Pierre Ducret
and Maria Scolan

CLIMATE

THE FINANCIAL CHALLENGE

Preface by Pascal Canfin

AFD
AGENCE FRANÇAISE
DE DÉVELOPPEMENT

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"Your hearts must have the courage
for the changing of the guards."
Bob Dylan,"Changing of the guards"

"Ceci tuera cela."
Victor Hugo, Notre-Dame de Paris

Preface
by Pascal Canfin

This book by Pierre Ducret and Maria Scolan is important. It is the first volume that describes and deciphers the extraordinary changes that have affected green finance over the last two years following COP21.

Those who, like me, have closely monitored these developments in the world of finance know that 2014-2015 may well have kicked off a new era in the sector's awareness of the climate challenge. But we needed a guide to find our way through the announcements by banks and insurance companies, the new rules established in France and elsewhere, the new tools on which development banks are working, and so on. Pierre Ducret and Maria Scolan have bridged this gap in a particularly instructive way, sharing their optimism while maintaining the necessary critical distance from the announcements made by public and private players, who have all too frequently accustomed us to not fulfilling their commitments.

I have had an eye on the financial sector since the date of my election to the European Parliament in 2009. One of the texts that I negotiated there is the Directive regulating the rating agencies. That was in 2010-2011. At the time, I proposed that these agencies should be required to measure company, and even State exposure to the risks linked to

climate change. I was the only negotiator supporting this idea. To the Left, the response was that the infamous rating agencies should not be entrusted with so noble a task. From the Right, I was told that our role was to talk about serious matters – as they saw it, climate was definitely not one of them. Barely five years later, the rating agencies themselves adopted this rule. They were not forced to do so by politically elected representatives but because of the demands of the risk assessment profession. These voluntary commitments can still be improved. Nevertheless they underlight a major cultural change in just a few years.

In 2014, I joined an American think tank, the World Resources Institute, considered to be the most influential in environmental matters worldwide. I had set myself several goals including that of obtaining during G20, a few weeks before COP21, a commitment from all countries to set up new rules on financial markets, to better measure climate risks. I thought we might be able to squeeze in such a commitment just before the COP. It actually went through in April 2015, thanks to the joint engagement of the Governor of the Bank of England, Mark Carney, and of French Finance Minister, Michel Sapin. This book does a very good job of recounting the shift that occurred when Finance ministers and financial regulators entered the game.

This connection between finance and climate change was not self-evident. Furthermore, for what continues to be a substantial share of the financial world, it is still not self-evident. We have moved from a marginal thematic issue to a challenge understood by approximately half of the

long-term financial actors, like pension funds[1]. And, for part of the environment world, this link was not self-evident either! Finance frightens people. And that is in fact the main strength of financiers, who like to use jargon and concepts whereby they seem to float above common mortals! Don't get taken in. Finance is simple, sometimes even simplistic, and too important to be left to the professionals of the sector. Because ultimately finance, just like environmental affairs, ties the present to the future.

I would like to thank Maria and Pierre for giving us key insights into this recent history which, if it keeps growing, will have shown us that there is always a glimmer of hope.

1. According to the Asset Owners Disclosure Project, half the world's asset managers have a climate risk management policy.

Introduction

New York, September 23rd, 2014: a People's Climate March organised by NGOs from all over the world is crossing Manhattan on its way to the United Nations headquarters. Leading politicians are part of the march: Ban Ki-moon, wearing a T-shirt and a cap, Al Gore, Laurent Fabius, Bill de Blasio… It is organised simultaneously in many countries, including China, bringing together more than 500,000 people. We too are present.

For us, and those like us who have been committed to the climate change issue for a long time, it is reassuring to see so many of its defenders stand up and be counted. The next day, in the imposing United Nations General Assembly Hall, responding to the invitation of Secretary General Ban Ki-moon, we attend an event that impresses us even more than the march: the heads of some of the world's most powerful companies (Unilever, Ikea, Engie, Nestlé, Google, etc.) make a public commitment to join forces in the struggle against climate change. And for the first time, there are global finance figureheads among them: Bank of America, Crédit Agricole, the big European pension funds. Even the highly symbolic Rockefeller Brothers Fund, the investment fund owned by some of the inheritors of the Standard Oil magnate, announces its decision to sell off its shares in the oil industry and invest into renewables...

We are not taken in by marketing ploys or by the "greenwashing" stream that these positions may be hiding. However, these are public commitments. Those who are making them know that they will be accountable for them. At this moment we understand that something is really changing in the world of finance, which had been so low-key about climate change until then. This is no longer about pioneers or players who have been committed for a long time. A new phase has begun and the reinforcements are powerful, whatever their motivations may be.

The following two years were a time of acceleration, the high point being COP21, and it now appears that the movement is far from dying out. This book is an attempt to explain the dynamic effect of what we will call, in the currently widespread usage, climate finance.

What is climate finance? In the jargon-ridden terminology used by the United Nations, the 2014 definition is:

"*climate finance aims at cutting emissions, reinforcing carbon sinks and decreasing vulnerability while maintaining and boosting the resilience of human and ecological systems to the negative impacts of climate change*". Phew! Simply put, climate finance aims at financing the transition to a carbon-neutral economy that will be resilient to climate change.

One can give this definition a narrow meaning, concentrating on financing aimed at assets characterized by low emissions, or by their ability to withstand the effects of warming that is already underway. But that's not enough: what is the point of covering the ground with solar panels if we continue to construct coal-fired power plants alongside them?

Therefore, we will assign a broader meaning to the term "climate finance". We will use it to encompass the ambitious programme that consists in redirecting global financial flows so that they help keep warming under the threshold of 2°C. That is the explicit objective covered by article 2 of the Paris Agreement on Climate Change, which was adopted by 193 countries in December 2015. In very concrete terms, this means achieving carbon neutrality during the second half of the 21st century. The target: zero net greenhouse gas emissions.

What does this definition imply? With respect to climate, financial decisions can be depicted as three circles, based on the typology established by the Agence Française de Développement (AFD): those directly financing the low carbon transition; those offering co-benefits for climate and lastly, those that are consistent with the 2°C target.

We believe that all financial choices need to take climate change into account and that all financial players, from insurers to investors, including banks, need to join forces behind the slogan of the European Investment Bank: "*putting climate into everything we do*".

For a long time, many financial players considered that climate finance was a business for specialised teams, and some of them still do. This book is for them: it endeavours to show how finance professionals can rethink their professions and integrate the climate challenge. It is also for those who look at finance with a wary eye, especially because of its clearly established responsibility in the 2008 crisis. We are convinced that the financial sector can help build a sustainable future and holds many of the keys to a successful transition toward a low-carbon economy.

Furthermore, it is evident that a large share of the financial world has finally become aware that its future depends on its ability to contribute to a new model. Although this is still a minority point of view in the "short-termist" world of finance, we believe that it can now become mainstream due to a combination of factors. Firstly, this view is compatible with the demands of the industry – in short, the law of risk/return. It also presents an opportunity to reconstruct the economic utility of finance and, in a way, to come to terms with the real economy. We think that climate finance can help develop a "new regime" for finance, which has only begun to emerge in the last few years and is becoming more and more visible.

That is why we have partly built this book as a story, to tell the tale of the breakthroughs in climate finance over the last few years. In sometimes unexpected (and for us gratifying) ways, the actors of climate finance, the questions put to the financial industry, the projects that are being implemented under its aegis, did in fact very recently break free from their marginal or "niche" image. They have shown up in more orthodox spheres, such as the boards of directors of major global pension funds, banks and insurance companies, and beyond that the inner sanctum of regulatory and supervisory authorities. We have been witness to, and at times modest players in this change. This publication is an attempt to trace our way through this adventure, its twists and turns and its heroes: Nick Stern, Rachel Kyte, the Carbon Tracker and UNEP Inquiry teams, Mark Carney, the Norwegian sovereign fund, Monique Barbut, Laurent Fabius and the team of the French Presidency, of course, and many others…

First of all, this work sets out the global financial equation to be solved: to finance the transition, it is less a matter of mobilising new capital than of redirecting existing and available capital. Then it explains why, despite the public policies that are being set up more or less everywhere, this reorientation has not reached the pace needed to achieve the 2°C target by the end of the century. The third chapter describes how the financial sphere gradually became aware of climate change issues, and describes the tools developed by its various professions to address those issues. The resulting panorama shows that climate finance tools already exist. The fourth part tells the story of the two years leading up to the Paris Conference on Climate, COP21, by showing how various financial players progressively developed their thinking and their positions. But now, after Paris, everything still remains to be done and the book closes with a description of what is at stake and what levers for action are available for the future.

CHAPTER 1

TRANSFORMING THE GLOBAL ECONOMY: IT CAN BE DONE

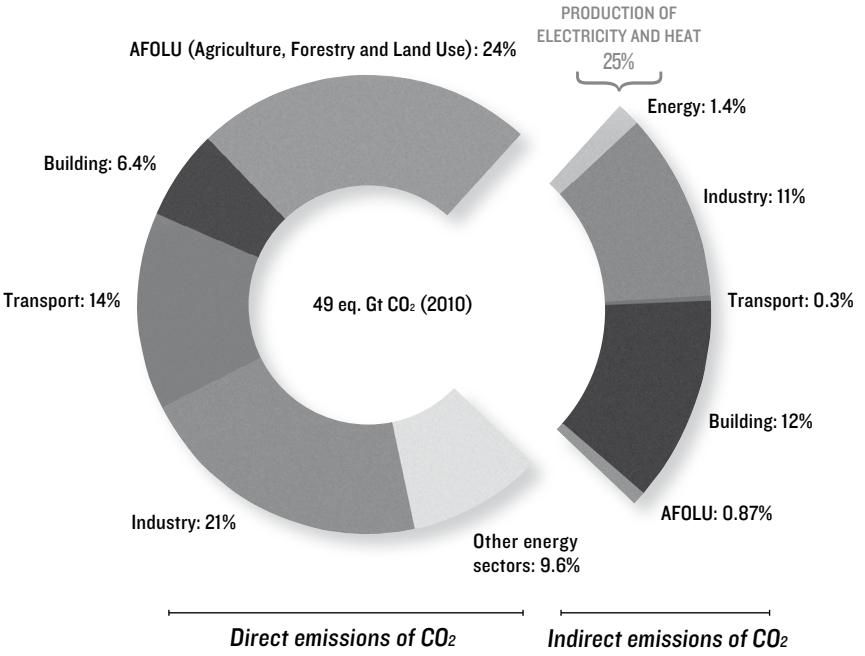
Science has often warned political and economic decision-makers about environmentally related dangers, but generally with respect to specific products or behaviours... With climate change, for the first time scientists are pointing to global upheavals: in every country of the world, in every segment of society and of the overall economy.

The Intergovernmental Panel on Climate Change (IPCC) was founded in 1988 at the request of the G7 to assess the state of scientific knowledge on climate change, by a consensus of climatologists and of every discipline concerned. The first IPCC report in 1990 suggested that human-induced emissions substantially increase the concentration of greenhouse gases[2] (GHG) in the atmosphere and add to the natural greenhouse effect. It predicted an alarming increase of global temperature and considered that 10 years would be needed to confirm its analysis. Over the course of its reports, the margin of uncertainty has been shrinking and the warning has become more focused: there is a need to drastically reduce GHG emissions and to change our economies in depth in order to do so.

2. The seven primary greenhouse gases are: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydro fluorocarbons (HFCS), perfluorocarbons (PFCS), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3).

Starting in 1992, this scientific knowledge formed the basis of climate-related negotiations and, slowly at first, of economic policies for transition.

GLOBAL DISTRIBUTION OF GHG EMISSIONS BY SECTORS



Source: IPCC, 2014.

IPCC calculated the world carbon budget, i.e. the maximum amount of carbon (and other GHGs[3]) that can be emitted without pushing global warming above 2°C.

3. Greenhouse gas emissions are measured on the basis of a method of equivalence taking into consideration the heating power of each gas relative to that of CO_2. The unit of measure is known as: eq. CO_2.

It estimated that the world still had a carbon budget of 1000 billion tonnes in 2011. It concluded that global net carbon emissions must be reduced to 0 between 2060 and 2075.

Where are GHG emissions coming from?

The IPCC reports measure worldwide greenhouse gas emissions by sector. The distribution in 2014 (see the graph opposite) shows that apart from the AFOLU sector (encompassing agriculture, forestry and land use in general), energy is responsible for most emissions. This means that the low-carbon transition depends above all on transforming energy systems, both:

– by developing renewable energies, emitting only small amounts of carbon, instead of fossil fuel energy; and

– by improving energy efficiency, which means reducing energy consumption in every field, including buildings, transport and industry. City and spatial organisation can also have a governing influence on the demand for energy.

The part played by nuclear energy in the low-carbon transition is a subject of discussion. There is no doubt that this technology's greenhouse gas emissions are low. In the context of its 2°C scenario, the International Energy Agency (IEA) considers that the most effective way to achieve its objective would be to double global nuclear electricity production capacity by 2050. However, in the light of the Fukushima Daiichi accident, the security requirements of plants in operation have been strengthened and some facilities have even been slated for dismantling, meaning that this technology will bear the curse of rising costs.

Be that as it may, the evolution of power systems will necessarily mean adapting existing energy transport and distribution networks, especially in the developed countries. It should also lead to an improved energy supply in the developing countries, since 1.5 billion people are still deprived of access to reliable and affordable energy.

We also need to consider the importance of the agricultural, forestry and land use sector. Although it represents 24% of global GHG emissions, it is also a source of carbon sequestration in soils and in plants whose potential can be much better used while meeting the food requirements of the planet's growing population.

The levers for reducing emissions

Energy

Transition involves the development of renewable energy for electricity and heat. Renewable energy production facilities can vary in size, from large offshore wind farms, solar farms and hydraulic dams to individual photovoltaic panels on buildings, agricultural methanisation and geothermal technologies… Similarly, transporting the generated energy may require large-scale networks or, on the other hand, may be locally organised through own consumption or microgrids. The development of renewable energy and reduced energy consumption must also be accompanied by new services. Information technologies can provide a way of adjusting supply and demand, in particular through systems regulating consumption combined with smart meters. The intermittent nature of renewable energies will require the use of storage solutions for which technologies still need innovative input.

Transport and Mobility

In this area, road transport holds a dominant position, with a particularly negative carbon footprint. However, many solutions can contribute to a transition in the sector. There is growth in the use of electric vehicles, requiring both a reduction in the cost of technologies (batteries or fuel cells) and widespread availability of recharging terminals (electricity and hydrogen). Replacing fossil fuels by biofuels will result in an improved carbon footprint but has now reached its limits regarding the priority given to using agricultural land for producing food. Increasing rail and maritime transport could be a key to the transition, as could the development of public transport to reduce individual transport, or a change in the way private cars are used (car sharing and carpooling), with the help of the Internet. Air and maritime transport still offers potential for energy efficiency but breakthrough technologies have not yet reached maturity or profitability.

Buildings

Nowadays, the cost of carbon-neutral buildings is not much higher than what is required to comply with European construction standards. Nevertheless, the transition will depend above all on renovating existing buildings, especially in terms of thermal insulation. Active energy efficiency solutions, using IT for central heating and air conditioning in particular, can quickly generate a 10 to 20% reduction in energy consumption, without calling for large investments.

Industry

The industrial sectors emitting the greatest amount of GHGs because of their high energy intensity are, in order:

chemical industries, steel works, cement works, paper works and aluminium production. There are several opportunities for improvement: tapping into potential sources of energy efficiency and heat recovery (unavoidable generated heat), innovation in industrial processes, and carbon capture and storage. A more radical approach involves the substitution of bio-sourced materials for traditional industrial products, and is developing little by little.

Services

Direct carbon emissions in the service sectors (trade and finance, etc.) are generally relatively low. But if the overall production system[4] is considered (from procurement to end-of-life of products and services), substantial improvements can be achieved, especially by developing the circular economy and the product-service system. Using new technologies has two opposite effects: on one hand, their electricity consumption is growing very rapidly, especially in data centres, while dematerialising activities does reduce consumption of transport or paper on the other hand.

Agriculture, Forestry, Land Use

Globally, agriculture is characterised by a large majority of small family-owned farms. One of the main issues facing this sector is to improve productivity, which is needed for many countries to achieve their development objectives, and to feed a growing world population, without increasing

4. Life cycle analysis (LCA) allows the environmental impacts of a "product" to be quantified (whether it is an asset, a service or even a process), ranging from the extraction of the raw materials that make it up, to its end-of-life disposal, including phases of distribution and use, from cradle to grave.

GHG emissions (like methane from livestock and nitrogen oxides from chemical fertilisers). Another essential requirement is to limit deforestation induced by agricultural and urban pressure and by industrial and domestic uses of wood. Agriculture is also a sector in which adaptation to climate change is crucial. The Office of the United Nations High Commissioner for Refugees estimated the number of climate refugees since 2008 to be 22.5 million. It is a confirmed fact that periods of drought, or climate disasters, are often followed by bursts of violence and rural exodus.

The Issue of Cities

Urban areas represent 50% of the world's population, producing 80% of its wealth, and generating 70% of its carbon emissions. The issue is to control their growth in order to develop "compact and connected cities[5]". This requires the combined planning of many levers: buildings, transport, urban services, etc. Strong urban management must go hand-in-hand with the collaboration of many players, especially the private sector and the inhabitants.

Adapting to Climate Change

This is the most complex topic on the agenda. It will be discussed below in this section.

What financing for which assets?

Depending on the sectors, but also within the same sector, the objects to be financed – referred to in financial terms as the "assets" of the low-carbon transition – are particularly diverse and call for adapted financing modalities.

5. According to the term coined by the New Climate Economy Commission.

Infrastructure

Infrastructure includes large energy production and transport facilities as well as urban and territorial development assets (water, roads, public transport, etc.). Financing for these infrastructure projects, for a long time based exclusively on public resources, increasingly comes from project funding by public-private partnerships or from totally private backers. The main financial stakeholders are public authorities, at national or sub-national level, public banks and agencies and the big investment and corporate banks.

Housing or Individual Transport

There are a great number of actors in these diffuse sectors and the financing operations are often limited in size. More often than not, these areas involve self-financing by households, supported by bank loans. The majority of the financing is private, whether or not it is incentivised by public support.

Industry

Generally, energy efficiency investments are not productive investments; because their profitability is slower than that of corporate horizons, they are left aside. Innovative mechanisms have to be thought up to finance them, combining corporate self-financing, conventional capital (shares, bonds) and innovative financing vehicles such as specialized funds.

Emerging Technologies

It is to be expected that in several sectors, innovations will occur incrementally, gradually improving the existing

technologies, or by breakthroughs. This is the case in particular of solar energy or energy storage. Financing these technologies often involves innovation financing and venture capital.

The Preservation of Assets

As regards land-use, giving a monetary value to carbon sinks represented by forests and soils, leads to a very special financing issue, which is very different from that of conventional physical assets. And even more than in the other sectors, the global low-carbon transition of farming cannot be considered separately from the issues of development, desertification, food, migration or from the resources mobilized to deal with these matters.

Minimising the Cost of an Inevitable Transition: the Stern Review

Over the last decade, increasingly precise economic assessments have translated the scientific issue into one of financing, beginning with the Stern Review.

Just after the entry into force of the Kyoto Protocol in July 2005, Gordon Brown, the Chancellor of the Exchequer, commissioned Nicholas Stern to draw up a report about the economics of climate change, adaptation strategies and the lessons to be learned from them by the United Kingdom. Nicholas Stern was not just anyone: Chief Economist of the British government, he had worked for the World Bank and unlike many of the economists investigating climate issues, he was proficient in the methods and theories of his peers, taking time and risks into consideration in cost-benefit analysis, using the theory

of finance and actuarial science, etc. Therefore, he was a fully legitimate player in the sphere of mainstream economics.

One year later, Nicholas Stern and his team submitted and published a report which would later be known as the "Stern Review". This was the first worldwide and complete analysis of the economics of global warming, a 700-page long piece leading to a conclusion that was simple but had enormous policy implications: it is clearly less costly to act now against the climate disruption than it would be to adapt to its consequences at a later stage. Based on IPCC works, the Stern Review demonstrated that a 5°C warming could cost between 5% and 20% of growth per year. At the other end of the scale, fast and international action to limit GHG emissions would be confined to 1% of growth per annum and therefore not impede it. Accordingly, Nicholas Stern proposed to devote 1% of the global GDP to the fight against global warming. This is obviously a cost but the Review put it into perspective; furthermore, it was the first study to stress the opportunities generated by the transition to a low-carbon economy, underscoring the fact that it could be the basis for a renewed strategy of growth and development.

