsidies, especially for consumers; the introduction, or increase, of carbon prices; direct compensation to the owners of fossil fuel resources who leave the fossil fuels in the ground; and falling demand for fossil fuels due to improved energy efficiency or substitution by non-fossil energy.

Falling fossil fuel prices for producers. Owners of fossil fuel resources may choose to leave their hydrocarbons in the ground when prices are falling. One reason could be that the short-run marginal cost of producing the resource is greater than the marginal revenue. A second reason could be that a combination of producers (such as OPEC) may seek to raise oil prices by reducing production. Third, if owners anticipate higher prices in the longer term, they may choose to leave the resource in the ground for now. On the other hand, there are reasons why production could continue in spite of falling prices, including the process of storing oil above ground for sale later if prices are expected to rise in the future (a contango situation), budgetary requirements, a fight for market share, or a concern that the longer-term prospects for oil prices are poor and that it makes no sense to postpone production. Furthermore, global production could well continue at the same level or rise for some period, but shift from higher-cost to lower-cost regions, in particular the Middle East. Nevertheless, a sustained period of low fossil fuel prices for producers will eventually discourage investment at the margin and could lead to some high-cost resources being undeveloped.

Ending hydrocarbon subsidies. The obvious problem with the previous argument is that low hydrocarbon prices will raise demand, feeding into higher expected producer prices and investment to develop the fossil fuel resources. Lower oil prices will also discourage the development of competing non-fossil energies, such as biofuels. One way to address this problem is to reduce or eliminate subsidies for hydrocarbons, especially those related to consumer prices¹³. The definition of 'subsidies' is not straightforward, but there is growing recognition that consumer prices held below world market prices are responsible for a significant waste of economic resources, as well as inefficiently high levels of fossil fuel production, consumption, and related CO₂ emissions. Currently low oil prices are an opportunity to reduce or even eliminate consumer subsidies, since consumers may experience little increase in their final price. This is precisely what a number of developing countries are doing right now. China, for instance, has increased taxes on the consumption of petroleum three times in recent months, while subsidies have been reduced in Morocco, Egypt, and Jordan, among other countries. To avoid a popular backlash when world oil prices begin to rise, it is also important to introduce fiscal measures to compensate the most vulnerable energy consumers, and other reforms, such as improved public transport.

Introducing, or increasing, taxes or carbon prices. Another way of dampening the impact of lower fossil fuel prices on demand is to introduce, or increase, taxes on consumption, with carbon prices being an important example of an economically justified tax. The economic case for introducing a carbon price (via carbon taxes, emission trading, or in other ways) has always been compelling. Those who use or produce carbon-based products do not bear the full social costs of their decisions, which contribute to climate change as well as to local pollution, affecting the health

¹² McLade, Christophe and Paul Ekins, 'The geographical distribution of fossil fuels unused when limiting global warming to 2 °C', *Nature*, 7 January 2015. <http://www.nature.com/nature/journal/v517/n7533/full/nature14016.html> (last consulted 9 January 2015).

¹³ The IEA estimate that fossil fuel subsidies amount to about \$550 billion per year, <http://www.bbc.co.uk/news/business-27142377> (last consulted 28 January, 2015).

and welfare of millions. Putting a price on carbon is a way of internalizing these costs and thereby influencing investment and consumer decisions.

It has always been politically problematic to introduce a price for carbon, though falling oil prices would make it easier. Recently, American economist and former Secretary of the Treasury Lawrence Summers wrote an article recommending the introduction of a carbon tax this year in the US because, apart from the economic merits, the impact on consumers would be politically acceptable and the budgetary consequences would be favourable. He noted that gasoline prices in the US have fallen by about a dollar per gallon and that a carbon tax of \$25/tonne would raise over \$1 trillion during the next decade while lifting the gasoline price by only 25 cents/gallon.¹⁴ The additional tax revenue could be redistributed to the most vulnerable energy consumers and used to support investment in public transport and Research, Development, and Demonstration (RD&D) in low-carbon technologies.

None of the parties is currently expecting a global carbon tax or price to emerge in the Paris agreement, but if the US were to adopt a carbon price this year it would be an important breakthrough. In any case, a number of countries (and sub-national governments) will use carbon prices to achieve their INDCs. With time, more countries will do the same and it is reasonable to anticipate that these national or regional carbon prices will eventually be related to one another.

Compensation to owners of fossil fuel resources. If energy prices do not provide incentives to leave fossil fuels in the ground, should owners be paid to discourage their development? This was the case made by the Ecuadorean government as the basis for not developing the oil reserves in the biologically unique Yasuní National Park. In 2007, the government offered a perpetual suspension of oil extraction in part of the park in return for compensation from the global community. The project raised funds but was eventually suspended by Quito in 2013. The reasons for suspension are controversial, but it was clear that there was a significant problem of trust on both sides. Some European contributors maintain that the Ecuadorean government was going to develop the Yasuní resources while receiving funds to compensate for not doing so. Contributors also wanted to have some control over how the money was spent, while the Ecuadorean government resisted what it considered to be foreign intervention.¹⁵ Nevertheless, the concept of paying for non-development of hydrocarbon resources deserves further study. To make practical sense, the idea would require a means of discouraging development of resources on a very large scale, and a way of compensating owners. Neither of these requirements has an easy solution, but the lower the expected price for fossil resources, the lower the cost of compensating the owners.