The Stern Review generated an international impact, due to the simplicity of its conclusions and to the message it gave, which was actually optimistic. However, it was challenged by other economists, in particular by William Nordhaus. In terms of economics, as well as of the climate, this Yale professor was equally as eminent as Nicholas Stern: in 1993, he published the article entitled "Reflections on the Economics of Climate Change" in the *Journal of Economic Perspectives.* With respect to the Stern Review, he considered that the "*central policy issues in the fight against*

climate change – how much, at what rate and at what cost – remain open." What he criticizes his British counterpart for, is to have chosen a very low discount rate[6]. And the choice of this rate plays a crucial part in the long-term evaluation of the costs and benefits of the choices made for investment in the fight against climate change. Nicholas Stern chose a discount rate of around 1.4%: to avoid damages of €100 in 50 years, he was ready to pay €50 today. But William Nordhaus recommended a discount rate of around 5%: to avoid damages of €100 in 50 years, he was ready to pay only €8 today. By choosing 1.4%, the Stern Review would have overestimated the attention paid to the condition of future generations. The author retorted that, to the contrary, in his review he had considerably underestimated the economic consequences of future climate change, which still argues in favour of low discount rates.

The discount rate is crucial because it expresses a preference for the present or the value granted to the future. If we believe in climate change and its consequences for the future, the choice of a low discount rate is relevant.

On October 27th 2016, on the 10th anniversary of the Stern Review, Lord Stern delivered a speech in which he stated that the Review underestimated the risks and cost of inaction. He went on to add that the concept of "costs of action" is being transformed by rapid technological advances and better understanding of dynamics of change so that the concept of "costs of action" is no longer relevant and should be changed to one of "investment". He closed with the words: "*Action is now seen as the growth story of the future*".

6. Discounting is an economic concept which reflects inter-temporal trade-offs. It is a way of comparing costs and revenues over time.

Copenhagen: $100 billion Annual North-South Funding

By emphasising the need for action on a global scale, the Stern Review also paved the way for renegotiating the Kyoto Protocol which was preparing to open in Copenhagen at the end of 2009.

We still bear the scars of the Copenhagen Summit, the 15th international conference on climate change (COP15), when it was decided that new climate objectives needed to be negotiated to replace the Kyoto Protocol, whose application would end in 2012. Hurricane Katrina in 2005, the Stern Review in 2006, Al Gore's documentary *An Inconvenient Truth*, and another IPCC report in 2007 were all factors contributing to public awareness and placing climate change at the centre of global concerns in 2009. But the negotiations failed… at least within the official framework.

To understand why, a brief reminder of the ins and outs of the climate negotiations can help. They refer to the founding text of the United Nations Framework Convention on Climate Change (UNFCCC) signed at the Rio Earth Summit in 1992. Since then, the signatory countries of the Convention meet each year at a Conference of the Parties (COP). The UNFCCC has two structuring principles: the distinction between developed countries (Annex 1) and developing countries (outside Annex 1), and a concept of common but differentiated responsibility. This concept implies that developed countries undertake to reduce their emissions and generate funding for the climate policies of developing countries.

In 1997, the annual COP, held in Kyoto, led to the adoption of the Protocol bearing the name of that city. It set for the first time a 5% reduction target on the GHG emissions of 39 developed countries for the 2008-2012 period, compared to 1990. It was planned to organise by 2009, during the Copenhagen COP15, a new international policy regime which, starting in 2012, would take over from the objectives of the Kyoto Protocol.

However, despite the major issues involved and the high hopes that had been raised, the UNFCCC Copenhagen negotiations did not succeed. What has been seen as a failure was essentially due to the way the negotiations were conducted, to poor preparation and implementation during the COP, but also to the more fundamental opposition of emerging countries like China, Brazil and South Africa. Having become major emitting countries, they were determined to maintain their status as developing countries and thereby avoid being assigned emissions reduction goals.

However, the negotiations did lead to a political agreement between a small group of 28 heads of state (including China and the USA), outside of the UNFCCC, which simply "took note" of this development. At the time, the Copenhagen Accord was seen as something of a makeshift solution. But it turned out to be the underpinning of the international agreement adopted in Paris at the end of 2015, especially regarding financial issues.

The first breakthrough of the Copenhagen Accord was to set a target limiting global warming to +2°C. Every country, whether developed or developing, was requested to submit its own commitment for 2020 to the Secretariat of the UNFCCC.

This represented a shift from the top-down approach, in which the international community imposed emissions targets on countries depending on their responsibility for global warming, to a bottom-up approach in which each country defined its targets, first taking its national circumstances into consideration. By the following year, 87 countries had submitted a target or a list of emissions reduction measures: for the first time developing countries had accepted qualitative goals and agreed to their results being verified in return for international funding.

The Copenhagen Accord also established the amount of this financial contribution: the flow of funding for mitigation or adaptation policies in developing countries from developed ones would have to reach $100 billion per annum by 2020. For that purpose, it was decided to set up a Green Climate Fund. In the course of successive climate negotiations and COPs, until the one in Paris in 2015, the developing countries did indeed remember the "Copenhagen promise", turning it into a central issue for negotiation: to reach an agreement, the developed countries had to prove that they would adhere to their North-South financial transfer commitments. It is evident that the matter of the $100 billion became more of a diplomatic issue than an economic necessity as soon as the ink was dry on the Copenhagen Accord.

But the Rio +20 Earth Summit was already being readied along with the international debate on sustainable development.

Climate and Development: From Opposition to Common Vision

For a long time, it was difficult for international negotiations to reconcile environmental issues with development. To do so meant moving beyond the opposition between environmental concerns – seen by developing countries as a luxury for rich countries with high pollution and carbon emissions – and the goal of catching up on development, which they consider as a right.

On the one hand, environmental topics began to assume importance in international negotiations, starting from the Rio Earth Summit in 1992, and three agreements on major issues were signed: biodiversity, desertification and climate change. The Agenda 21 was published at this time. It was an action plan containing many recommendations applicable to the economic, social and environmental fields. In parallel, starting in 2000 the international development agenda had been supported by the Millennium Development Goals, a set of eight targets primarily intended to respond to the major humanitarian issues before 2015, on which public development aid was to focus.

It was during the Rio +20 International Conference in 2012 that a meeting point between environment and development was reached. To prepare for this new summit, the United Nations brought the theme of green growth to the forefront. This new concept was not so easily accepted. Some of the developing countries lost no time in criticising it, seeing above all the risk of the developed countries adopting strict environmental standards that would impede their own development. To minimise this risk, the developing countries proposed to set Sustainable Development

Goals (SDGs) within outlines yet to be specified, but which would take the realities of each economy and national priorities into account.

Eventually, a consensus was reached concerning the two concepts in the Rio +20 final statement. This breakthrough may seem only remotely connected to the issues of finance and climate, but it did help specify the financial issues in evolving to a low-carbon and sustainable economy on an international scale. Green growth was indeed the subject of many studies, in particular by the OECD, into the means of reconciling development and the environment.

As far back as 2012, the OECD carried out modelling work to show that if we cannot manage to adjust economic growth to avert environmental risks, we must expect to face considerable costs and potentially irreversible consequences. The ensuing damage will be detrimental to the health and well-being of the population groups concerned, and to the potential for sustainable development on a global scale because the most severe and spectacular repercussions will be on the developing countries. The conceptual clarity of the OECD's definition of green growth is particularly helpful:

"*Developing countries will need to put their natural capital in the service of their development process. Green growth is all about being clear about the nature of that resource use and where society wants to end up in the long term. Some trade-offs are worth making, while others may involve irreversible losses that may forever be regretted.Green growth is not about environmental preservation. It is about a no-regrets approach to securing the natural resources needed to make development sustainable in the long run.*" The question is put from a slightly different standpoint for the developed countries:

investment and innovation must be catalysed by green growth to create new economic opportunities. The focus is thus put on improved productivity, innovation and the creation of new markets.

In parallel, sparked by developing countries, the Sustainable Development Goals (SDGs) for 2030 were being prepared as successors to the Millennium Development Goals (MDGs). They were adopted in October 2015. While the MDGs had been perceived as a prescription from the North to the South in response to social issues, the 17 SDGs resulted from a more collaborative and general approach, covering all the issues of development around the base of a universal requirement. They are applicable to both developed and developing countries, according to their capabilities. In addition, the political responsibility of States themselves is very clearly stated for SDG implementation, even if North-South solidarity continues to be important. Furthermore, climate is acknowledged to be a cross-cutting objective (SDG 13) to be taken into account for the achievement of the other goals, such as the eradication of poverty and hunger or the promotion of education, work, access to water, energy, etc.

SUSTAINABLE DEVELOPMENT GOALS

1 – No poverty	2 – Zero hunger	3 – Good health and well-being	4 – Quality education
5 – Gender equality	6 – Clean water and sanitation	7 – Affordable and clean energy	8 – Decent work and economic growth
9 – Industry, innovation and Infrastructure	10 – Reduced inequalities	11 – Sustainable cities and communities	12 – Sustainable consumption and production
13 – Climate action	14 – Life below water	15 – Life on land	16 – Peace, justice and strong institutions
17 – Partnerships for the goals			

The issue of development finance underwent a transformation as well. The action plan for funding the SDGs, adopted in Addis Ababa in July 2015, states that countries must be the primary financers of their development, in particular by improving their tax system, mobilising national and international private means of financing, and setting up appropriate regulations.

The United Nations Conference on Trade and Development (UNCTAD) has estimated the investments needed for achieving the SDGs to be between 5 and 7 trillion dollars per year. For developing countries alone, they amount to 3 to 4.5 trillion dollars a year, primarily for essential infrastructure, food security, climate issues, health and education. Specifically, UNCTAD found that it would be necessary to double the amount of private investment.

Estimations of the Necessary Investment Volumes

In addition to this work which was particularly valuable in proposing new outlines for sustainable economic policies, analyses were added to translate the low-carbon transition goals into financial data.

The Green Investment Report

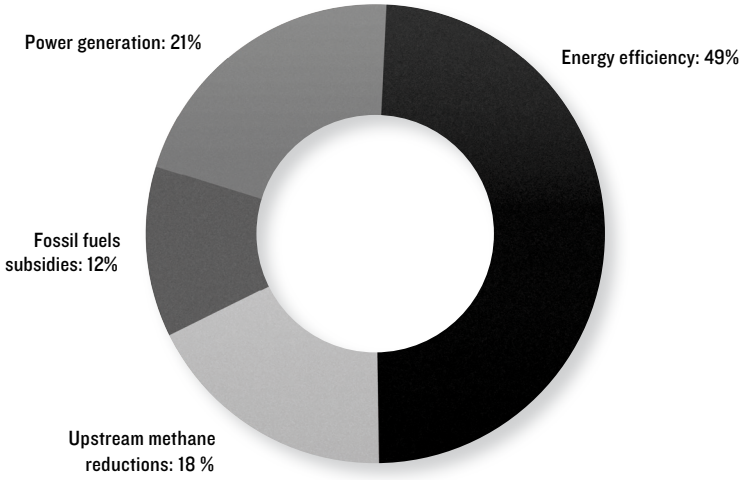
Published by the World Economic Forum, as part of the G20 meeting held in 2013, the Green Investment Report takes a look at the ways and means of unleashing private finance to benefit green growth.

The report covers every sector of the economy which can contribute: agriculture, transport, real estate, energy, water. In a "business as usual" scenario, infrastructure investment needs are assessed at 5 trillion dollars per annum, between 2013 and 2030. But this is not expected to be enough to achieve global environmental and sustainable development goals. Development needs to be "greened" and the necessary additional investment is estimated at $700 billion per annum. Furthermore, although private investments are observed to be gradually shifting, the reorientation is still too slow. Linked with consistent policies, public funding has an important role to play but, because it is so scarce, everything will depend on governments' capabilities to mobilise private funds and fill the gap to cover the necessary financing. Experience shows that this can be done if targeted financing mechanisms, public-private partnerships and increasing financial expertise can support private investment.

The IEA Scenario

Every year, the International Energy Agency publishes an in-depth study of energy across the world, and its prospects. For several years, the IEA has supported the international climate goals and has also added to its analyses a scenario for 2035 known as "450 ppm[7]", defining the energy options to be taken to achieve the 2°C target. In 2014, it completed its annual study by an analysis of the investment needs. This became a landmark and has served as a framework for the various observers involved: political, economic and, of course, financial.

IEA SCENARIO 2: **REDUCED EMISSIONS IN ENERGY BETWEEN NOW AND 2020**



Source: World Energy Outlook Special Report, 2013

7. ppm: reference used for the GHG level, expressed in parts per million in the atmosphere, not to be exceeded for the 2°C target to be achieved.

In its low carbon scenario, the IEA considers that a cumulative investment of $53 trillion into energy supplies and energy efficiency will be necessary by 2035 to achieve the 2°C target while responding to increasing global energy demand. Two thirds of new energy demand will come from emerging and developing countries. In the OECD countries, the main objective will be to compensate for declining oil and gas production and to replace older power stations. The IEA suggests that this perspective is an opportunity not to be missed, to modify energy systems by adopting more efficient technologies.

The IEA observes that the energy scenario based on current trends will not address the goal of climate stabilisation since current policies[8] and market signals are not strong enough to move investments toward low-carbon energy sources and energy efficiency at a sufficient scale and pace.

Approximately $300 billion of investment into fossil fuel energy sources would become obsolete (stranded assets[9]) because of more rigorous climate policies.

The conclusion of the IEA is that it will be necessary to set up credible and consistent policies, combined with the addition of innovative investment vehicles. It considers that the right economic signals need to be provided, in particular the removal of subsidies for fossil fuels and the pricing of carbon[10]. From the financing standpoint, it considers that there is still work to be done to link existing instruments with the specificities of low-carbon projects,

8. The policies known in 2014, that is before the transmission of more ambitious national contributions (INDCs) to the UNFCCC.
9. See definition p. 250.
10. See chapter 2, p. 59.

particularly because of their characteristic dispersal, diversity and small-size[11].

This analysis has become a reference, in consideration of the comprehensive nature of the global data collated by the IEA and the robustness of its analyses. However, it addresses the energy sector alone. Observers have identified that the IEA is counting on energy efficiency as a way of achieving half of the climate objectives. The IEA's assessment of the financial sector is also interesting. It will take time, the report concludes, with realism and determination, to raise the skills of the financial sector on a par with the climate goals.

The "Better Growth, Better Climate" Report

In 2014 the Global Commission on the Economy and Climate, also known as the New Climate Economy, was founded to analyse the risks and opportunities related to climate change. The Commission derives from a partnership between seven developed and developing countries: Colombia, Ethiopia, Indonesia, Norway, Korea, Sweden and the United Kingdom. It is chaired by the former President of the Mexican Republic, Felipe Calderón, and co-chaired by Nicholas Stern. The project is supervised by an international council made up of former heads of state and government, ministers of finance and leaders in the world of economics, business and finance. This mixed "North-South" composition for the governance and outcomes of the New Climate Economy contributed significantly to the credibility and authority of its work.

11. See chapter 3, p. 95.

In 2014, its first report, entitled "Better growth, better climate" made a major contribution to understanding the low-carbon transition. The aim of the project was to address the question: how can policy-makers reconcile the achievement of their economic and social goals with reduced climate change risks? The conclusion of the report is that every country, regardless of its level of income, can build sustainable economic growth through structural and technological changes combined with greater economic efficiency. This can be achieved, the report observes, by building right away on the enormous potential for structural changes that lies within three key systems of the economy: cities, land use and energy systems. In these three systems, three "drivers of change" must be used as a means of overcoming obstacles: raising resource efficiency, investing in infrastructure and innovating in technologies, business models and social practices.

The report is particularly optimistic with respect to the additional financial requirements: "*Managed well, the additional investments in infrastructure needed to make the transition to a low-carbon economy will be modest. The infrastructure requirements for a high-carbon economy, across transport, energy, water systems and cities, are estimated at around US$90 trillion, or an average of US$6 trillion per year over the next 15 years. By combining renewable energy with reduced fossil fuel investment, more compact cities, and more efficiently managed energy demand, low-carbon infrastructure will increase investment requirements by only an estimated US$270 billion a year. These higher capital costs could potentially be fully offset by lower operating costs, for example from reduced expenditure on fuel. Investing in a low-carbon*

economy is a cost-effective form of insurance against climate risk".

The additional investment needed would therefore only be 5% more than in the "business as usual" scenario. What is more, the report does not estimate the costs of adapting to climate change which could be avoided in this way. However, as the New Climate Economy admitted itself, these estimates are intended to provide ballpark figures and major orientations rather than precise data, because of the uncertainties of projections in the future.

Low Carbon Investments: Just One More Push!

In parallel to measuring the financial needs for low-carbon transition, several projects have tried to estimate existing investment flows for low-carbon transition across the world.

The Global Landscape of Climate Finance

Since 2011, the Climate Policy Initiative (CPI) think tank has been working on an annual map of the financial flows dedicated to climate across the world, the "Global Landscape of Climate Finance". This panorama, whose methodological accuracy has been improving from one edition to the next, aims at providing comprehensive information about financing volumes, and their origins and destinations.

The latest issue concerned 2014 flows, and revealed an 18% growth over 2013, to reach an estimated $391 billion. Of this total, public funding represented 38%. At 62%,

private flows displayed strong growth. Among the public players, international and bilateral development banks played an essential role and devoted a growing share (27% on average) of their activities to climate finance. Private financing grew by 26% in 2014, despite a continued decline in costs, especially for photovoltaic solar technology. For renewable energy, the sector in which the CPI has the most accurate data, the funding stemmed essentially from project developers (38%), followed by corporations (24%) and individuals (18%). The contribution of commercial banks increased to 19%, while the share coming from traditional investors (investment funds, venture capital and institutional investors) was minimal. The CPI also discovered, in addition to the conventional funding systems, innovative approaches like Green Bonds, YieldCos[12] or instruments providing risk coverage for project finance.

Eighty percent of climate finance went to projects aimed at reducing carbon emissions: above all renewable energy (50%), energy efficiency (25%), sustainable transport (20%), low-carbon technologies (4%), agriculture, forestry, and lastly waste and wastewater management. Financing for adaptation to climate change (20%) came essentially from public funds but the share of the private sector increased, suggesting that new business models were beginning to appear.

Finally, it appears that 74% of the flows – and 92% of private financing – were raised and spent in the same country, indicating that investors have a strong national preference. 30% of the flows went to the Asia-Pacific region, essentially China. The United States and Europe (24%) were next…

12. See chapter 3, p. 95.

Adaptation finance was primarily directed toward East Asia and the Pacific, followed by Sub-Saharan Africa.

Useful Mapping of Flows at Country Level

This mapping work is very interesting at a global level. It is even more relevant at national levels. In France, for instance, the investment requirement was estimated at around €60 billion per annum.

In line with the global method defined by the CPI, I4CE (Institute for Climate Economics) has developed a landscape of climate finance for France. It assesses the amount of 2013 flows at €36 billion. Among other results, it showed that public financing flows are high (31%) compared to private financing; and only 13% of them are designed to have a leverage effect on the economy as a whole.

By comparison, the German landscape showed that the private sector provided more than 95% of climate finance in Germany in 2013.

The Puzzle of Financing Adaptation to Climate Change

Adaptation to climate change consists either in preventing the damages caused or limiting its effects. It calls essentially for infrastructure investment. Insurance techniques may also be used, consisting in managing the risks of climate damage and extending to their identification, reduction and transfer.

In 2014, the 5th IPCC Report estimated that the financial needs for adapting the developing countries ranged between $70 and $100 billion per annum, between

now and 2050. But, according to the most recent work of the United Nations Programme for the Environment (UNEP), these costs are underestimated: they could range as much as $150 to $300 billion per annum in 2030 and up to $500 billion per annum in 2050.

Why are these figures so vague? First, the needs of adaptation and their cost will depend enormously on the emissions reduction policies and on the global capacity to stay below the 2°C threshold. But according to the IPCC, even if the 2°C target is met, warming will have consequences: sea level rise, storms, floods, droughts… Some are already observable, and costs will continue to rise. In addition, vulnerability changes depending on the areas concerned: climate change will affect every one of the world's regions, every economy will have to face the costs of adapting, but the least developed countries and small island states will be more severely affected and have the greatest adaptation needs. Finally, in the face of global warming, a quest for balance between cost and economic efficiency can cause a substantial variation in adaptation costs. For instance, when confronted with rising sea levels, the choice could be to protect a coastal zone or, on the contrary, to move population and activities away from the coastline.

For all of these reasons, the great difficulty in assessing financing requirements for adaptation lies in the absence of a "metric", a consistent unit of measurement. We know more or less how to count tonnes of carbon avoided by an investment in the same way everywhere. We also hope that we can agree, although this is more difficult, on how to assess the tonnes sequestered by changes in land use. But there is no common measurement instrument to all adap-

tation investments. The only reference they share is the estimate of the cost of failing to adapt, sector by sector, that is, the quantification of risks by the insurers. This is one of the reasons this branch of the financial industry is granted a special place within climate finance. We will come back to this point.

Because of this complexity, adaptation to climate change has long been the forgotten side of negotiations and of public climate policies. But the subject has assumed growing importance because of pressure from developing countries. National contributions (or INDCs[13]) published in 2015 that address adaptation highlight areas where adaptation is a key factor for a country's development: agriculture, water, health, coasts, forests, biodiversity, infrastructure and tourism. But much remains to be done to assess these needs.

According to the CPI's global climate finance landscape, the funding flows for adaptation amounted to $25 billion in 2014, of which 90% were invested in the developing countries. But, currently, the CPI is only able to measure international public financing flows – encompassing public development aid, climate funds, and especially financing from the financial development institutions. These development institutions contribute 84% of the international public financial flows. The lack of data means that this does not account for national public expenditure, or for investments by the private sector.

Adaptation finance is primarily dedicated to the management of water (55%), then to agriculture, forests and natural resources (13%), disaster risks (8%), infrastructure

13. See definition, p. 249.

(7%), support to national policies (5%), coastal protection (4%) and industries and services (1%).

Adaptation, Resilience, Loss and Damage

As international negotiations progress, the most vulnerable countries have raised the issue of the liability of developed countries in losses and damages related to climate change, considering that they might be expected to compensate countries which have suffered the consequences of global warming. This issue of loss and damage has been investigated more deeply as part of an international cooperation system which began in 2013, during COP19 and known as the Warsaw Mechanism. It addresses the subject of prevention and coverage for climate risks related to extreme events or to slower changes in the climate. The Paris Agreement in December 2015 (Article 8) recognised this international approach but ruled out any liability or compensation (COP21 decision, paragraph No. 52). In short, the Agreement seeks to prevent and repair rather than penalise.

Sources of Financing for Adaptation

UNEP considers that there will be no way of avoiding the involvement of private finance, because of the high costs of financing adaptation. How can this be achieved? Schematically, the method consists in enhancing the "profitability" of adaptation projects in two ways: by integrat-ing the costs of adaptation to infrastructure projects from the design stage; by identifying solutions

that both enable emissions reductions and improve adaptation to climate change.

Many areas in which adaptation to climate change needs to be taken into consideration are reliant on public action, like urban development or water management, etc. Nevertheless, the private financial sector can be brought in: if the public sector sets up risk management systems, the private sector will be able to support actions by households, farmers and entrepreneurs.

The Price of Oil: A Variable That Is not so Crucial

Oil prices are particularly volatile. In mid-2014, a barrel of crude was worth $100. In early 2016, it was available for less than $30, a 75% loss of value in 18 months; then it rose again to $50 in May 2016. How does this volatility affect the low-carbon transition?

Low oil prices can slow down the transition: they make investments into energy efficiency somewhat less attractive, making it more difficult to finance them by the savings made on energy consumption. In theory, they also penalise the replacement of fossil fuel by renewable energy. However, the recent considerable fall in the price of oil has not affected renewable power generation which is growing all over the world. Indeed, the bulk of electricity is generated from coal or gas, meaning that the correlation between the price of electricity and that of oil is weak. Therefore, power generation costs are determined mainly by the prices of coal and gas. On this subject, the current reduction in coal prices is substantially due to the abundant availability of low-cost gas.

On the other hand, very low oil prices reduce the profitability of fossil fuel reserves that cost the most to exploit, such as deep offshore drilling, which only becomes profitable when the price per barrel rises above $80.

Finally, low-cost oil creates a favourable context for the removal of the subsidies oil is granted in many countries, or even for the introduction of a carbon price, a measure that becomes more acceptable in economic and social terms.

What Are the Consequences for Financial Actors

Durably low oil prices can weaken banks that are deeply engaged with the oil producing companies, especially in the United States. In addition, some investors recently had to cope with a drop in oil sector share values. But observers expect the price of oil to rise again, and under that assumption one might wonder whether the sector's market capitalization will swing back up and make financing the oil business attractive again. In an original study published in May 2016, "Sense & Sensitivity," the Carbon Tracker think thank explained why they do not think this would really be the case. Their study compares the value of oil producing companies in two scenarios: one compatible with the 2°C target and a "business as usual" scenario, under various price assumptions per barrel ranging from $40 to $180. The primary conclusion of the study is that oil company valuations (especially for the main players) will remain higher if they adopt 2°C strategies, as long as the price per barrel does not exceed $120. By adopting 2°C scenarios, oil companies will limit their production to the least costly reserves. The most vulne-

rable companies are the small operators which, unlike the majors, do not have significant low-cost reserves. The think tank considers that, in general, oil companies would be well advised to build their forecasts on an assumption of moderate demand growth in line with a 2°C scenario, and that any high cost project (i.e. deep sea drilling, oil shale, etc.) will destroy value. An illuminating analysis for bankers, investors and the oil companies themselves.

Financing the Transition Gap Is Possible Everywhere!

The low carbon transition is already underway, but not quickly enough to limit global warming to 2°C. The extent of the funding required for this transition varies among studies, which do not address exactly identical scopes. But in any case, these studies indicate that it is possible to finance the transition by reorienting investments. High-carbon investments need to be reduced and eventually discontinued, and replaced with low-carbon investments. Schematically, comparing the existing needs and flows demonstrates that tripling current flows of low-carbon investment would be enough to cover the funding gap.

All these studies consider that the additional cost of the low-carbon transition is between 5 and 15% of financing needs in a "business as usual" scenario. The work already carried out, especially by the New Climate Economy, show that the transition to a low-GHG economy is possible in every type of country: low-carbon growth is just as conceivable in the developing countries as a transition in the developed economies.

The steps taken to reach a better measurement of these amounts still need to be further specified by country. The countries themselves are indeed responsible for their own low-carbon transition with respect to the international community. More in-depth studies would facilitate the policy choices required to implement national contributions.

Improved knowledge of the flows by sector, for example energy, would also be a relevant way of checking that the low-carbon transition is carried out in an orderly manner and that "brown" investments are tailing off gradually as "green" investments grow.

The tools for measuring and monitoring the low-carbon transition have yet to be developed. Everywhere in the world, close cooperation between States and research organizations will be essential to anticipate and properly calibrate public policies.

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CHAPTER 2

PUBLIC POLICIES AND FINANCING THE TRANSITION

Meeting the 2°C target will thus require bridging the financing gap. The challenge is considerable in a context where the very stability of financial systems was affected by the 2008-2009 crisis. Its economic consequences are still being felt. Moreover, that crisis can in part be blamed for the breakdown of climate negotiations in Copenhagen at the end of 2009: because of economic and financial emergencies, environmental issues were no longer a priority. Only in the years that followed was the fight against climate change considered as a way to stimulate or develop economies, and were public policies put in place. Is today's context conducive to accelerating the transition? Can macroeconomic policies work towards climate goals?

Climate Change Public Policies

Public environmental policies can take several forms:

– regulations requiring energy consumption or greenhouse gas emissions standards;

– incentives, for instance support for renewable energy by guaranteed purchases at rates defined in advance (feed-in tariffs);

– transparency obligations regarding GHG emissions;

– carbon pricing.

Public environmental policies came into being at the end of the Post-World War II economic boom, after the first 1973 oil crisis and a succession of ecological disasters. Governments, most of them in developed countries, responded by implementing energy savings measures and establishing environmental standards in various economic sectors. The advent of structuring concepts, like sustainable development in 1987, and the work of the IPCC, which released its first report in 1990, led to the organization of the 1992 Earth Summit in Rio.

But structurally pro-climate policies only appeared in the early 21st century, mainly in the field of energy. Specifically, Germany initiated its "Energiewende" (or energy transition) in 2000. The concept was developed by the Öko Institute, and advocates an energy mix based on renewables, on improved energy efficiency and on a more decentralised power system. The German plan to gradually phase out nuclear power was accelerated after the Fukushima disaster in 2011. In 2008, the United Kingdom adopted its Climate Change Act, paving the way towards long-term emissions reduction, combined with carbon budgets. In France, the government organised the Grenelle Environmental Roundtable in 2007, a series of meetings between the state, local governments, NGOs, employers and employees, aiming to reach long-term decisions regarding environmental and sustainable development issues. The process led to the "Grenelle 1 Programming Act" in 2009 and to the subsequent 2010 act defining commitments, better known as "Grenelle 2". Following broad consultation, France decided to adopt its "Energy Transition Act for Green Growth" in 2015.

The European Union set an example by creating sectoral standards, especially for industry, buildings and vehicles. In 2008, on the eve of the Copenhagen Summit, the Union adopted its 2020 Climate and Energy Package summarised as "20 20 20 by 2020", i.e. three targets to achieve: 20% renewable energies, 20% energy savings and 20% GHG emissions reduction compared to 1990. In 2014, the 2030 Climate and Energy Package tightened the three targets: 40% reduction of GHG emissions, 27% renewable energy and 27% energy savings. But each Member State continues to be responsible for its own energy policy.

Climate Legislation Around the World

The Grantham Institute, a research organization specialising in climate change and the environment within the London School of Economics, maintains an online database of national laws on the climate, the "Global Climate Legislation Study", which covers 99 countries and the European Union. Its analysis report in 2016 shows that more than half of the countries have adopted carbon emission reduction goals for their economy as a whole and 80% have set objectives by sector covering, by order of frequency: renewable energy, energy efficiency, transport and land use. The Institute stresses on a lack of legislation regarding adaptation. It also noted the existence, in more than half of the countries analysed, of framework laws organising the low-carbon transition in a strategic approach. While acknowledging that the quality of these laws is difficult to assess because of the great diversity of the countries involved, it does consider that "good" laws on climate are those that link information on the state of the country (by

an inventory of GHG emissions and climate risk maps) with the goals they have set and the policies to achieve those goals.

This database is a valuable tool for investors. It will be even more so in the coming years when the countries translate the national commitments they made at COP21 into public policies. But is the context favourable to the low-carbon transition? Will these climate policies be financed?

A Difficult Financial Context

After a deep downturn due to the 2008-2009 crisis, advanced economies experienced a slower recovery than emerging countries. According to the IMF 2017 Outlook, "*Global economic activity is picking up with a long-awaited cyclical recovery in investment, manufacturing, and trade. World growth is expected to rise from 3.1 percent in 2016 to 3.5% in 2017 and 3.6% in 2018*". In this context, public debt has generally grown: in 2016 global public debt represented more than 80% of Gross Domestic Product (GDP), near 100% in Europe, against almost 50% in emerging countries. In 2016, public deficits were 3.6% as a world average, 1.7% in the Euro zone, almost 5% in the emerging countries and 4.4% in the least developed countries. To think that public resources will be able to finance the low-carbon transition on their own is therefore an illusion. Furthermore, it is undesirable since the objective is a complete transformation of the economy. All the financial circuits thus need to be in line. It follows that the essential role of public funding must above all be to foster private long-term investment – the basis of growth – while steering it to achieve climate goals.

Long-term investment depends on a combination of self-financing and external financing, schematically from loans, debt securities like bonds, notes… and equity (shares). Disintermediated securities (stocks and bonds) are acquired directly by investors such as pension funds and insurance companies. They can be listed, i.e. negotiable on a market, or unlisted.

The financing structures differ according to the extent to which financial systems are intermediated by the banking sector. In the United States, 80% of investments are funded by financial markets (stocks and bonds) while only 20% come from bank loans. In Europe, on the other hand, bank financing represents between 60 and 70% of financing, and the rate is even higher in emerging countries; in China, for example, it reaches 75%.

In countries where financial intermediation is the standard, long-term financing is difficult because the duration of bank loans is generally shorter than the long-term financing needs of the infrastructure. What is more, after the 2008 financial crisis, banks toughened their lending conditions by shortening maturities and increasing their demands with respect to credit quality. And new international bank solvency standards, derived from Basel III, increased the cost of long-term financing even further. These developments explain why corporates and major projects have increasingly resorted to the market, especially through bonds.

Additional obstacles are intrinsic to the funding of the low-carbon transition sectors: banks, like investors, know relatively little about these new areas seeking finance and perceive them as high-risk. In addition to this, profitability in these sectors often remains lower than market require-

ments, or may depend on national support policies which can be unstable. Commercial banks generally tend to prefer short-term financing and to maintain activities within their previous "business as usual" methods. Under these conditions, how can capital be re-orientated at the scale and levels required by the low-carbon transition?

Public Stimulus Policies

In 2008 and 2009, the crisis caused a severe drop in investment. To restore their economies, after having urgently worked to maintain the stability of the financial systems, the authorities of developed countries set up policies with two goals in mind: on the one hand to revive credit through expansionary monetary policies, and on the other, to stimulate investment, at least in Europe. Did these policies have a beneficial effect on investment, especially green investment?

Facilitating Credit after the Crisis

Central banks steer monetary policy by modulating banks' ability to grant loans to the economy. Following the crisis, they reduced their policy rates to encourage banks to revive the credit system. However, these conventional monetary policies, relying on rates, fell short of their objective. In a context of low growth and very low interest rates, some central banks, including the FED (Federal Reserve of the United States), then the ECB (European Central Bank) set up exceptional monetary policies, referred to as unconventional or Quantitative Easing (QE), by which they directly purchase debt present in the banks'

balance sheets. Beyond action through rates, they decided to directly modulate the amount of liquidity in circulation. For example, in 2014, the ECB launched a program to refinance banks in the longer term at a low rate, known as the "Long Term Refinancing Operations" (LTRO), in particular by purchasing loans to SMEs. A few months later, the Governments bonds purchase process was initiated to alleviate bank balance sheets. Then, in April 2016, it was decided to further strengthen this policy through 2017.

Although the FED decided to stop using quantitative easing at the end of 2014, the policy was strengthened and renewed in Europe and Japan. However, there is no getting away from the fact that it did not produce the expected results, and observers have been critical. This is because superabundant liquidity has to a large extent remained in the financial sphere, without permeating through to revive the real economy; in Europe, in fact, bank loan volumes have remained stable since QE entered into effect.

Naturally, very low interest rates are a most favourable context for low-carbon transition investments. QE policies have opened a whole new area which some economists have worked on, considering that monetary policy might serve this transition directly[14]. Some, often the same ones, also believe that this monetary policy should be combined with budget policy to get public investment going again. In Europe, however, such joint action is ruled out by the 3% limit on public budget deficit. These constraints make it even more desirable for public finance to guide private investment – which is

14. See chapter 4, p. 153.

what the European Commission is trying to do by implementing the Juncker Plan.

The Juncker Plan for 2015-2017: Reviving Investment in Europe

At the end of 2014, the European Commission proposed an investment plan for the EU for 2015 to 2017. The starting point was the observation that while the European GDP in 2014 regained its 2007 level, investment fell by 15% over the same period, representing a €450 billion decline. The European institutions were worried because, in the short term, this drop was delaying the economic recovery process; in the longer term, it was reducing the potential for growth and competitiveness. The Commission blamed the loss of investor confidence for this situation, because of uncertainties regarding demand, and the lack of capacity for small and medium-sized enterprises to bear the risks related to investment, especially for long-term projects.

Rather than increasing the public budget of the Union and making direct investments (in consideration of the relative weakness of the European budget and the priority goal of limiting public debt), the Commission proposed to devote European funding to strengthening the ability of the economy to take risks and re-initiate private investment. It was observed that available capital is anything but scarce within the Union – monetary policies for recovery have created abundant liquidities – but needed to be released efficiently in favour of long-term investment. With the backing of its president, Jean-Claude Juncker, the Commission's plan was therefore to select target areas considered

to be the key to Europe's long-term growth: energy, transport, broadband, education, research and innovation, renewable energy, energy efficiency and support for SMEs.

Initially, the Juncker plan consisted in a €16 billion Commission contribution and an additional €5 billion from the European Investment Bank (EIB). The resulting €21 billion fed into a new European Fund for Strategic Investment managed by the EIB. Member States were also invited to contribute to the Fund.

What is really new for a public policy is that the Fund is not intended to invest itself, but to issue guarantees to private long-term investments and to European SMEs.

Through these guarantees, the Commission hopes that the system will encourage entrepreneurs to develop their projects and private financial actors to finance them. On the basis of this €21 billion guarantee, the European institutions feel they can cover investment projects amounting to €315 billion, representing a leverage factor of 15, an estimate which they consider to be prudent. Everything depends on the Fund's ability to cover initial project risks, thus creating investment opportunities in several tranches: senior tranches, which have priority in the event of a solvency issue and subordinated tranches which exhibit higher risks and rewards. Private investors are therefore invited to take senior debt, while the public banks should be able to acquire subordinated debts. The plan also includes a one-stop shop for advisory services to project sponsors and a portal identifying all the projects seeking finance.

The ambition of this plan is also to be a new step in the policy for setting up a capital market union that aims in particular at reducing the rate of banking intermediation, which is very high in Europe. In particular, the Commission

intends to reinvigorate the European securitisation market, avoiding the mistakes made before the crisis[15]. In so doing, it hopes to expand the investor base and to improve the allocation of capital to those sectors most in need.

In seeking every opportunity to revive investment in Europe, this plan did not, unfortunately, make low-carbon transition its priority. In October 2016, European environmental NGOs, including the WWF, published an analysis of the 93 infrastructure projects approved by the EFSI by July 2016. This report considers that the plan failed to make a strong contribution to the fight against climate change primarily because it has provided significant funding for fossil fuel infrastructure, motorways and airports, in particular in member States such as Germany, the Netherlands, France and the UK, which already have very dense infrastructure networks. But the Juncker plan is a reflection of the Commission's and the EIB's new vision of how European public financing should work: promoting private investment, guiding it so that it serves both the priorities of the Union and the European economy too. This vision is based on common sense in that it defines an efficiency criterion for public expenditure: its leverage effect on private investment. And the Commission is justified in attempting to expand this arrangement to the developing countries.

15. The origin of the 2008 global financial crisis was the sub-prime crisis in the United States. Sub-primes were real estate loans aggregated in securitised investment vehicles. When part of these loans proved to be insolvent, shareholders of those vehicles, the banks, investors and savers encounter great difficulties, creating general distrust of the securitised assets.

Yet, criticism is increasing regarding the weak additionality of the plan: has it really boosted investment in Europe? For some, the projects it financed could well have been financed by the EIB with its traditional model. Moreover, according to the Bruegel think tank it did not really focus on those countries where investment has really broken down.

Extending the Juncker plan could therefore be useful provided that its funding is consistent with a 2°C trajectory and that it really takes more risks than the private sector. Indeed, as discussed below this principle is one of the essential keys to low-carbon transition financing.

The Position of the Financial Actors: Give us a Carbon Price!

Recovering from a crisis creates a difficult context. Yet macroeconomic policies have never been so favourable to investment in general and, if possible, to investment into the low-carbon transition in particular. There is an abundance of liquidity. Nevertheless, financial actors don't seem to be playing the game extensively or fast enough. Why is this? Primarily because for a long time they did not feel that it was any of their business.

Due to their function, which is to finance the economy, financial actors until very recently considered that their profession was not in a position to play an active role in directing the economy towards a low-carbon model, whatever concerns some of them may have had regarding climate issues. What they were saying is that their role is rather to finance the most solid and profitable projects in a given time horizon. For investors and asset managers, schemati-

cally this consists in choosing investments by seeking the best risk/return profile among the shares held in portfolios for each investment horizon. For the banks, the equivalent is to grant loans by assessing their repayment capacity using financial analysis. What is more, climate risk was generally perceived by the financial sector as being intangible, remote, and only liable to materialize in the very long term, in any case beyond the decision-making horizons of investment and financing.