Depressed demand for fossil fuels: energy efficiency and substitution. There are many microeconomic reasons why demand for some fossil fuels might fall, apart from the combined impact of carbon taxes and the end of fossil fuel subsidies. In particular, fossil fuel demand is reduced by the introduction of tighter fuel economy standards for road transport and of energy efficiency standards for buildings. Likewise, the substitution of fossil fuels by renewable energy in the power sector is reducing demand for certain hydrocarbons, especially natural gas.

Technological innovation to promote de-carbonization

The best and most sustainable way to reduce the use of fossil fuels is through the development and deployment of competitive low-carbon technologies, in particular renewable energies. As

¹⁴ Lawrence Summers, 'Let this be the year when we put a proper price on carbón', Financial Times, 4 January 2015, <http://www.ft.com/intl/cms/s/2/10cb1a60-9277-11e4-a1fd-00144feabdc0.html#axzz3OLP6kEOg> (last consulted 9 January, 2015).

¹⁵ The latest twist on this is the diplomatic rift between Ecuador and Germany related to Ecuador's refusal to allow German parliamentarians to visit the Yasuní. <http://m.theepochtimes.com/n3/1160876-ecuador-and-germany-at-odds-over-rainforest-visit/>

former Saudi oil minister Sheikh Yamani once famously noted, ‘the Stone Age didn’t end because we ran out of stones’.

This challenge is particularly important in the electricity sector, for two reasons. First, fossil fuels compete with renewables in the generation market. Second, electricity competes with hydrocarbons in final energy markets, including heating and increasingly in transport. Although renewable power has gained market share in large part due to subsidies, the most recent study from IRENA illustrates how fast and how far the cost of renewable power has fallen and that in many cases renewables compete successfully with fossil fuels.¹⁶ Nevertheless, further innovation is clearly needed in order to drive down the costs of integrating renewable power in electricity systems and to eliminate the need for subsidies.

Policy Incentives. Experience in the EU suggests that the challenge is not simply to introduce a carbon price but to send long-term signals that encourage innovation in low-carbon technologies. For instance, policy could define a rising minimum carbon price, along with import taxes reflecting the carbon content of products from countries that do not have similar carbon levies. In the absence of this sort of explicit long-term price signal, other policy incentives are required. These should be technology-neutral, as with carbon intensity targets, and preferably not involve subsidies.

Coordination of technology development. There is also a good case for coordinated international action for technology development, even though this is politically difficult due to intellectual property rights. There has been some progress in the UNFCCC negotiations on this matter, but much more effort and financial support are required.

Financial support for developing countries

In 2009, the developed countries pledged to mobilize \$100 billion a year by 2020 from public, private, and other sources to help vulnerable states to develop cleanly and to adapt to more extreme weather and rising seas. Successful de-carbonization and adaption in developing countries depends critically on ensuring sufficient financial resources. There is no evidence yet that funds on the required scale will be mobilized, nor is there an agreed basis for measuring the financial resources being made available, especially those from the private sector.¹⁷

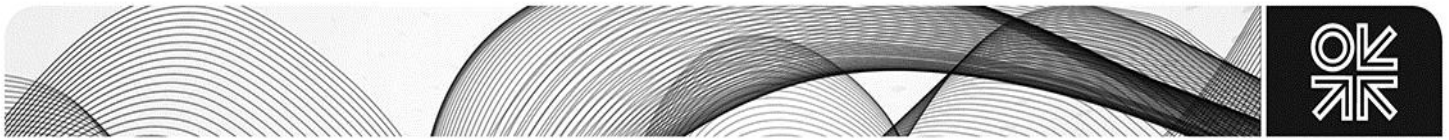
Whatever funds are made available must be managed effectively. There is very little prospect of this happening for the large number of small-scale projects that are anticipated without a significant degree of decentralization of project finance decision-making. However, small-scale projects in developing countries are often economically unattractive due to the absence of long-term loans on acceptable terms. International funds, such as the Green Climate Fund, should support local and regional banks by helping them to offer more attractive long-term loans.

The role of business and civil society

While it is evident that national governments are critical to the de-carbonization process, they alone are not able to get the job done. Indeed, they often get in the way for a variety of reasons, including short-term electoral politics and concern about upsetting existing business interests and political constituencies. To close the mitigation gap, business, civil society, and sub-national

¹⁶ IRENA, ‘Renewable Power Costs in 2014’, <http://irenanewsroom.org/2015/01/17/renewable-power-costs-plummet-many-sources-now-cheaper-than-fossil-fuels-worldwide/> (last consulted 18 January 2015).