Lastly, this proclaimed neutrality of the finance world with respect to climate issues was relatively consistent with the approach arising from the major financial reforms of the 1980s. In response to earlier credit selectivity policies, these "big bangs" had attempted to liberalise the system by eliminating privileged circuits, disintermediating and assigning more importance to the markets in order to better allocate capital and to prioritize lowering the cost of financing of the economy. As a matter of principle, many financial actors, especially the banks, took an unfavourable view of any outlook involving the orientation of their activity towards priorities dictated by public authorities.

At the very most, they could be convinced to acknowledge their social responsibility by adopting principles for responsible investment.

As a result, financial actors considered the management of the climate issue as falling under the responsibility of the public authorities dealing with economic and industrial policy, and of producers and consumers. To summarise, financial actors saw climate change as a real economy issue only, which didn't need any specific financial agenda.

For this reason, when it really began to consider climate issues seriously, the financial sphere massively, though not always in good faith, supported the introduction of a carbon price as the most reliable way of directing the economy to a low-carbon model. It wanted a price with the broadest possible reach, one that would be uniform, global and would apply to the economy as a whole without creating any distortions. In this way financial actors could continue their business as usual, while taking into consideration any signals that were more favourable to the climate. There was a reason for this behaviour: ideally, a carbon price is the most rational and theoretically the most powerful tool to steer the economy; but what about real life?

The Direct Route to a Low-Carbon Economy?

According to the polluter-pays principle in economics, setting a price on carbon consists in organizing payment for negative externalities, more commonly referred to as damages or nuisances, caused by GHG emissions. Payments should be made by those directly responsible for the emissions. This economic instrument is not the only one available: public authorities can also create environmental standards prohibiting or regulating harmful activities. But using a carbon price offers a major advantage: rather than imposing consumption and investment choices on economic players (in the way a regulation would), it supplies them with a signal whereby they themselves can decide whether they want to reduce their emissions, which ones, how and when. Leaving this margin of appreciation must lead to the choice of the easiest and least costly actions.

Carbon pricing does enhance the competitiveness of low-carbon activities. It should create an incentive to use the lowest emitting available energies, for instance gas rather than coal.

If the price is high enough, if it is maintained for a long enough time and is predictable, it serves as a signal which can modify long-term investment choices being made now, and favour the lowest emitting technologies, for instance renewables, over fossil fuel energy.

There are two primary ways of introducing a carbon price into the economy:

– taxes: the authorities (usually National Governments) set the carbon price level. This ensures that they get a relatively predictable volume of tax income but this simple solution does not guarantee that a low emissions goal is achieved;

– emissions trading systems (cap & trade): the authorities define an emissions cap not to be exceeded and, within this limit, allocate allowances to the emitters, who can then trade them on a market. Allowances are accounted for with a single unit (the tonne of carbon), and allocated either free of charge or, increasingly, through an auction system. Emitters have to buy allowances if they exceed their authorised limit or may sell them if they have emitted less than that threshold. The emissions allowance price is established according to supply and demand on the market. Using this system, the authorities are sure of reaching their quantitative goal of emissions reduction.

Whether a carbon price is derived from a tax or a cap & trade system[16], it is always a policy tool: it is efficient if it encourages economic agents to align their activities on the long-term decarbonation path chosen by the authorities. Generally speaking, carbon pricing is not a financing tool, except in two cases: it is a source of tax income for Goverments which collect the proceeds of a carbon tax or from the sale of allowances; it can also be a source of additional financing for low-carbon investment projects, as it is in the framework of offsetting schemes.

2009-2013: Carbon Pricing Decried

The first regional carbon emissions trading system was European: the European Union Emission Trading Scheme (EU ETS), launched in 2005. It extends to the energy and major industry sectors, covering almost 50% of the European Union's emissions.

In the early learning period, the system lacked proper governance and resulted in inappropriate and fraudulent actions that were particularly harmful to its reputation. As a result, the European Commission reinforced the rules and controls. More generally, the EU ETS results were disappointing because of the overabundance of allowances: the carbon price was very low and incapable of supplying

16. Other carbon prices are worth mentioning:
– Implicit carbon prices, measuring the cost of emissions avoided by public policies, whether through standards (e.g. vehicle emissions standards) or investments (e.g. renewable energy subsidies);
– Public shadow carbon prices, aiming at directing public investment decisions;
– Internal carbon prices that companies choose to apply as a way of guiding their strategic choices.

a signal strong enough to produce the desired transition. Emissions in the sectors covered by the EU ETS did drop but only because of the economic crisis and competition from other public policies (such as support for renewable energies), far more than because of any signal provided by the carbon price.

Within the scope of the Kyoto protocol, in parallel, the United Nations had launched an emissions trading system between the developed countries required to comply with goals to reduce carbon emissions in the 2008-2012 period. This system was completed by another flexibility mechanism, the project mechanisms[17]: if developed countries coming under these requirements failed to achieve their goal, they were authorised to offset their exceeding emissions by buying carbon credits created by the United Nations. These credits were generated by low emitting projects, conducted essentially in the developing countries which had no emission reduction goals.

Between 2008 and 2012, the carbon credits supervised by the United Nations were also accepted by the EU ETS as offsets within a 13.5% limit of emissions from companies covered by the European trading system. This added some flexibility to the emissions reduction requirement in Europe, while financing cleaner development elsewhere. The arrangement was in fact the main source of UN carbon credit demand but eventually caused its collapse. For as of 2012 the European Union decided that it would only accept offset credits within particularly severe limits: henceforward, emissions reductions had to actually occur within Europe. The resulting break in demand caused a sharp drop in the

17. Clean Development Mechanism (CDM) and Joint Implementation (JI).

price of carbon credits, depriving the entities involved in the various projects of a substantial share of their revenue. Some 5,000 situations of this type were counted worldwide; they would have reduced carbon emissions by 1 billion tonnes of carbon emissions.

In fact, for project sponsors, the carbon credits that had been sold off were particularly valuable, amounting to 10 to 50% of their investment financing plan depending on the sector. Despite the imperfections of the UN system, these credits had indeed succeeded in generating leverage for $200 billion in low-carbon investments worldwide between 2005 and 2012. Beyond feelings of nostalgia and regret among the people involved, the entire experience remains a valuable milestone that climate finance should use as inspiration.

These setbacks have been used extensively in climate negotiations by the States who were opposed to carbon pricing as a policy tool. The oil producing countries, Gulf countries for example, were among the leading opponents, backed by unlikely allies from the ranks of the staunchest critics of liberalism (such as Bolivia).

We drew the lessons from this experience, the discussions it led to, and the discredit brought upon it, which was to a large extent unjustified, in an article entitled "Carbon pricing, the value of an experience"[18], published in 2012. In this text, we already highlighted the negative effects of the "economist's dream" that the persistent theme of "a global carbon price or nothing!" has represented.

18. *Vraiment durable*, No. 4, 2013.

A Single Carbon Price: Solution or Problem?

In theory, a single global carbon price would be more efficient than a patchwork of pricing policies since the climate damage caused by one unit of carbon is the same wherever emissions occur. This single price would allow the fair distribution of efforts across the world; it would avoid both distortions in competition between countries establishing a carbon price and the risks of delocalising activities (referred to as "carbon leakage" risks).

Yet most economists specialising in climate, including the I4CE research team, argue that there is actually no reason for the value of carbon to be the same everywhere, considering the great disparities between the social and economic situations in different countries, the path that they choose towards reducing emissions and the co-benefits that they expect (reduced pollution, better health, development of innovating industrial technologies…). If the tonne of carbon today costs €35 all over the world, it would be more than affordable in Sweden, where the carbon tax is €135 per tonne, but in Pakistan for instance it would make new housing construction simply impossible. To be fair and tolerable, a single global carbon price would mean either enormous financial transfers from the developed countries to the developing countries, or a very low level – well below what some countries desire for their own economy. Another final condition would have to be met for a single price to work: other policies such as the tax system affecting the energy sector would need to be harmonised.

In 2015, a few months before the Paris COP21, some economists unfortunately including Jean Tirole, winner of the Nobel Prize for Economics, revived the dream of

establishing a single price for carbon, in the hope that their proposal would be taken into account in the negotiations. The idea did not meet with success: it was economically questionable, but above all politically unrealistic. We should remember that since the COP15 in Copenhagen, at the end of 2009, the chosen international approach concerning climate policies has been to leave it up to the countries to choose their own courses of action, according to their historical and present-day responsibilities, but also to their national circumstances. Only on this condition did negotiations resume after 2009, and only for this reason did they succeed in Paris in 2015.

At the end of 2016, a high-level commission chaired by Joseph Stiglitz and Nicholas Stern was set up to "identify indicative corridors of reference values for the social cost of carbon" in order to move carbon pricing forward all around the world. We deem this approach more relevant. In its report submitted in May 2017 the Commission concludes that a strong and predictable carbon-price ranging from $40 to $80 in 2020 and rising to $50-$100 range by 2030, is consistent with the 2 degrees objective. It states: "*Carbon prices and instruments will differ across countries, and implementation and timetables will depend on the country context.*"

The Carbon Pricing Revival

It is because of hard-hitting international campaigning by the World Bank, launched in 2013, that the price of carbon was again promoted among all the political and economic actors as being a priority tool to reduce carbon emissions.

This campaign which has, in a way, "saved carbon pricing from the gutter" is very much due to the leadership of a key figure and her team: Rachel Kyte, then Group Vice-President for Sustainable Development at the World Bank. Her stroke of genius was to take carbon pricing out of the top-down logic of the Kyoto Protocol and to adopt an exclusively pragmatic position. The issue was no longer how to introduce a global price or a device capable of providing the ultimate solution (a "silver bullet"), but to show in concrete terms how carbon pricing could serve the national public transition policies. She therefore strived to promote and disseminate information about the many diverse policies under implementation at the time.

According to the World Bank, in 2016, about 40 national jurisdictions and over 20 cities, states, and regions, including seven of the world's ten largest economies had set up a carbon pricing policy, covering approximately 13% of global emissions. This type of policy had been extensively expanded since 2013. China, for instance, initiated 7 regional ETSs in 2013 that would serve as pilots for the national scheme intended for 2017, if China doesn't prefer to adopt a tax. California also developed its own system. Worldwide, these policies, studied by I4CE in a series of monographs, represent enormous diversity.

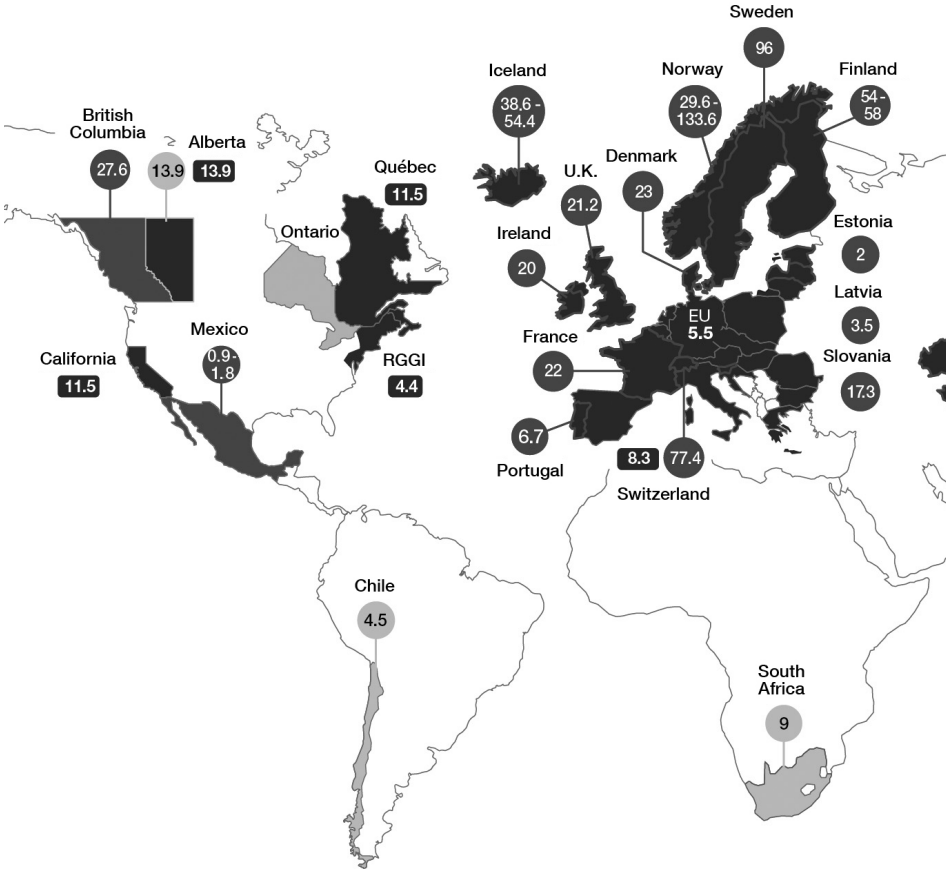
Carbon prices have reached very different levels across the world, from less than one dollar to more than €130 per tonne in the case of carbon tax in Sweden. For 85% of the emissions covered, the price is less than $10 per tonne. It is far less than the level required for reaching the 2°C target but, be that as it may, a growing number of States rely on pricing to achieve their climate objectives.

The Three Major Challenges for Carbon Pricing

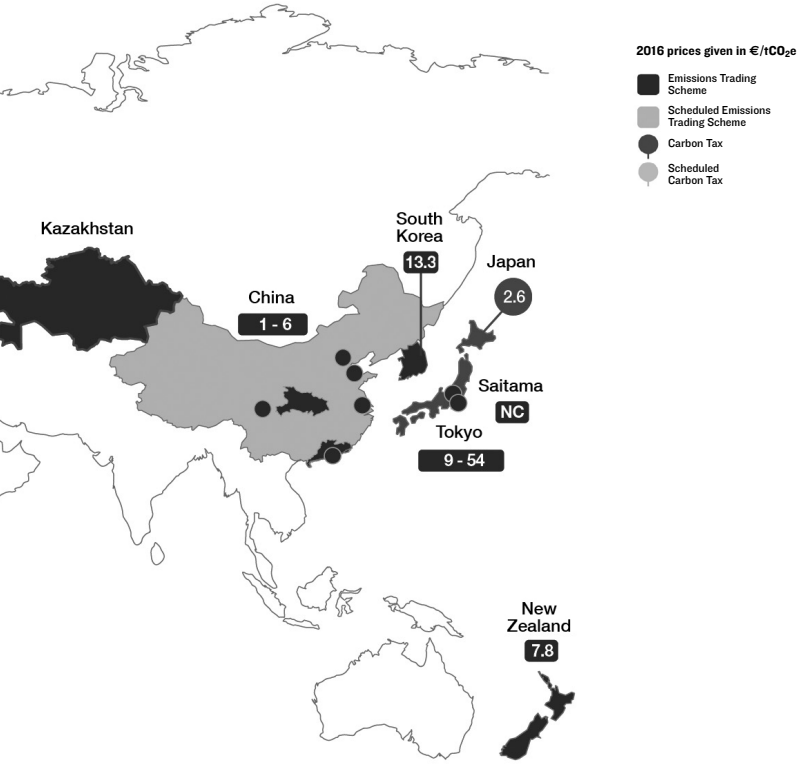
Three major challenges will determine the further development of this movement.

Removing Fossil Fuel Subsidies

The one pricing policy that could become universal is the removal of negative carbon prices. What does that mean? These are hidden prices, favouring carbon emitting activities. The most prevalent example consists in the subsidies going to fossil fuels. In its 2015 report, the IMF assessed fossil fuel subsidies at $5.3 trillion in 2015, i.e. 6.5% of global GDP. These subsidies exist in every type of country, developed or developing. Depending on the measurement method, the highest subsidies can be found in China (by volume), in Ukraine (as a share of GDP) or in Qatar (per capita). In some countries, they even push the consumption price of fossil fuels below their production cost.



According to the IMF, the current decline in the price of fossil fuels, in particular oil prices, is a golden opportunity to reform the public subsidies they receive, or even to introduce a carbon price in some cases. The subsidies were often initiated for social reasons but studies show that in the developing countries, the benefits are mainly enjoyed by the 20% of households with the highest incomes. But removing them does involve a primarily social and political risk.



Source: I4CE, July 2016.

What should be done? The IMF is in favour of increasing taxes first on those fossil fuels most consumed by high-income actors and households in and delaying tax increases on consumer products used by the poorest segments of the population. In parallel, it also advises to pursue an energy efficiency policy and to apply compensatory measures for low-income households (for instance, by issuing energy coupons). The IMF thinks that new tax rules should be

automatic, gradual and supervised by an independent body to neutralise their political sensitivity. All this should be accompanied by communication emphasising the benefits of reform, for example, the possibility of reallocating the tax proceeds to education or health. Several countries have already removed or reduced their subsidies to fossil fuels, like Angola, Bahrain, Egypt, Mexico, Morocco, etc.

Repairing the European Emissions Trading System

The European Union is currently trying to remedy the weakness of the EU ETS by reducing the glut of allowances in circulation. But the disagreements between Member States regarding the level of ambition of the common climate policy make it very difficult to implement the reform. In addition, the actors of the system (energy producers and industries) have opposing views on the role and operations proposed by the EU ETS. Two debates have come into being:

– the principle of regulation: some believe that the weakness of the carbon price on the market is not an issue, as long as the quantitative emissions reduction goal is reached year after year; others consider that allowance prices must on the contrary be raised sufficiently and provide a signal strong enough to steer investment.

– the regulation methods: the proponents of rule-based regulation consider that public action should be limited to automatic implementation based on a general principle and triggered by a previously known allowance price; they stand against those who are in favour of discretionary intervention aimed at raising/lowering the price of carbon.

The draft reform project proposed by the Commission consists in establishing a rule-based intervention mechanism, by regulating the amount of allowances in circulation, thanks to a mechanism which puts allowances in a market stability reserve. Since 2005, the EU ETS has been used as a laboratory for other regions of the world. It might be hoped that the ongoing reforms will enable it to regain its primary role: giving a consistent price signal that supports the long-term path toward reduced carbon emissions chosen by Europe.

The Successful Establishment of Chinese Cap & Trade

The main objective of the seven pilot emissions trading systems in China, launched between 2013 and 2014, is to garner experience and develop a national trading system. These systems share the fact that they cover the industrial and energy sectors and are able to use national carbon credits. Until 2012, China was the biggest beneficiary country of UN carbon credits and is very well placed to recognise the merits of project mechanisms.

The stakes are enormous: success would allow China to break free of its dependence on coal. But the challenges are equally enormous because the size of the market will raise questions of governance, of emissions accounting and monitoring methods, of national register maintenance, etc. In March 2017, Yi Wang, considered an unofficial spokeman on China's climate policy declared publicly that China could consider a carbon tax rather than a cap&trade. To be continued…

The Achievements of Carbon Finance

Emissions trading schemes are considered by some to be costly to set up and difficult to regulate. But their intrinsic quality is to guarantee emissions reductions within the perimeter covered. This implies that emissions are measured and their reductions verified – referred to as the process of "measuring, reporting and verification" (or MRV). In itself, MRV has undeniable advantages with respect to the integrity of public policies, but also to strategic management at company level and to civil society scrutiny: "What is measured can be managed."

With the Kyoto Protocol, the United Nations climate administration progressively established a set of rules, concepts and measurement tools to define eligible projects for the generation of carbon credits, and to quantify the carbon emissions avoided by projects. The idea was to produce quality assets for offsetting, i.e. environmentally robust assets. Being increasingly precise and rigourous, this work resulted in the development of a series of methods by sector and project type. This process of learning ultimately guaranteed the quality of the UN credits and a degree of standardisation allowing MRV costs to be reduced.

In parallel, voluntary offset standards complementing the UN credits were developed. The best known are the Verified Carbon Standard (VCS) and the Gold Standard. Some voluntary standards thus specialise in covering emission reduction sectors not covered by the United Nations (e.g. the Gold Standard applies to the forestry sector). The volumes generated under those standards – 300 million tonnes of carbon in 2014 – are insignificant compared to the UN credits, however.