¹⁷ ‘Fight over Global \$100 Billion Aid Stalls Climate Deal’, Bloomberg, October 25, 2014. <http://www.bloomberg.com/news/2014-10-24/emissions-link-to-100-billion-in-climate-aid-snarls-un-talks.html> (last consulted 24 January, 2015).



governments sometimes have to take the lead. I can identify at least three roles, with a particular focus on civil society and business.¹⁸

The first role is to promote and engage in open debate about the risks of climate change, the costs of action versus inaction, and the policy options. In spite of the scientific evidence, many people are not convinced that the cost of addressing climate change is justified, especially because the required funds are also wanted for other important uses. In this debate, I accept that policies to address climate change have frequently been wasteful and served special interests, but this does not justify inaction once the science is so compelling. The policy challenge is to use the funds more efficiently and to draw on competitive markets to help deliver innovative solutions. Furthermore, it is important to stress the social and environmental costs of fossil fuels. I also emphasize the co-benefits of mitigation, in particular the improvement to the local environment and to health, and note the growing evidence that addressing climate change is consistent with successful and sustainable economic growth.

Obviously, this debate must occur at all levels of society, but I am convinced that one of the key challenges is to engage the very youngest people. This is not only because they have the most to lose from failure, but because they are not cynical and are inclined to think that anything is possible, until there is genuinely convincing evidence to the contrary. In words extracted from a longer poem ('Let's Go Green') by my 9-year-old niece, Sofia Robinson:

'The world is in trouble,
Let's go green,
We'll recycle,
Save water,
And help the Earth to be clean.'

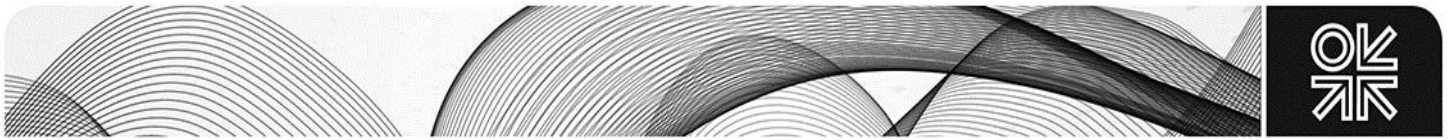
If young people are not convinced that this is a battle worth fighting, then we are in even more serious trouble than we think!

Second, all members of civil society and the business community who are convinced of the need to act must press governments to be ambitious in Paris, to meet commitments made there (at least through naming and shaming those that do not), and to establish stable regulatory frameworks that encourage low-carbon innovation and efficient de-carbonization. This is not simply about lobbying key governments and marching during climate change summits, it is also about making climate change a critical and permanent political issue, for instance by calling for cross-party agreements on energy and climate change policy and the introduction of carbon prices.

Third, new technology and private business initiatives are fundamental drivers of social and political change. Public and private funding of basic RD&D is obviously critical. Building on the findings from basic RD&D, entrepreneurs periodically develop transformational products and business models that change our lives. Personal computers and the internet, both privately-funded developments that built on publicly-funded research, have completely changed just about everything over the last 40 years. Likewise, the private commercialization of electricity was transformational, as was the commercial development of both air and road transport. In all these and many other cases of transformational change, the political and regulatory environment is critical, but private initiative combined with innovation is the fundamental driver and often way ahead of policy.

Today, the need to address climate change offers business and research communities the opportunity to be part of a profitable transformation of our energy system. For instance, in the

¹⁸ Sub-national governments, in particular cities, are increasingly important in the fight to address climate change. However, they are not the focus of this note.



power sector, we are at a point of inflection, where smart electrical equipment (such as air conditioners that respond to price signals) are becoming commercially available, and where major companies like Google are developing commercial models to support distributed renewable generation, and are expected to commercialize control devices that will coordinate consumer use of all smart devices in a given location. Along with the arrival of smart metering and distributed generation, the availability of smart devices opens the door to new business models in which energy consumers and their suppliers share the benefits of more efficient ways of producing and using energy. The list of related opportunities is very long indeed, including the growth of electric vehicles and the active participation of consumers in the production of electricity and its sale to wholesale markets. Who exactly will walk through that door and change our lives with these tangible actions, and whether government will lower barriers to facilitate these transformations, are questions which remain to be answered.

Conclusion

There are good reasons to be pessimistic about the prospects of an ambitious agreement in Paris. However, there is every reason to press for an agreement that is as ambitious as possible in terms of mitigation, with a structure that ensures that commitments can be strengthened over time.

Independently of Paris, different and more ambitious policies are needed at both the national and international levels. The currently low price of oil offers an opportunity for governments to lower or even eliminate fossil fuel subsidies, introduce carbon taxes, and pay owners of fossil fuels to leave their resources in the ground. Policy should also encourage energy efficiency and innovation in the development of low-carbon technologies so that they are genuinely competitive with fossil fuels, especially in view of the prospect of continued low prices for the latter.

While national governments will play a critical role, civil society, sub-national governments, and especially business communities must increasingly take the lead with tangible actions that will accelerate de-carbonization. In particular, it is important for business to take advantage of the inflection point in the commercial development of smart technologies that allow both for a more efficient use of electricity and for the penetration of renewable sources of power. The development of a smarter and more flexible demand-side to the electricity market is central to a more efficient use of electricity, to the penetration of intermittent renewable energy, and to the eventual electrification of transport. It is hard to find more important and tangible actions than these.