Even today, the search for innovations to finance low-carbon transition projects involves the generation of carbon credits to ensure the financial equilibrium of projects. For instance, this is the case of the Livelihoods Carbon Fund which is aimed at restoring degraded ecosystems, like mangroves or forests, while redeveloping the local economy with projects funded partly by carbon credits.

The carbon credit system spearheaded what is called carbon finance, an activity that prospered as long as the European credit demand lasted. This sector covered not only credit trading but also the approach to assessing emissions avoided by the projects, the development of rigorous methods to achieve this, the auditing process required to obtain international certificates and the issuance of certified credits.

Today, the carbon credit supply system has outlasted demand. There is an evident rigidity due to the United Nations administration, but it can also be seen in a more positive light: beyond the project mechanisms, one of the major merits of emissions trading systems that is rarely mentioned is that they require MRV. MRV is the keystone of carbon policies, for states and companies alike, and might play the same role in the future for the financial sector too.

There is an area where national regulation cannot prevail to reduce carbon emissions: that of international trade and transport. A sectoral approach is therefore needed. Significant progress was made in the air transport sector in October 2016 thanks to the agreement reached within the framework of the International Civil Aviation Organisation (ICAO): 66 states representing almost 87% of international aviation activity agreed to participate in a market

based mechanism. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) will ensure carbon neutrality in the growth of the sector from 2020 onwards. The choice of offsetting stems from the fact that it will be impossible in the short term to eliminate direct emissions from the sector due to the lifespan of active aircraft, still imperfect technological advances and the future growth of air traffic. The implementation of the agreement will be gradual and differentiated depending on the level of development of participating countries. It involves sett-ing up an international MRV system. ICAO will also need to determine the type of projects and credits generated that will be authorized for offsetting.

This agreement could be compared with the deal adopted in Kigali on October 15th, 2016 covering HFCs in the framework of the Montreal Protocol. In that case, international regulation was preferred to carbon pricing.

Why? First, the Montreal Protocol has been very successful in eliminating CFCs, which were harmful to the ozone layer. Secondly HFCs, introduced as substitutes for CFCs, are very powerful greenhouse gases. Lastly, substitute technologies exist in this sector and are the same around the world. Therefore progressive elimination is both the easiest option to negotiate and the simplest to implement. The Kigali agreement sets a timeline for the gradual reduction of HFCs by 80-85% by the late 2040s. Deadlines are shortened for developed countries where alternative new technologies are relatively more affordable and extended for emerging and developing countries.

Emissions reduction policies for the maritime transport sector and international trade are yet to be agreed.

The Price of Carbon: Necessary but not Sufficient

Why financial actors considered carbon pricing as the priority policy is well understood: it improves the quality of the cost signal without distorting funding conditions within the economy. If the price is high enough, if it is maintained for a long enough time and is predictable, it can generate confidence among investors who now wish to favour low-carbon investments. For financial intermediaries, it acts as a uniform veil over the economy, changing nothing in their traditional financial risk/reward approach. How convenient!

However, the carbon price cannot be the beginning and the end of climate policy. It is not a silver bullet.

In some sectors, like transport, housing or consumer goods, it needs to be very high to be effective but in that case it would be socially intolerable. Other forms of policy, ranging from regulation to direct financial incentives, will therefore need to be implemented to overcome the obstacles to the financing of the low-carbon transition.

Persistent Obstacles to Transition Financing

At the end of the day, the inadequacy of green funding can be considered as a poor allocation of capital. Carbon pricing is an attempt to correct that by internalising the damage caused by carbon emissions. But there are other obstacles facing the low-carbon transition and its financing.

The Cost of Green Technologies: A Barrier Which Is Gradually Coming Down

The cost of green technologies is experiencing a constant decline, especially for renewable energy, where technological and industrial developments are taking place quickly. The International Agency for Renewable Energy (IRENA) periodically compares the competitiveness of energy sources in different regions of the world: terrestrial wind farms, biomass, geothermal and hydroelectric technologies are already competitive compared to fossil fuels. The costs of the more mature technologies (biomass, geothermal and hydroelectric) are now relatively stable. The cost of photovoltaic solar energy was halved between 2010 and 2014 and is already competitive in several regions of the world.

The very rapid and recent growth of photovoltaic power production and onshore wind generation technologies represents a benchmark for the entire economic transformation that is required. The reduction of their production costs makes these technologies profitable without subsidies in large parts of the world, where they have now become competitive even with coal. They represented more than two thirds of the new electric capacity installations in 2015 (Renewables 2016 Global Status Report). The IEA (World Energy Outlook, November 2016) considers that there is a transformation taking place on the new global power markets, driven by renewables, predicting that they will experience a 42% growth by 2021 based on future reductions in production costs (-25% for photovoltaic and -15% for onshore wind generation technologies).

Renewables are winning the battle for electricity, if not for energy as a whole. This ongoing process needs to be matched in other sectors too.

In some areas, especially transport, low-carbon solutions such as electric vehicles are growing fast (the market almost doubled in 2015 according to the World Energy Outlook), while others are in the research and development stage for air or maritime transport.

Various other barriers are standing in the way for financial actors to engage.

Risks That Are High or Perceived as Such

Risks related to low-carbon transition assets are still perceived as high. Some are ordinary investment risks, in particular abroad: macroeconomic risks like inflation and exchange rates; political risks (instability, corruption, conflicts).

They are even greater in the emerging and developing countries, characterised by: the inadequate size, diversity and liquidity of the financial markets; poor knowledge base on markets and investment; unattractive regulatory and legal frameworks.

In addition, there are operational risks, possibly caused by project or technology management shortcomings; counterparty risks (for instance, uncertainty about the trading possibilities for renewable energy or changes to their feed-in tariff regimes); liquidity risks, that is, the inability to sell an asset. These are all factors which result in additional risk premiums and limit access to capital at affordable costs.

Costs Specific to Low-Carbon Assets

The small size of many projects, such as energy efficiency projects or local renewable energy projects, can also form an obstacle. The costs of measuring project impact and reporting (transaction costs) can also be mentioned, as well as the costs of acquisition of sectoral expertise by the actors all the way down the line, from public authorities to financiers.

Imperfections in Financial Markets

The more general faults of financial markets slow down the financing of the transition: because of their short-term tendency, their short-sightedness (which is further encouraged by the use of stock indices rewarding the economy as it is), asymmetrical information that prevents us from seeing this new risk represented by climate change, and naturally, a failure to factor in negative externalities (carbon emissions) or positive externalities (the co-benefits of a low-carbon economy on air quality, and therefore health, on productivity, etc.). These risks and barriers are part of the specific agenda of the financial industry in the broadest sense which can only be overcome by regulators, who play a crucial role in this respect.

In light of its constraints, global finance must therefore continue to advocate the introduction of appropriate carbon pricing. The industry cannot, however, deny its share of responsibility in allocating capital to the low-carbon transition.

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CHAPTER 3

CLIMATE FINANCE, HOW MANY DIVISIONS?

As necessary as it may be, acting on the demand for capital, through macroeconomic policies and carbon pricing, is not enough to boost the low-carbon transition to the required level. For the time being, public economic and financial policies do not display a clear focus on steering investment. Furthermore, carbon pricing is not widespread enough in the world, and the price is often too low to be effective. In addition the spontaneous financing of green projects by the market is faced with multiple barriers.

Yet the supply of capital to finance green projects is on the increase. Slowly, but surely, we are witnessing increasing willingness among investors to allow for climate issues. They are becoming more aware of the real influence of climate change on the value of their portfolios, and they are increasingly well equipped to take it into account, thanks to the responsible investing approach which has prepared them to accept environmental criteria in their decisions.

The RI Movement and its Quest for "Materiality"

Responsible Investing (RI) refers to investor approaches to integrate sustainable development into financial management. It originated long ago in Anglo-Saxon faith movements attempting to give an ethical dimension to their investments: either by philanthropic financing (education,

health and research services), or by a refusal to invest into sectors not aligned with their convictions (weapons, tobacco...). Only in the 1990s did the RI concept and tools really take shape and develop within financial institutions not having a religious or ethical vocation – in short, it moved into the market. RI is now practiced by every institutional investor category from pension funds, insurance and sovereign funds to reserve funds, foundations, and to a lesser extent by savings managers proposing investment products to private customers.

In a definition that is now generally accepted, RI consists in incorporating extra-financial criteria in investment choices, in addition to those concerning only the financial characteristics of the assets. These criteria are put into three categories: Environmental, Social and Governance (ESG). They cover areas that are relatively well defined: environmental criteria more specifically involve the depletion of natural resources, waste, pollution, deforestation and greenhouse gas emissions; social criteria refer to working conditions, respect for local and indigenous communities, conflicts, health and safety of employees and company relations with employees; governance criteria involve executive compensation, corruption, lobbying, diversity, management structure, fiscal strategies, etc.

Little by little, proficiency in RI matters has developed with the creation of extra-financial rating agencies. Specialised teams were set up among asset managers and investors, dedicated savings and investment products and the establishing of ESG policies were developed by institutional investors, labels and indices were created, public authorities implemented incentives, and so on.

The RI approach has grown enormously since 2000, especially in Northern Europe and in France. Under the aegis of the United Nations, in 2005, six "Principles for Responsible Investment" (PRI) were defined, with a commitment by the signatories to report each year on compliance with these principles. This was a significant contribution to the development of a standard and a transparency framework for RI. The PRIs also became a powerful structure for exchange about practices among investors, enabling a great deal of progress, and serving as a representative body for its members vis-à-vis international and national authorities.

According to a 2016 study by the global network of sustainable investment forums, GSIA, the RI market has reached 26% of the assets managed worldwide. Europe continues to be the biggest market where RI covers 53% of the assets under management, but over the last years the fastest growth has been in Australia/New Zealand. The study does not mention Africa; although RI does exist on the continent, it is not yet structured.

SHARE OF RI IN MANAGED ASSETS (2016)

Europe	52,6%
Canada	21,6%
United States	37,8%
Australia	50,6%
Asia	0,8%
Japan	3,4%
World	26,3%

Source: GSIA, 2016.

Why so strong a development? Investors are coming to realize that consideration for ESG criteria is a way of gaining a better and broader understanding of risks facing the companies and projects into which they invest. It also offers a means of selecting company assets that will be able to adapt to their economic and social context, or to anticipate new customer expectations or new regulations. In short, extra-financial information sheds more light on investment decisions. Investors and their managers, however, use this information in substantially different ways.

A distinction is traditionally made between several approaches which are not necessarily mutually exclusive and may be applied at different stages of the investment process:

– Selection: this technique consists in selecting the issuers with the best ESG performance among their industry peers; reference is made to the "Best-in-class" approach. When this selection of the best assets is made across sectors the approach is referred to as "Best-in-universe". Using a screening technique, managers use filters to generate a specific investment universe, prior to the investment decision. Companies are screened according to their ESG performance.

– Integration of ESG factors: asset managers systematically and explicitly include ESG factors in their financial analysis.

– Exclusion: some companies are removed from portfolios because of their area of activity (tobacco, alcohol, weapons, gambling, GMOs, nuclear, fossil fuels…); reference is made to sectoral exclusion. They can also be excluded because of their business practice that runs against international standards (forced labour, corruption, etc.); in

this case the exclusion is normative. Negative screening is a way of implementing exclusion policies.

– Thematic investment: opposite to exclusion, this approach consists in investing into sectors or companies contributing to sustainable development, like renewable energy, water, the reduction of greenhouse gas emissions, job creation, etc.

– Engagement: this method is based on direct dialogue with company managers and/or exercising shareholder voting rights as a way of influencing corporate behaviour regarding ESG criteria.

Overall, the strategies most often encountered are exclusion (essentially normative) followed by ESG integration and shareholder engagement.

Financial Performance, Extra-Financial Performance and Fiduciary Duty

For a long time, it was commonly assumed that applying extra-financial criteria to investment is detrimental to its financial performance. This opinion is still widespread among savers. Combined with sales teams lack of knowledge in proposing RI savings and investment products to private clients, this goes a long way toward explaining how little success they have achieved with the public at large. This belief has also prompted some investors to stay clear of SRI by maintaining that their fiduciary duty, i.e. their duty to act in the best interest of their clients (savers, future pensioners, etc.) requires them to do so.

However, more and more precise observations, verified over time, demonstrate that the performance of RI

funds is equivalent to any other. Today, several studies suggest that RI even enhances investment profitability because it allows broader and more accurate analysis of the risks involved. What is more, financial performance today is the main source of legitimising the RI approach in the financial area, according to the saying: "Respect for values creates value". But RI suffers from its broad and rather vague definition, from the many approaches of investors, their complexity, and even their lack of transparency. The success of RI has gone hand in hand with a loss of meaning, as an illustration of the eternal dilemma between widening and deepening.

The RI growth crisis is symbolised by two events that occurred in 2014. Due to the very rapid increase in the number of signatories worldwide over the preceding four years the PRI was criticized by its founding members, who are convinced responsible investors, for being somewhat lax in enforcing the principles it promotes. PRI have since reinforced signatory reporting requirements. Then, in France, the preparation of the RI "label" promoted by the public authorities crystallised the debate between those who, like Novethic, were in favour of a demanding label and other market players who wanted less stringent labelling. So did RI forget its initial calling as it developed? Until recently, it is true that nobody really expressed concerns regarding its social and environmental performance. With public authorities gradually bringing in transparency requirements with respect to RI, the instrument ended up being limited to a legal compliance process. If RI has transformative virtues, and it would be wrong to conclude that it does not, they are neither intentional nor measured.

The concept of "impact investing" is recent and is still emerging in response to questions about the extra-financial performance of investment. Impact investing could be defined as an investment made with the intention of generating positive social and/or environmental effects. Any difference from the conventional RI approach is due to the fact that investors seek, measure and report on performance and progress.

More generally, investors attempt to select the ESG criteria that could have the most direct effect on their financial performance. This is referred to as a quest for the materiality of extra-financial criteria. Generally speaking, investors acknowledge materiality in matters concerning company governance. For environmental issues, the area of climate change is where recognition of materiality has made the greatest headway – it is true that measuring the problem is relatively easy because it is based on a quantified and single physical indicator: the tonne of emitted and financed carbon.

Due to recent developments, however, it is now considered that not worrying about the sustainability of investments is in fact what really constitutes a breach of fiduciary duty. In the summer of 2016, the British pension fund supervising authority was the first to make a recommendation stipulating that taking ESG criteria into consideration was an intrinsic part of the fiduciary duty of asset managers.

At last, results have become a matter of concern. Finally, RI can be harnessed to tackle the issues it has claimed responsibility for. Furthermore, RI's strong point is to have developed the tools and methods enabling shareholders to influence companies and steer the real economy.

What is more, it has secured the backing of a professional community capable of acting at the forefront of finance. RI put the "green" worm in the apple of finance. From then on, all that was needed for the climate finance butterfly to spread its wings was for the materiality of climate risk to be demonstrated.

Carbon Risk: New Activism

Carbon Tracker Revolutionises the Language of Finance and Climate

When *Rolling Stone* readers opened their magazine in August 2012, they discovered a long feature entitled "Global Warming's Terrifying New Math" by Bill McKibben, an environmentalist author who is a star in the United States. The article made an enormous contribution to spreading the concepts of "stranded assets" and of the "carbon bubble". Who invented these mysterious concepts? Carbon Tracker, a British think tank founded in 2011 by a group of financial, energy and legal experts. Carbon Tracker set itself the objective of generating awareness among decision-makers about the risks that investments into fossil fuels produced for financial stability. It made no bones about its goal: modifying capital allocation and re-orientating financial systems so that they would contribute to a low-carbon future. With its first report published in 2011 and the work that followed, Carbon Tracker revolutionised the language of finance and climate.

Carbon Tracker's thinking started from the internationally accepted goal of limiting global warming to 2°C, and from the planet's carbon budget calculated by the IPCC,

which should not be exceeded in order for that goal to be met. On this basis, they examined fossil fuel reserves that were already known and owned by the mining and oil producing companies or by the producing States. It found that the resources that were ready to be used represented five times the volume of the global carbon budget. It came to the conclusion that if we really want to meet the 2°C target, then 80% of these reserves, owned by the fossil fuel industry, should be left untapped.

"Keep it in the ground" then became the slogan of activists against fossil fuels.

But these reserves are already part of their owners' economic models; their value is mirrored by their share prices and determines their borrowing capacity. Therefore, these reserves are the primary assets of the fossil fuel producers. If they had to be kept in the ground, there would be a dramatic decrease in the value of these companies. The resulting artificial, or at least risk-prone, value is referred to by Carbon Tracker as the "carbon bubble". It is made up of assets which are stranded, in other words threatened, or even destined to lose value (meaning that before the end of their economic life, they will no longer be capable of generating any profitability). In support of this theory, the collapse of the railway companies on the stock exchanges because of the development of the automobile in the early 20th century is often quoted.

This analysis is definitely a matter of concern for investors. There is a real risk of the carbon bubble bursting if policies requiring severe restriction of emissions are adopted at some point in the future, for instance after major climate events or if costs/prices of low-carbon technologies become relatively lower. This new risk-driven

approach brings new questions: is there any way of acting on the carbon bubble? Will the reassessment of fossil fuel values be brutal, or on the contrary will they be anticipated and organised? Do investors have stranded assets in their portfolios?

Just how much are they exposed to carbon risk? Companies working in the fossil fuel sector must also wonder about how best to allocate their investment capabilities. Could using such a capability to exploit fossil fuel reserves be wasted capital?

Carbon Tracker speaks the language of finance, and its particularly innovative approach has been heard by investors. It is noteworthy that it also resonated in other circles: from NGOs specialising in climate to the Bank of England, Carbon Tracker was taken seriously.

350.org Targets the Investors: Go Fossil Free!

The 350.org movement appropriated Carbon Tracker's standpoint as early as late 2012, and targeted investors for one of its international campaigns: Go Fossil Free! 350.org was founded in the United States in 2008, and aims at mobilising civil society, essentially to limit the power of the fossil fuel sector. Its name was chosen in reference to the carbon emissions reduction goal: to remain below 2°C implies reducing the concentration of carbon in the atmosphere to 350 ppm (parts per million). Its methods are radical, modern and often festive: they include campaigns on the Internet, local presence and massive and spectacular public events.

The Go Fossil Free! campaign calls upon institutions around the world to immediately stop any further invest-

ment into companies working in the fossil fuel sector and to divest in the next five years. In particular, it targets American universities and colleges, religious organisations and retirement funds.

Starting in 2012, under pressure from their students, US universities began to redirect their financial portfolios by selling off shares and bonds they held in fossil fuel companies. Early in 2015, 350.org arrived in France and attacked the Retirement Reserve Fund (known as FRR), which holds €34 billion designed to complete the pay-as-you-go retirement system's resources after 2020, once the demographics become very unfavourable. In its own defence, the FRR acknowledged that it held shares and bonds in high emitting companies but that it had already initiated a long-term policy to reduce its carbon footprint; it was also one of the few investors that disclosed the composition of its portfolio. And it became a victim of its own transparency!

Divest-Invest is a more financial but equally radical international movement which, in 2014, completed the action of 350.org by federating philanthropic investors who are active on climate issues. It goes even further by calling on all investors (from sovereign funds to foundations and pension funds, including individual savers) to divest from fossil fuels and re-invest into renewable energies and low-carbon technologies.

Aiming for A: Shareholders Bring Pressure to Bear on Companies

At the same time, British public pension funds, charity and church organisations formed a coalition named Aiming for A (where the A stands for environmental excellence) to use their power as shareholders against the biggest min-

ing and energy production companies listed on the stock exchange in the United Kingdom.

They chose to engage with investee companies by filing resolutions at general assembly meetings. Aiming for A's 2015 campaign targeted BP and Shell through relatively moderate resolutions: they asked the two groups to explain their strategy of adaptation to climate change, but also to commit to quantitative carbon emissions reduction targets. They enjoyed a sweeping victory: in both cases, the general assemblies voted in favour of the resolutions concerning the strategy, by a 98% majority supported by the Norwegian sovereign fund, by Calpers (the Californian public servants pension fund)… and by the boards of the groups themselves. Conversely, resolutions on quantitative objectives were rejected.

In 2016, the targets were multinationals in the mining sector: Rio Tinto, Glencore and Anglo American. In parallel, oil producers Exxon and Chevron, who had thus far managed to contain the climate resolutions, were forced to face the major US pension funds and other global asset owners. The funds themselves are coming under pressure from their members who, through the Vote your Pension website, are pushing them to be vocal during shareholder meetings.

A two-pronged movement is underway. On the one hand, citizen climate activism is focusing on financial issues and using the methods developed by the RI. On the other, RI investors themselves are adopting activist methods by engaging as committed shareholders and pursuing increasingly precise and demanding policies. And it is working: a Ceres survey carried out in late 2015, "Shareholders Spur Action on Climate Change", demonstrated that of the 100 or so

shareholder-driven climate commitments made in 2015 by US firms, 73% were entirely met, and 13% substantially.

Total's story: In 2011, Greenpeace and Phitrust Active Investors, an asset management company, had prepared a draft resolution to obtain more information about Total's investment policy into the tar sands in Alberta. They came up against firm opposition from Total's management and were unable to file their resolution. In 2015, the company escaped the action of the Aiming for A campaign but in 2016, Patrick Pouyanné, Total's Chairman and Chief Executive Officer, decided to take the bull by the horns: during the presentation of the Group's annual results in February he unveiled an ambitious climate strategy, claiming its consistency with the IEA's 2°C scenario. This strategy operates on four different axes: concentrating on the most profitable oil projects, giving priority to gas projects, withdrawing from coal and developing renewables and biofuels. On March 15th, the board of directors decided to issue a report to the shareholders about climate risk management; it was published on the occasion of the general meeting in May. This enabled Total to work around the resolution of Aiming for A, which has become meaningless. By conviction, or under pressure, the group has above all made a public commitment to change its economic model over the next few years. Watch this space.

Investors Take Hold of the Climate Issue

Shareholder activism is merely the most spectacular facet of the actions that shareholders have undertaken to push companies to make climate change one of their concerns. Early in the decade, many institutional inves-

tors, including the biggest and most deeply committed to RI (like the Norwegian sovereign fund and the big North American pension funds) have gradually converted the climate issue into an effective focus within their investment policy. In this way, according to Novethic, in 2015 more than half the European institutional investors (53%) declared they prioritized climate.

Two basic approaches can be observed. The first approach aims at limiting portfolio carbon risk, i.e. the risk that assets would lose value because of public policies or changing corporate business models. Another approach focuses on seizing the opportunities offered by the low-carbon transition, by investing into the "green" sectors and the companies contributing to it.

Four possible types of investment policies can be carried out separately or in combination:

1 – Reducing portfolio carbon footprint: this presupposes assessing the emissions from the assets held. Footprinting can rely on the standardisation work carried out to assess corporate emissions. In particular the GHG Protocol is recognised internationally and defines three emission circles: direct emissions (scope 1); emissions linked with the energy consumed by the activity (scope 2); emissions of the entire value chain of the activity (scope 3), from the purchase of materials, services or other products, employee travel,upstream and downstream freight transport, all the way through to the use and end of life of the products and services sold.

The choice of measuring and reducing a portfolio's carbon footprint has no influence on the asset allocation strategy followed to achieve that goal. It is a recent approach

and a great deal of research work[19] is underway to ensure its fine tuning and to integrate climate into risk management. It will also be necessary to take portfolio management methods into account. Management can be direct or indirect, that is, entrusted to one or several asset managers. It can be active or passive. Passive management is growing fast because it represents a low cost for the managers. It consists in accurately replicating a reference index such as the global MSCI or Eurostoxx... This method has been strongly criticised for freezing the economy and preventing the low-carbon transition from taking place. Very recently, conceptual work and the creation of low-carbon indices helped remove this obstacle.

2 – Divesting from the highest emitting companies, in particular from fossil fuels;

3 – Shareholder engagement to encourage companies to allow for climate issues in their strategies;

4 – Portfolio greening: this approach consists in allocating part of a portfolio to sectors contributing directly to the low-carbon transition: renewable energy, low emitting infrastructure in transport, sustainable buildings, etc. A decision to acquire green bonds can be a very simple way of achieving such allocation.

19. A 2014 article ("Hedging Climate Risks", by Mats Andersson, Patrick Bolton and Frédéric Samama) proposes a long-term investment strategy for passive management which hedges climate risk without giving up on financial returns. Investors who choose this "free option" obtain at the least the same performance as their reference index. But as soon as carbon prices rise, their portfolio will outperform this index. It is a case of Pascal's Wager applied to carbon risk in a way.

Collective Investor Mobilisation

Responsible investor networks are helping mobilise investors in favour of climate. In this finance business, in which the players are not competitors, it is relatively easy to foster collective action through the sharing of knowledge, or even through alliances. Among the main networks acting on climate, PRI naturally occupies a special position since it is the most powerful and the biggest with over 1,200 members. The Institutional Investors Group on Climate Change (IIGCC), in Europe, and its counterparts on the other continents[20] form the Global Investor Coalition on Climate Change, a coalition providing a global platform for dialogue between investors, governments and the international climate bodies on policies and practice. The United Nations Environment Programme also established UNEP FI, a partnership in the financial sector bringing together 200 actors, investors, banks and insurance companies, also working on climate.

As will be discussed in chapter 4, these networks together crystallised investor commitments in the lead-up to COP21 in 2015.

Insurers at the Forefront

The insurance industry is one sector within finance that did not need any NGO pressure to raise its awareness of the climate risk weighing on profitability, and its activity in general.

20. Ceres in the United States, the Investor Group on Climate Change (IGCC) extending to Australia and New Zealand and the Asia Investor Group on Climate Change (AIGCC) in Asia.

Insurers, whose job it is to analyse, prevent, cover and transfer risks, have been on the front line for 20 years in confirming the increased frequency of extreme weather events: typhoons in South-East Asia, floods in Europe and North America, hurricanes in the United States, droughts in Africa… The Munich Re reinsurance company considers that 90% of today's natural disasters are weather-related and that the losses they caused amounted to $27 billion in 2015 alone.

Besides, 70% of global risks are not insured, especially in the emerging and developing countries. This limits the resilience of these countries and their populations with respect to climate events, although they are the ones most exposed to them. Being refunded for damage is the very first condition for being resilient and the second is being reimbursed quickly. Most damage actually occurs after the disaster: losses of activity and earnings, health issues... making insurance an essential factor for adapting to climate change.

Until now, the insurance industry has managed to cover the losses caused by the increasing frequency and severity of climate-related disasters, at least those that were insured. Because damages are insured on an annual basis, the profession is currently able to cope with them by gradually increasing insurance premiums. In addition, risk transfer techniques (like reinsurance[21] or cat bonds[22])

21. Reinsurance is the operation with which an insurance company takes out an insurance policy with another company for part of the risks it is covering.

22. Catastrophe bonds (or cat bonds) are high yield bonds issued by insurance or reinsurance companies. If a predefined catastrophe occurs (earthquake, tidal wave, hurricane...), the bond holder loses all or part of its interest, or even of its principal.

help to reduce the exposure of the companies considered individually.

But climate change is increasing the uncertainty affecting the activity, which consists in referring to the past to forecast the future. Now that climate systems are changing, information from the past is less reliable for the future. In preparation for increased climate risk, the big insurers and reinsurers have already developed research to better understand, quantify and model it.

But what will happen to them when climate change causes increasingly severe damage? According to Allianz, losses caused by extreme climate events could worsen by 30% per annum in the next 10 years, reaching an annual average cost of $1 trillion. Insurers and reinsurers will initially be able to select the risks they insure, by excluding certain risks or defining limits (for instance, no longer insuring new housing on the coast because of the rising sea-level). Conversely, however, climate change may be an opportunity to better define these new risks and insure them (such as the risk of drought faced by farmers). Insurance could also contribute to risk prevention by offering more favourable premiums for low-carbon or resilient activities and behaviour.

Beyond a certain level, however, insurers alone will no longer be able to cover the climate risk, which will have to be addressed by public authorities. And even sovereign risk may reach its limits. As expressed during the global finance and climate event, the Climate Finance Day in May 2015, and often since then: "A world which stays below +2°C is insurable, but a world at +4°C would not."

Climate change nevertheless provides an opportunity for the insurance industry, to develop new activities and

new products, in keeping with the very nature of the business. The role of insurers is twofold: in its core business, to innovate in order to cover climate risks, but also to reduce and to forestall those risks; as investors, to adapt their assets to climate change.

Innovating to Cover New Risks

In the event of a climate disaster, one major issue would be the shortening of the time between the disaster itself and the compensation it would trigger. Parametric (or index-based) insurance is a new way of quantifying damage and compensation, by defining upfront the amount to be paid to the insured party if a specific event occurs, such as flooding, or drought. Thanks to satellite monitoring, it is based on more accurate knowledge of land use (now with a 90 m² resolution), allowing improved risk modelling risks and damage verification. Compensation processes can be sped up, and adjusters are not needed to assess damage, which reduces costs and thus boosts affordability to low-income populations.

In addition, to increase the level of protection and the number of insured parties, microinsurance solutions are being proposed in the emerging and developing countries. To insure the greatest possible number of people on low income, what is important is to reduce distribution costs, for instance by developing insurance via mobile phones and microfinance networks. Quite rightly, insurers consider that a new and very large market is opening up.

One way of offering insurance coverage for sovereign risks to the countries most vulnerable to climate change is the creation of regional risk-pooling agencies. A typical

example is the African Risk Capacity which groups 32 countries on the continent, and is more specifically focused on drought risks in the Sahel. In case of damage, the compensation provided under this setup is funded by a combination of donor country contributions and beneficiary country premiums. National adaptation programmes are financed as well. The same type of coalition also exists for the Caribbean countries exposed to hurricanes, with the Caribbean Catastrophe Risk Insurance Facility (CCRIF).

In addition, the insurance industry is a valuable source of information due to its ability to collect risk data. Sharing this data could increase the resilience of the areas and activities involved. Specifically, this information could help local governments plan for risks and manage adaptation policies.

Insurance companies could also create products adjusted to the low-carbon transition: insurance for renewable energy assets, "green" insurance rewarding low emitting behaviour – for instance "pay-as-you-go" car insurance or property and housing insurance that would incentivize energy efficiency or adaptation to climate change.

Adapting Asset Portfolios

To cover the risks they insure, insurance companies have to invest their resources into different financial instruments. As such, they are one of the primary long-term institutional investor categories, and they need to seek better matching between the assets and liabilities on their balance sheets.

For insurers, making their assets and liabilities consistent means implementing an investment policy that allows for

the types of risks they need to cover. For instance, in 2016 Axa decided to exclude tobacco companies from its investment portfolio because the costs of covering damage caused by tobacco are weighing more and more on its health insurance activities. The same could apply to climate risks, if it were not for the prudential rules applying to investment policies. In the European Union, the 2008 financial crisis resulted in the introduction of the Solvency II prudential framework which entered into effect in 2016. The system foresees balance sheet valuation at fair value, that is the market price, and no longer at historic cost. It also requires insurance companies to hold sufficient capital (on the above basis) to cover losses for an event which could cause their ruin, i.e. which is likely to occur over a 200 year timespan.

Although these rules are designed to protect the financial system's stability, and therefore the global economy in the event of a crisis, their drawback is to increase the cost of capital of the riskiest and longest investments, especially equity shares and infrastructure which are essential assets for low-carbon transition. Insurers therefore consider that they are prevented from sufficiently adapting the asset side of their balance sheets, and thus from contributing more actively to redirecting their financing to the low-carbon transition. Discussions with the regulators can be used by the industry as an argument justifying a lack of voluntary action ("if you want green, first change the rules of the game"). However, the insurers have a point: in managing and interpreting prudential ratios, how can the legitimate concern for climate be handled? Banks face the same question.

Banks: From Niche to Integrated Approaches

Banks are as deeply involved in directly financing the economy as the investors are. However, the way they approach the climate issue seems to be less visible and more fragmented. They probably operate under greater constraints, partly from the individual demands of their clients – who have to be convinced about the climate issue and its consequences on their activities and strategies – and collectively, because they compete with one another.

This relative discretion is also due to the diversity of their activities. What does this mean? Generally, a distinction is made between retail banking and corporate investment banking which may or may not be integrated into universal banks depending on country legislation.

Retail (or high street) banks deal with private customers, professionals and SMEs. Their work consists in granting them credit, managing their deposit accounts and proposing payment tools, investment and savings products to them, through a network of local branches. The strategic importance of retail banking for financing the low-carbon transition on a global scale stems from the part they naturally play as finance aggregators for small-size investments, which represent a considerable share of the items to be financed. To finance energy efficiency investments for private clients or small businesses, the purchase of electric vehicles and even small solar panel installations, retail banks and their affiliates specializing in leasing and consumer credit are irreplaceable. They can also help train their clients through their approaches to their own business and development. Specialised "green" loans are appearing, for home energy retrofitting for example. Most of them are

publicly supported but still depend on the business policies of the banks. So should more "green" banks be created? It all depends on the development potential of existing bank networks. But there cannot be any green economy financing unless the banks become greener by adopting climate goals in their strategies, by training their staff, and by monitoring the "greening" of their operations.

The corporate and investment banks are specialised in corporate clients consisting of the biggest companies, States and large institutions.

They provide not only loans and cash flow (bottom line) management to these major customers, but also a series of services allowing them to optimise their balance sheets by covering risks and financing the growth and development of their activities (essentially by access to the financial markets or by merger and acquisition operations). For instance, for the issuance of shares or bonds, bank services include asset origination, arrangement of issuance or transactions, asset placement with investors and underwriting[23]. Project finance operations are also within the scope of investment bank business.

All of these activity branches are equally important with respect to the low-carbon transition, but they use different levers.

Credit and Climate Risk: Breaking the Tragedy of the Horizon

A major share of the leverage banks can mobilize to contribute to the low-carbon transition comes from the massive amount of credit they inject into the economy. It

23. Underwriting : selling securities to investors on behalf of issuers by taking the pricing risk.

would make sense for banks to adopt the same approaches as investors when they are lending, focusing on risk and/or opportunity. This could lead them to limit the loans they grant to high-emitting activities, to check the compatibility of their credit portfolio with the 2°C target, and to lower loan prices (interest rates) for low-emitting activities. To be fair, several of the big banks in the United States, Europe and China are indeed trying to address climate change issues at a strategic level.

But very few of them publish any data about their exposure to carbon risk, considering that it says too much about their business.

Some banks have also adopted sectoral policies to redirect their financing efforts, through lending guidelines. For instance, they may decide to exclude high-emitting sectors from their credit or project financing policy, or to introduce sector limits in consistency the IEA 2°C scenario. Like Citigroup, they may also assess the sensitivity of their loan portfolio to carbon risk by running stress tests. As financing and investment banks, they could also bring climate-related criteria into their advisory activities.

For a long time, banks objected that the short-term nature of the greater share of loans they grant does not require of them, or allow them to take climate risks into consideration, because they are long-term. Sub-text: climate risk is not a risk to them in this activity, and therefore they have nothing to worry about. It is what Mark Carney, governor of the Bank of England, quite rightly referred to as the "tragedy of the horizon". But this line of thinking is no longer tenable: the accumulation and succession of small short-term credits, like loans for energy efficiency in housing or car credits, have an equally strong impact

as long-term credits for large operations. It is true that the banks are little inclined to measure the emissions financed through their loans because of the costs that such monitoring generates at the outset. It means costs in acquiring skills, and costs of changing IT systems for them to be capable of keeping track of masses of climate-related data.

Climate Risk and Bank Supervision

Similarly to the insurance companies, the banks fear that taking climate risks into consideration in credit activities will make it even more difficult to meet the capital requirements under the Basel III agreements. Basel III reformed international bank regulations after the 2008 financial crisis to strengthen the stability of the financial system. In a 2014 report, the University of Cambridge and UNEP FI considered that the "Basel III committee should explicitly acknowledge environmental risks". The bank supervisors could explore the possibility of integrating climate into the stress tests they use as part of the "second pillar" of these agreements (monitoring procedures). As part of the "third pillar" (market discipline), they could also look at the question of transparency regarding the level of exposure of the banks to environmental risks and their capability of managing these risks.

Some bank players have turned the issue on its head and propose an alleviation of prudential requirements for green financing. In September 2016 for instance, the French banking industry organization (*Fédération Bancaire Française* – FBF) published a memo to "successfully finance the energy transition". This proposal, named "the green supporting factor" consists in lowering capital requirements for financing and investing in assets that contribute to the

energy transition and thus reduce the systemic risks associated with climate change.

Assets eligible under this rule would be identified by third-party certifications that are widely recognized and financed by retail or investment banks.

This very interesting proposal should be further discussed and studied. A condition for success lies in the ability to rely on the perfect quality of labels and certifications that will attest to the green integrity of assets. Such standards and certificates already exist, some must become more reliable. Another condition is that banks must be able to track these assets in their IT systems, to collect data and to evaluate the green performance of their loans. If these conditions are met, why not reward green financing and investments?

These matters are now being discussed between the French banks and the Government, since the adoption of the "Energy Transition Act for Green Growth" in 2015. Article 173 of this law stipulates that the government will report to the Parliament about the implementation of a regular stress test scenario representative of the risks entailed by climate change.

For the banks and the insurance companies, this prudential framework could become one of the levers for financing the transition.

Creating Green Products: Innovative Niche Activity

The creation of green savings or investment products and the financing of low-emitting projects are both innovations by banks and asset managers who are – thankfully,

one could say – using the carbon transition as a business opportunity.

Such savings and investment products appeared at the end of the 2000s in preparation for the Copenhagen summit, but many of them suffered from poor performance during the years that followed, often due to excessive specialisation in sectors exposed to strong technological or competitive effects, as was the case of the greentechs a few years before. Their environmental integrity is also an issue. Under the aegis of the public authorities, two labels were created in France in 2015: the SRI label and the Energy and Ecological Transition for Climate label. They will guarantee the integrity of funds, whether they target the public at large or institutional investors.

Public opinion has often had a bad image of the creative structuring teams in American and European investment banks, thought to embody, like their trader colleagues, the "finance cut off from the real economy" point of view. It must be acknowledged that these very same people were the inventors of the prime innovation in climate finance climate of the last decade: green bonds.

Green Bonds: Green, but What For?

In January 2014, four banks (Crédit Agricole, Bank of America Merrill Lynch, Citibank and JP Morgan Chase) wrote the "Green Bond Principles". At the time, the green bond market was still emerging and the term "green" referred to the fact that the bonds financed projects that were favourable to the environment. The green credentials were self-proclaimed and suspicions of greenwashing began to threaten the new market's reputation. These banks occu-

pied a dominant position in the market, as the main arranging banks for green bond issuance. The time had come for them to give a level of guarantees as to their integrity and transparency.

Ever since, the adjective "green" used in the term "green bonds" has been a constant discussion topic among the market's players and observers: are these green bonds really green? The question is no doubt essential but is not the only issue. A broader reaching question should be raised: how can green bonds help finance the low-carbon transition?

What Is a Green Bond?

First of all it is a bond, i.e. a negotiable debt instrument. It is also characterised by environmental or climate benefits in the case of climate bonds. Generally speaking, green bonds aim at financing the environmental projects of the issuers: companies, public entities or financial institutions. They can also be issued directly by project vehicles in which case they become green project bonds. Lastly, they can be used to refinance green loans by securitisation methods; in this case they are issued by financial companies and referred to as green securitised bonds.

Green bonds first appeared in 2007 with the first issuance by the European Investment Bank of "Climate Awareness Bonds", followed a few months later by those of the World Bank. Originally, the main issuers were the multilateral public banks, who enjoy particularly good financial ratings. The market really took off in 2014 when issuances became diversified (local governments, companies and banks); $11 billion of green bonds were issued

in 2013, followed by $37 billion in 2014 and $42 billion in 2015.

In 2016, the market size doubled with $100 billion of green bonds issued. Even so, green bonds are a mere drop in the ocean of the $100 trillion global bond market.

Why Green Bonds?

Generally speaking, bonds are very attractive to investors, thanks to established risk/return profiles, substantial volumes, and standardisation, which keeps transaction costs low. For borrowers, there are also advantages to replacing bank loans, which have become more scarce and costly following the 2008 financial crisis, and the introduction of the Basel III standards. Furthermore, bond financing is well suited to low-carbon transition projects, as they often require high investment upfront and then provide regular earnings – this is especially true of renewable energy. The fact is that green assets (such as renewable energy, energy efficiency, transport infrastructure, water and waste management…) are financed up to approximately 80% by loans.

The principle of green bonds is to have the same financial characteristics (rating and prices) as other bonds – plain vanilla bonds in the financial market jargon – from the same issuer. Furthermore, green bond issuers may expect to improve their reputation if they can prove that they are participating in the low-carbon transition of the economy.

Setting up a system of green bonds rather than conventional bonds means that the issuer can expand its traditional investor base. Investors are showing increasing interest in green bonds, which come with environmental benefits at no extra cost to them. The main buyers are responsible

investors who integrate environmental, social and governance criteria into their investment choices. Investors who seek to reduce the carbon footprint of their portfolios are also targeted buyers but, with the advent of the portfolio carbon risk concept, all investors should be potential buyers.

Investors are increasingly interested in this asset class, as evidenced by the large number of "over-subscribed" green bond issuances, for which demand far exceeds available volume.

How Do we Know Whether a Bond Is Really Green?

There is no official standard for authenticating a bond as being green. On the market, there is a wide diversity of more or less green bonds, related to their actual environmental impact (known as "fifty shades of green"). For this reason, in a developing market, with increasingly diverse issuers and more demanding investors, a need has started to appear for transparency and understanding of this new market. Several initiatives are attempting to address the issue.

The Green Bond Principles: Increasing Transparency

The publication of the Green Bond Principles (GBP) in 2014, followed by new versions in 2015 and 2016, provided an initial response to the need for market integrity. In fact, the Principles did not propose an accurate definition of the green nature of the products. Above all, what they did was to establish rules for transparency that the issuers could voluntarily choose to abide by.

The GBP include a non-comprehensive list of the major areas that may underpin green bonds: renewable energy, energy efficiency, sustainable waste management, agriculture, forestry and water, the preservation of biodiversity and adaptation to climate change. They also set down the guidelines for selecting the projects to be financed, in particular by encouraging their evaluation by an outside consultant when they are issued. The issuers generally call upon auditors (KPMG, PWC, EY…) or specialised companies like Cicero, Southpole, Sustainalytics or Vigeo Eiris. They can also commit to finance assets certified by specialised labels (for instance, for real estate, the LEED label for energy and environmental performance). To guarantee that the collected funds are assigned to green projects, the GBPs encourage issuers to establish specific accounting and project portfolios within their accounts. Annual reporting on financed projects and their expected environmental benefits is recommended, featuring qualitative performance indicators and, wherever possible, quantitative impact indicators (such as carbon emission reductions).

The Green Bond Principles recommend independent auditing of compliance with its principles by the issuer. In this way, each investor is given precise information about the product and can check whether it is in line with desired financial and environmental criteria. These principles are now widely adopted by market players.

The Climate Bond Standard: A Label in the World of Green Investment

Taking a step further toward market transparency and credibility, the Climate Bond Initiative NGO established a climate bond standard in 2015, certifying the green nature of an issuance. The standard sets accurate eligibility criteria by activity area (e.g. solar, wind power projects, low-carbon buildings, bus rapid transit…). It also certifies that the issuer has followed principles which are very close to the recommendations made by the Green Bond Principles.

The Market Today: The Foretold Arrival of Emerging Countries

Green bond issuances amounted to $41.8 billion in 2015 and $80 billion in 2016. There was evidence that issuers were diversifying, with an increasing share consisting of companies, playing on an equal footing with the development banks, followed by subnational authorities, banks, and an emerging share of securitized assets. The sectors financed were renewable energy, energy efficiency in buildings and industry, transport, water, waste management and pollution, agriculture and forestry, and adaptation to climate change.

In 2015, Europe and the United States were still leading the green bond market with newcomers to the market, in particular the emerging countries: China, India, Brazil and Mexico. But in 2016, Chinese issuances accounted for one half of the total. For emerging countries, two main areas are at stake. Green bonds help to finance their considerable development needs and those of the energy and environ-

mental transition. But they also allow to extend and consolidate national capital markets to reduce dependency on bank loans and on the international markets[24].

How Can the Green Bond Market Be Developed?

Increasing the Number of Issuers

Development banks and public banks have played an essential role in creating the green bonds market by fostering product awareness and liquidity, and by arousing interest among investors. Although company issuances represent a particularly high development potential, those of public issuers (especially subnational authorities) do too: they are powerful players in the low-carbon transition and must not be underestimated.

To date, only the prosperous cities or regions in the United States or Europe have issued green bonds based on their very high quality signature. In consideration of the worldwide share of cities' climate related investments the trend will hopefully spread. For municipalities with insufficient solvency and size to issue their own bonds, several solutions can be considered. For instance, banks can securitize loans granted to finance low-carbon local projects (which would continue to be flagged as underlying assets through the issued bonds), and market them in the form of green bonds. Alternatively, the value of municipal issuances can be enhanced by public guarantee funds (such as the Green Climate Fund), in the search for optimal leverage.

24. See the example of China developed in chapter 5, p. 195.

But this development is partially impeded by the lack of solvency among many cities across the world and even more so by national regulations limiting their direct access to credit, even for those that are sufficiently solvent. The reasons for this are often purely political: many governments are reticent when it comes to decentralising finance, which could strengthen the power of its opponents. Most of the multilateral banks have prohibited direct credits being granted to subnational governments, under the influence of boards consisting of government representatives. Among the bilateral development banks, only the Agence Française de Développement grants direct loans to local governments in the developing or emerging countries.

Nevertheless, for cities to issue green bonds could be an opportunity to accelerate global financial decentralisation. It would be a meaningful way of aligning with the thought process behind the territorial part of the "Action Agenda". Most projects actually have to be designed at subnational level and should thus be financed on that scale. This would highlight the driving role played by local governments in the process of transition, a role that directly involves their duties toward their populations. In fact, and perhaps regrettably, a head of State or of government has never yet lost his/her grip on power for environmental reasons; however, a mayor can lose elections on a public transport or waste management issue.

Is sovereign green debt going to foster the green bonds market? Governments issuance of sovereign green bonds is a desirable way of financing the public investment program related to their climate policies. But it comes up against traditional national budget rules (rule covering the non-dedication of revenues) and the diversity of the goals as-

signed to public debt. At the end of 2016, a few states launched a sort of race to become the first ever "sovereign green bond issuer": France, Sweden, Nigeria, Italy… It is a logical way to finance NDCs, and 40 % of the global bond market is represented by sovereign debt. Poland won the race. A real surprise if we think back to its reliance on coal, and its reluctance to support the European climate policy. Was this issuance a political signal of transition for the Polish economy or an attempt to hide increased investment in fossil fuel projects? In January 2017, The French government issued €7 billion 22-year green bond. Apart from its long-term and big amount, providing a high degree of liquidity in the market, it is one of the few green bonds to date that will finance intangible assets such as R&D among other proceeds.

Finally, on the geographic level, the future volume of green bonds appears to be playing out in Asia: China and India are setting up pro-active frameworks for massive schemes to develop green bond financing for their climate and energy policies. The national standards established by both countries have taken much inspiration from the Green Bond Principles. These countries intend to make green bonds a privileged tool to attract foreign capital, which will be beneficial to their low-carbon transition and to the development of their financial marketplaces.

Specifying and Harmonising Green Bond Impact Measurement

Among the players and market observers, debates have been initiated regarding the real contribution of green bonds to the low-carbon transition. Some believe that this contribution can only be confirmed if they finance new projects. This would rule out issuances, especially by the

banks, aimed at refinancing existing assets. This opinion is open for discussion since the bonds refinancing loans for assets with definite environmental integrity would enable the issuers to free up capital for new projects. Having that possibility is essential to banks and borrowers because the certainty of being able to refinance can lead to reduced credit costs upfront.

This brings us more generally to the requirement for additionality that some observers demand of green bonds. The additionality of a facility means that without it, financing would not go through. By nature, green bonds are not additional because the assets they finance could equally well have been financed by conventional bonds.

There have also been challenges to the possibility of issuing green bonds to finance green investments made by companies contributing enormously to climate change, in the fossil fuel sector in particular. But if their green bonds comply with the principles of integrity and transparency accepted by the market, what is there to criticize? These companies cannot be expected to begin their low-carbon transition and, at the same time, be denied the tools to finance it. As CBI often states "Green bonds are about green assets, not green entities." Observers should rather focus their vigilance on the compatibility of these companies' strategies with the 2°C target.

However, the matter of measuring the real impact of green bonds is important: avoided carbon emissions energy saved, water quality... At present, few issuers are capable of supplying quantified information to their investors. Which is why the EIB, with the other multilateral banks, developed a method known as the "IFI Framework on Impact Reporting Harmonisation", which may be used as

a model for other issuers. The Green Bond Principles have endorsed the method which promotes harmonisation and therefore comparability of the data that is so important for market development.

A difficulty arises from the complexity of this reporting process, which makes it unaffordable for some corporate issuers. In its 2016 report entitled "Green Bonds Must Keep the Green Promise!" WWF, the environmental NGO, and a serious observer of finance, considers that only bonds that can measurably demonstrate real environmental benefits are worthy of being called green bonds.

Favouring Green Bonds to Accelerate the Transition

As tools for the confirmed financing of low-carbon assets, green bonds are definitely helping to make capital greener. But it is important not to misinterpret the role they play in this transition: the term "green" represents only the additional piece of information supplied by issuers to investors. This "green" information increases investor demand but is not enough to increase supply, which would imply facilitating green projects and therefore the transformation of the real economy.

Market development is coming up against barriers essentially related to project financing costs. Public support for green bonds could therefore help lift these barriers for projects whose yields are otherwise less attractive than those of the bond market in general. Whether such support is appropriate should be assessed with respect to other public structures that might support the financed assets (for instance, when renewable energy has already been granted feed-in tariffs).

How should such support be provided? On a fast developing market where demand exceeds supply by far, it is not clear why governments would choose to grant a fiscal advantage to buyers. Conversely, on the supply side, green bond enhancement through guarantees or insurance would improve their risk-return ratio. Green bonds could thus become a way to reduce capital costs and add to the attraction of certain projects or programmes. Similarly, tax relief on the issuers could work in favour of green bonds. Lastly central banks, in line with their asset purchasing policies (quantitative easing), could privilege them and reduce project refinancing costs.

Increasing the Number of Projects Liable to Be Financed by Green Bonds

Many low-carbon transition projects, especially in the areas of energy efficiency or small renewable installations, are not attractive to investors because of their small size. These scattered sectors are essentially financed by bank loans. But it would be possible to create project or loans aggregation vehicles to refinance through green bonds. Securitisation has been getting bad press since the subprime crisis. This technique consists in the refinancing of assets (essentially loan portfolios) by issuing bonds, and is nothing to be feared in itself; what is important is the quality of the underlying assets. "Green securitisation" could well be an opportunity to clear its reputation.

Distributing Market Tools

To improve the liquidity and transparency of this market, several stock exchanges have launched dedicated listing segments.

• In this way, LuxSE, the Luxembourg stock exchange, offers listing for more than 100 green bonds, from 20 or so issuers, in 20 different currencies.

The listing comes with information about the environmental integrity of the products. In September 2016, it launched the Luxembourg Green Exchange (LGX), a platform that requires green securities to adhere to strict eligibility criteria, such as disclosure of the use of proceeds and ex-ante as well as ex-post reporting.

Several green bond indices were also launched recently, such as Barclays-MSCI Green Bond Index, based on alignment with the Green Bond Principles, but comprising stricter eligibility criteria. Then in 2016 Moody's initiated a green evaluation methodology, the Green Bond Assessment, based on its own array of qualitative criteria. It was followed in 2017 by S&P which created a Green Evaluation Tool.

Reducing the Cost of Green Issuances

As mentioned, green bonds can be a powerful tool in favour of the low-carbon transition, thanks to their inherent simplicity and to the ease with which they can be included in portfolios. But behind the issue of "what is green", something the market has had concerns about from the beginning, lies the actual "cost" of the qualifier. Issuers want to limit the cost of project selection, reporting and impact measurement since their green issuances do not generally enjoy price advantages compared to their "conventional" issuances; as far as investors are concerned, they would like to have perfect green products without having to deal with their own analyses, that only big investors or asset managers familiar with RI are capable of handling.

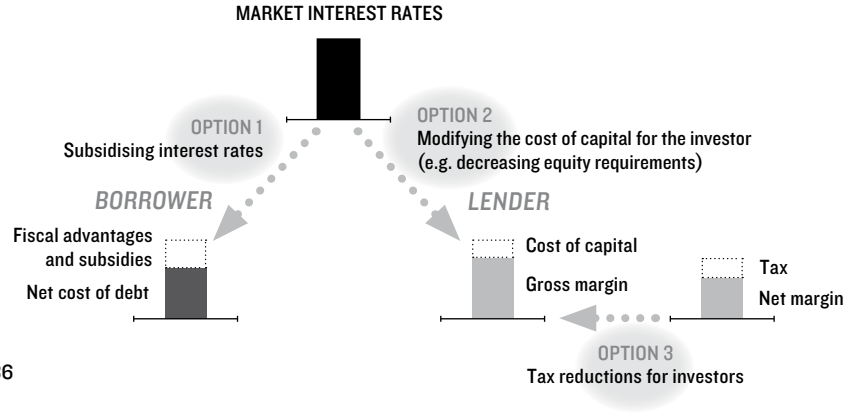
Creating widely recognised international labels and standards should reduce the cost of information about green bonds. But the need for a single global label is not recognized by all: to meet the various needs of investors, what they really need is a standardised assessment method.

Recent issuances seem to demonstrate that investors were ready to buy green bonds at slightly lower rates than their equivalent "non-green" counterparts, against high environmental quality. The trend has yet to be confirmed. Barclays Research considers this development to be plausible in a context of increasing attention to carbon risks by investors, since all the information supplied by green bonds would reduce the asymmetry of information about the carbon risk of assets.

Under these conditions, in the short to medium term, only the market advantages offered by public measures could turn green bonds into real tools to accelerate the low-carbon transition.

An I4CE study "Beyond Transparency: Unlocking the Full Potential of Green Bonds" established a typology:

POLICY OPTIONS TO REDUCE THE NET COST OF BORROWED CAPITAL
FOR THE BORROWER OF A PROJECT WITH AN ESTABLISHED RISK PROFILE



Note: Borrower's objective is to minimize its net cost of capital while lender's objective is to maximize its net margin. Options 2 and 3 will tend to reduce the market interest rate (provided the effect is not limited to increasing the net margin of the lender) while option 1 does not modify the market interest rate.

Source: I4CE

Making Green Bonds the Bond Market Standard

CBI (Climate Bonds Initiative) considers that the potential market for certifiable bonds is approximately $700 billion per annum, including more than $100 billion labelled green bonds. According to its managing director, Sean Kidney – a creative militant for green bond development – it will take a yearly volume of $300 billion in issuances for the transformation effect to begin to be felt on the bond market. What effect can be expected?

His thinking is as follows. It is almost accepted by now that to access the capital held by those investors most committed to the climate finance movement, it will be necessary to feed their appetite for green investments, which obviously need to be profitable. Green bonds are the most appropriate vehicle for that exchange. Some investors have already decided to replace ordinary asset lines in their portfolios by green bonds from the same issuers. If tomorrow the movement is backed by most of the institutional entities managing a colossal share of global savings[25], green bonds will simply become the required market standard. Furthermore, if green bonds alone fail to reduce the cost of capital needed for these investments, their development

25. Pension funds, insurance companies, investment funds, sovereign wealth funds and reserve funds of the OECD countries manage $100 trillion.

could eventually increase that cost for investments which are not in line with the transition.

But what projects are the green bonds going to finance? Infrastructure projects of course, but also a wide variety of small projects.

Infrastructure Financing and Project Finance

Infrastructure choices will be critical for the success of a global transition respecting the 2°C target. Because of their very long lifespan, they play a determining part in placing or not placing economies on a low-carbon and climate-resilient, in such areas as transport, energy, water and communications.

There is a huge need for new infrastructure, especially in the emerging and developing countries: the New Climate Economy assessed the investment requirement at $6 trillion per annum on average over the next 15 years. It will have to be fulfilled without replicating Western models of the 20th century, to the extent possible.

The New Climate Economy believes the topic to be so important that it dedicated its 2016 report to infrastructure: "*The challenge is urgent. The window for making the right choices is uncomfortably narrow because of lock-in of capital and technology and because of a shrinking carbon budget.*" Barriers must be tackled, the report insists, to raise the quantity and the quality of infrastructure investment: "*suppress price distortions, strengthen policy frameworks and institutional capacities, accelerate the greening of the financial system and ramp up investments in clean technology R&D and deployment*". Accordingly,

it calls on governments to implement relevant public policies and on public financial institutions to double their investments in sustainable infrastructure as quickly as is feasible.

The development of telecommunications on the African continent, which bypassed the construction of costly centralised networks, should be an inspiration to the development of renewable energy sources on the continent. It is in this area that the transfer of capital from the North will be most needed.

Conversely, in a developed world that is already well equipped, or even very well so, Western Europe has the densest infrastructure network of all sorts in the world.

The priority should be to focus more on servicing, renovating and adapting existing infrastructure to intensify their usage and improve their resilience, making massive use of digital technologies.

In any case, new infrastructure projects (known as greenfield infrastructure in financial circles) or existing (brownfield) infrastructure require special treatment from the financial standpoint. This is especially true since infrastructure projects take a long time to mature: it takes several years to plan, decide upon and build an electric power station or a piece of transport infrastructure. The choices made in the next few years will be crucial.

Traditionally, a lot of infrastructure is financed by the public sector (states, local governments, national public or development banks) because it provides essential services and generates benefits for society as a whole (positive externalities), or simply because it calls for very high initial investments. At present, there is a general lack of financing of infrastructure projects, due in particular to pressures on

public finance. The issue is therefore twofold: increasing the financing of infrastructure projects by private players and prioritizing those that contribute to the low-carbon climate-resilient transition.

Increasing the Private Financing of Infrastructure Projects

Bringing in private financing for infrastructure is considered increasingly desirable, either through public-private partnerships, or through liberalisation in the sectors concerned.

Public-private partnerships (PPP) allow public entities to entrust a private operator with the task of building and managing public infrastructure for a long period under a contract. The operator is compensated from the earnings generated by user payments for the services provided, by public financing when the infrastructure does not generate revenue, or by a combination of the two.

Introducing competition is another way to proceed. For instance, the European Union has opened the energy sectors to competition, leading to free choice of suppliers for consumers, and freedom of establishment for producers who also enjoy equal access to the grids. The growth of renewable energy plays a part in this context, resulting in the appearance of a great variety of producers. 90% of existing renewable energy production infrastructure relies on project finance.

Project Finance

Infrastructure is characterised by distant financing horizons, capital intensiveness and the significant time lag often

observed between the cash flow it generates and initial investments. Because it is well adjusted to these characteristics, project finance constitutes the privileged infrastructure financing method for various partners to participate, through contributions that are adapted according to their various risk-taking capabilities.

The techniques involved seek to obtain leverage by attracting large amounts of debt. They consist in creating ad hoc financing structures (special purpose vehicles) grouping various project partners and public or private financiers. The structure is characterised by a debt factor representing between 70 and 90% of the financing, leaving an equity share ranging between 10 and 30%. By creating various financing tranches, the risks and rewards can be shared between partners: senior debt (reimbursed as a priority in case of difficulties); so-called junior debt, mezzanine or subordinated debt (reimbursed after senior debt with better remuneration); and finally, equity. The debt can take the form of bank loans and/or project bonds.

Financing such as this also aims at attracting long-term investors toward infrastructure financing. In theory, this type of asset should be attractive to them in many ways: the very long lifespan of infrastructure assets corresponds closely to their long-term commitments, and infrastructure projects often generate reliable and regular income streams that are protected from inflation and can become rents once the initial investment has been amortised. This is very much the case for renewable energy which generally has very low operating costs. For all these reasons, infrastructure is kept separate from other asset classes, shares and bonds, and is seen as a way of diversifying and reducing portfolio risks.

But infrastructure currently represents a small overall share of the portfolios held by institutional investors, amounting to only 1% globally. They are discouraged by various risks: long durations and high development costs, uncertainties around public intervention in the case of PPPs, project complexity which can be a source of opacity... Only the very large long-term investors have the necessary skills to invest directly into infrastructure projects. That is why infrastructure funds are created to address the needs of less skilled investors. These funds can be specialised by nature of assets and risks (equity, senior or mezzanine debt) or by sector (transport, renewable energy, water).

Financing Low Carbon and Resilient Infrastructure

To analyse infrastructure projects with respect to their impact on climate, one particularly relevant approach is life-cycle analysis. It consists in assessing the impact of infrastructure on carbon emissions, from its construction to its dismantling, and of course during operation. Projects should in addition be assessed with respect to physical risks related to climate change.

COP21 was undoubtedly a decisive event for the adequacy of infrastructure choices with respect to the transition. Most countries developing their national contribution (NDC) are likely to transpose them into national policies, and to break them down into investment programmes for low-carbon resilient infrastructure. Some of these choices will play a determining role, especially in the emerging and developing countries: motorways or railways? Coal or renewable energy? Urban sprawl or dense cities? etc. COP21 was an opportunity for several initiatives by fi-

nancial players to prompt dialogue between public authorities and investors, to create a favourable environment and investment opportunities. In particular, this was the case of the Green Infrastructure Investment Coalition launched by the PRI, the Climate Bond Initiative, the International Cooperative and Mutual Insurance Federation (ICMIF) and the UNEP Inquiry.

To facilitate the financing of these infrastructure projects, public authorities are in a position to reduce risks to private financiers by undertaking different types of actions: defining a low-carbon transition roadmap and a project pipeline to be financed; setting up a legal and regulatory environment that is stable and transparent as regards the projects; taking up the riskier part of the financing, offering guarantees or insurance and even having the projects benefit from subsidies or tax advantages (this is the previously mentioned leverage effect). Large projects also entail high development costs, in particular technical, legal and financial feasibility investigations that are difficult to absorb into the future income of the infrastructure. These upfront costs can be covered in the form of public subsidies.

Thanks to their previous experience of financing large infrastructure, national public banks and development banks, traditionally deeply involved in project finance, have the power to influence investment choices. Many of them have also adopted ambitious guidelines with respect to climate-friendly financing. They are also best placed to take on the more significant risks of the projects or to create conditions that will reduce the risks facing the other partners. They may also bear the initial extra costs of the adaptation measures that will make the infrastructure less vulnerable to climate change.

Private banks involved in arranging or lending activities in project finance may join the Equator Principles, a tool to guide them in managing the environmental and social risks of projects in emerging and developing countries. These principles have been adopted by ninety-two banks and cover 70% of worldwide project financing. They offer a minimal guarantee that the interests of local populations are respected. They also cover environmental impact assessment, including carbon emissions, and foresee an analysis of less emission-intensive alternatives; this constitutes a bare minimum. The increasing share of project bonds in project financing also opens the way for low-carbon projects to issue green project bonds which, as mentioned previously, could meet the needs of investors.

New tools are appearing to make green investments attractive by enhancing their liquidity and regular profitability. YieldCos for example are listed on the stock exchange, and founded by renewable energy operators to hold portfolios of assets that are already operational. In this way, they promise to generate high and regular dividends for investors, while freeing up capital to enable operators to reinvest in the development of new projects. YieldCos were developed more extensively in the United States and in the United Kingdom over the last two years. They recently experienced downfalls on the stock market. In North America this was mainly due to excessively high yield requirements. In the UK, the main reason was the instability of public policy in support for renewable energy.

Rating Agencies: Borrower Solvency not yet Affected by Climate Risk

Ratings based on solvency are assigned by the agencies to debt-issuing companies and countries. Each agency has its own grading system ranging from AAA for the more dependable issues to C considered as speculative, and even D for those that are very likely to default. These ratings are essential for the borrowers because they determine the interest rate to which they may be entitled, and therefore their cost of capital. For investors, they are powerful decision making tools. In a nutshell, ratings from A to B are considered to be "investment grade", i.e. suitable for purchase by institutional investors.

For the last few years, the biggest rating agencies (Standard and Poors, Moody's) have been focusing on the new risks related to climate change without really knowing how to deal with the issue: their rating methods assess issuer solvency prospects on a 5-year horizon only, and are poorly suited to the introduction of climate-related criteria. Furthermore, the "climate-related" factors used to assess the solidity of issuers can vary enormously, from regulation through to risks of climate events. Their very nature can also in one of three categories, in line with the typology defined by the Bank of England: physical risks, transition risks, litigation risks.

For the time being, the approach has been to publish reports, which allows them to use a more qualitative approach. Even so, none have yet been able to integrate risks related to the climate into their ratings.

The positive results of COP21 provided an opportunity for each of them to publicly affirm the reality of the risk.

They are beginning to include the physical risk dimension in the insurance sector but also the transitional risk aspect for some high carbon emitting sectors, starting by identifying stranded assets: unregulated electricity generation, coal mines, coal port terminals for instance. To be continued.

Financing Green Growth and Innovation

The assets for the low-carbon transition are essentially financed in the form of debt. Nevertheless, equity continues to be essential for some of the projects, but also for emerging companies and new technologies.

Investment by private equity brings in capital to new companies in their growth phase, from the early project stage (venture capital) through to development, often preceding listing on the stock exchange. Venture capital, used to finance innovative companies with a strong development potential, is the preferred financing method for cleantechs. Specialised private equity funds have appeared and multiplied over the last ten years.

Many of the low-carbon transition technologies are already mature, even competitive in some parts of the world. Nevertheless, there are huge areas of possible innovation in the cleantech field: solar energy, smart grids, energy efficiency in industry, but also sustainable urban management, circular economy, eco-mobility, etc.

And other branches are beginning to move on from research and development to commercial operations: offshore wind farms, marine energy, biogas, renewable energy storage... What is more, the continuous reduction in the costs and the increasing quality of technologies over the last few years remain important in terms of their wides-

pread dissemination, in particular in developing countries. Deploying these technologies presupposes a multiplication in the numbers of new players, project developers and sponsors, who will require seed capital input that conventional banks or financial markets do not like to finance. Last but not least, several countries are considering low-carbon transition sectors as new driving forces for the growth of their economies, based on innovation and high added value factors, and offering export perspectives. This is particularly the case in the European countries.

In this area, the challenge is to develop a positive interaction between public policies and private equity players. Public policies can act to support research, to guarantee favourable and stable legislative and regulatory environments, and to support exports with financing solutions. Public finance institutions, like the EIB, can support private equity in the form of funds of funds, both to support specialised management teams and to catalyse the input of private capital.

In the developing and emerging countries, because knowledge of the sector is essential to be able to finance it, the creation of specialised investment management teams represents an additional issue.

Crowdfunding, Third-Party Financing and Microfinance: Alternative Financing?

The novelty of the climate challenge and the relative inability of the conventional financial system to get to grips with it have driven the search for alternative financing methods for the low-carbon transition.

Third-Party Financing

The internal rate of return (IRR) is a tool for measuring the expected profitability of projects. The IRR of energy efficiency investments is based on the energy savings cash flow they generate making it theoretically possible (although this depends on many parameters starting with the prices of avoided energy consumption), for the owner of an asset to entrust it to a third party who would deal with financing the investment and would be compensated from the actual savings. This is referred to as third-party financing.

In industry, as in the part of the tertiary sector where the return on investment can be rapid (such as investments in the food refrigeration chain in mass retail), this type of financial set-up can lead a company to consume neither its equity nor its debt capacity for energy efficiency investments which are not its core business. Many alternatives to such operations have been developed worldwide in the favourable context caused by high oil prices. Energy Service Companies (ESCOs) were developed for that purpose.

But the ESCO model is more difficult to set up in the building sector, and especially for housing, for many reasons.

The first is that the strictly financial yield coming from energy retrofitting in buildings is often low, especially for deep renovations. In addition, it is difficult to force the occupants of a building, and all the more so a housing unit, to adopt the strict behaviours (like closing windows) required for the energy savings to materialize to the extent promised by the investments made. Third-party financing

of energy efficiency retrofits in buildings is still seeking to make headway, and its future will depend above all on industrialisation and a reduction in the cost of the works themselves.

Crowdfunding

Crowdfunding makes it possible for individuals, using Internet platforms, to fund the projects they want through a donation, a loan or an investment, outside the traditional savings and funding circuits. Its use is growing in the world of low-carbon transition financing. Climate-related projects now represent 35% of the projects attempting to raise funds among the public. Extending beyond simple funding issues, crowdfunding offers other advantages too: individuals can participate in the financing of locally meaningful projects and feel involved.

In Germany, 50% of renewable energy projects are financed by cooperatives, through individual contributions. And this method can be combined with equity, bank financing and even conventional project finance.

Microfinance

Microfinance offers financial services to people who do not have access to conventional banking circuits. Above all, it targets economic and social goals by mobilising available finance tools: microcredit, microsavings, microinsurance, microleasing. Its strong point is its ability to mobilise local savings. In developing countries, it can be a major factor for low-carbon transition in several areas: the financing of sustainable agriculture among small producers, the

installation of renewable energy production sites by small and medium-sized companies, off-grid local projects, etc. The challenge is to increase microfinance institutions' expertise in climate-related technologies and to reconcile the economic, social and environmental impacts of finance in an inclusive approach.

In developed countries, microfinance is well suited to the financing of the fight against fuel poverty.

The biggest challenge arises from the cost of microfinance, especially the interest rates which are increased by the higher costs of solvency analysis, of individual support and of management expertise than those of conventional bank networks. Mobile technologies could be put to good use to reduce the costs of access to financial services.

Public development aid which traditionally was substantially turned towards Government support, is now seeking to focus directly on these local initiatives through programs that come closer to the reality in the field.

There are many advantages to these financing methods, which primarily stimulate conventional financial circuits. But we believe that they are more complementary than they are alternative.

Financial creativity over the last few years has shown that financial players can facilitate the low-carbon transition. What was possible has become essential with the perspectives opened by COP21.

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CHAPTER 4

FINANCE GETS IN ON THE CLIMATE NEGOTIATIONS

In the two years prior to COP 21, a series of announcements, events, pieces of work and public positions in the financial sector radically changed the status granted to the climate issue in the financial industry mindset. Narrative.

The UNEP Inquiry into the Design of a Sustainable Financial System

The word "sustainable" does not mean the same thing to all in the world of finance. To the traditional majority, sustainable means being able to resist systemic shocks and risks. The need to increase this resilience appeared to be more relevant than ever after the 2008 financial crisis. Through the RI prism, sustainable financing means allowing for sustainable development factors (that is, not just economic but also social and environmental) in financial decisions. The stroke of genius of the UN Environment Program, UNEP, is to have understood that the two issues needed to be connected and to have demonstrated, for instance, that the goal of greening financial systems could become part of regulatory duties. Starting in 2014, UNEP entrusted to a small team of economists and financiers the task of conducting an enormous survey, the "UNEP Inquiry into the Design of a Sustainable Financial System". The Inquiry's scope of work was to explore the means of aligning the financial system with the Sustainable

Development Goals, and especially with the contribution to a transition to a green and low-carbon economy. The project lasted two years and handed in its conclusions in October 2015, just before the global Summit on Sustainable Development Goals and the COP 21 climate meetings.

The Inquiry studied the financial systems in the main countries of the world, focusing in each case on monetary and financial policies, on standards and transparency obligations, on ratings, indices etc. It looked at the role played by the financial authorities: central banks, regulators, ministries, stock exchanges… It also went into transversal topics such as green bonds and even digital banking and finance, indicating a set of good practices and a series of recommendations.

A Quiet Revolution in Financial Systems

The Inquiry was particularly on the lookout for innovative experiences worldwide. It identified what it called a "quiet revolution". One hundred or so good practices were selected which, in the emerging and developing countries, were aimed at bolstering economic development and facilitating environmental priorities and, in the developed countries, focused on a quest for market efficiency and stability. Contrary to all expectations, its primary discovery was that innovations and financial creativity were found much more often in the emerging countries than in the developed world. An inspiration!

These innovations were put into five categories by the Inquiry:

• Enhancing market practice: for instance, in South Africa, the Johannesburg Stock Exchange requires listed companies to supply extra-financial and sustainable development information. The Inquiry considers that market practices, such as the dissemination of information, ratings or indices are relevant but secure only modest effects on their own.

• Harnessing the public balance sheet: in the United States, investment into municipal bonds used to finance sustainable infrastructure or renewable energy is granted tax relief. Fiscal incentives of this type are probably effective but their limits are due to their reliance on public finances.

• Policy-directed performance: the Bangladesh Central Bank, for instance, offers favourable refinancing conditions to "green" loans made by the banks. According to the Inquiry, the orientation of credit and monetary policies is probably efficient but could have unexpected consequences on the financing of the economy.

• Encouraging cultural transformation: in Indonesia, the roadmap towards sustainable finance includes a programme to increase the skills of the finance professionals. This line of training, capacity development and knowledge sharing is underused everywhere but is considered indispensable to facilitate the implementation of policy orientations.

• Upgrading governance architecture: the Inquiry described and documented the initiative underway at the time, driven by the Bank of England, the first central bank to have integrated climate change into its prudential supervision of the insurance sector.

The Central Bank of the fifth global economy made a breakthrough with this vision of the climate issue as a regulatory issue. This determining contribution will be described further in this chapter.

For a Systematic Approach to the Transformation of Finance

The good practices identified by the Inquiry, taken one by one, are unlikely to protect society from weaknesses in the financial system that enable mispricing, rent-taking and instability… But even so, they can serve to inspire more systematic vision and policies for the transformation of finance. Accordingly, the Inquiry also recommends linking the various approaches to adjust to the actual conditions in each country, so that financial systems develop towards more sustainable models.

The greatest success of the Inquiry lies in its capacity to mobilize: by surveying good practices, classifying them and drawing up recommendations that might serve as a basis for ambitious and realistic policies, it boosted awareness of the ability for the financial sector to direct the real economy; and it sped up the development of such policies worldwide. This decisive impulse could not just end with a report release. In early 2016, UNEP renewed the Inquiry's assignment to work more specifically on the implementation of innovative policies among the national institutions of several key countries for the low-carbon transition.

What Will the Norwegian Pension Fund Decide?

Meanwhile, in 2014 the small but international world of climate finance had its eyes on Norway: what would the climate policy of the world's biggest sovereign fund and third largest institutional investor turn out to be? The Government Pension Fund Global was founded in 1990, to accumulate the tax proceeds from national production of oil and gas and manage them in the long-term interest of the country. In 2014, the Fund was managing €900 billion of assets, invested into approximately 8,000 companies across the world. It is symbolic of Norway's wise wealth management: oil income contributions to the budget are capped and the balance is capitalised in the Fund whose investments aim at preparing the country's post-fossil fuel future.

The first certainty was that this climate policy would be the result of a democratic process. Under NGO pressure and as part of an open dialogue in Norwegian society with the institutions and public powers, the Fund adopted an ethical investment policy as early as 2004, setting an example for the world. In 2014, once again driven by NGO pressure, the parliamentary opposition urged the government to give some thought to the climate question. To do this, a group of experts, headed by the economist Martin Skancke, was appointed in April 2014 to assess whether the fund should or should not exclude coal and oil companies from its investment universe. The group of experts handed in its recommendation in December: yes, exclusion of the highest emitting companies was possible, but based on a case-by-case examination.

It also considered that the Fund should above all better assess the carbon risk of its portfolios and intensify its active shareholder policy.

One outstanding point: the expert group gave an economic response to an ethical question. The public report was open for consultation then examined by the Parliament. In the spring of 2015, the Norwegian Finance Minister announced the new sovereign fund policy: it would bring in an exclusion criterion based on carbon emissions. The Parliament approved the measure and the Fund immediately withdrew from the capital of 120 companies: mining companies but also electricity generating and cement producing firms, representing a total of US$9 to US$10 billion in investments according to the estimates. The biggest divestment from coal in the world! The decision encouraged major investors like Axa or la Caisse des Dépôts among others, who lost no more time in adopting a coal exclusion policy.

Chinese Financial Reforms

In 2015, the question of coal was also at the heart of economic and financial thinking in another country: China. At the beginning of the decade, the country was still considered to be an impediment to the low-carbon transition for three primary reasons:

– although it had become (probably by 2006) the world's biggest GHG emitter ahead even of the United States, it had only committed to reducing the carbon intensity of its growth;

– furthermore, the failure of the Copenhagen negotiations was considered to be essentially due to China, which brought its full weight to bear on kindling the opposition

between the developed countries, historically responsible for GHG emissions, and the emerging and developing countries, claiming their right to economic catch-up. This closed position was all the more unacceptable in that, since the 2009 Copenhagen conference, Chinese per capita emissions, and the accumulated stock of GHG in the atmosphere emitted from China, had reached European levels. Under these conditions, it was difficult for the leader of the G77 to continue demanding that rich countries bear the burden in the name of their historical responsibility. This excessively simplistic vision of "climate justice" (that of the Kyoto Protocol) was simply no longer tenable;

– finally, until the Chinese changed their position, there was no hope of the United States changing because this argument was (it still is, but now without any grounds) regularly brandished by the share of the American political class most actively preventing any progress in negotiations.

However, Chinese priorities were quietly changing. First of all there was a political change. Xi Jinping, who had been expected as early as 2010 to become the General Secretary of the Communist Party, finally became the President of the People's Republic in 2013, with a mandate to continue economic reforms. In parallel, China adopted its 12th five-year plan whereby it adopted the ambitious goal of changing the Chinese economy from a model based on overconsumption of energy and labour to a model based on capital and technology.

Soon after the 12th five-year plan (covering the 2011-2015 period) was adopted, Chinese authorities came to the alarming conclusion that the energy system presented major economic and social issues: increasing dependency on fossil fuel imports; levels of environmental damage that

were becoming difficult for people to live with, in particular air pollution in the cities; far higher energy intensity than global standards in large industrial sectors; lastly, uneven spatial distribution of energy infrastructure with some rural areas still not properly connected to electricity grids. While growth in China was still essentially fed by the overconsumption of coal, for the first time the 12th plan set gradual and relative goals for energy transition. It foresaw a reduction of the energy intensity of the economy, a reduction of coal intensity in growth and an increased share played by non-fossil fuels in the country's consumption.

The five-year energy plan published in 2013 confirmed these goals, establishing essentially a net energy consumption ceiling and a cap on coal production by 2015; quite a turnaround! To do this, China opted to put a price on carbon by establishing pilot emissions trading schemes in the seven major cities: Beijing, Chongqing, Guangdong, Hubei, Shanghai, Shenzhen and Tianjin. This system was to be the forerunner of the launch scheduled for 2017 of a national exchange system.

China's diplomatic positions concerning climate are changing in parallel, adding to the credibility of its internal energy transition policy. Its climate goals were announced jointly with those of the United States in November 2014 through a joint and spectacular declaration by President Barack Obama and President Xi Jinping, deeply underscoring the will of the two world powers to reach a climate agreement in an approach that would "take into consideration their national circumstances".

The national contribution of China was published in June 2015 and sets the peak of its GHG emissions at 2025 at the latest. In accepting such an emissions cap, and no longer a coal intensity coefficient for its growth, China recognised its liability as a major power and opened the way to a universal agreement while setting an example for the developing countries.

Financing the Chinese Transition

In preparing for the 13th five year plan (2016-2020), which made green growth one of its priorities, China was also examining the issue of financing its transition and the financial policies to be implemented to do so. Under the leadership of the central bank of China, the People's Bank of China (PBOC), a green finance committee was set up in 2014. This committee gathered the country's main banks and financial institutions and international experts.

As early as 2013, the UNEP Inquiry devoted a report to China, which was written with the participation and approval of its authorities, in particular the PBOC. The Inquiry estimated that the country would need to generate $600 billion per year in green investments and that at least 85% should come from the private sector.

On August 31st, 2016, a few days before the G20 summit, the PBOC, along with other Chinese governmental agencies published "Guidelines for Establishing the Green Financial System" in China. The Guidelines recommend the introduction of policy incentives such as relending operations by the central bank, guarantee programs, interest subsidies for green loans and the launching of green climate national and local funds. They stress the importance of the

green bond market and the need to unify green bond standards at the national level. Gradual introduction of mandatory environmental information disclosure for issuers is also recommended in order to better inform investor decisions.

With the growth of green finance, China has major potential for the development of its financial markets. Through its increasing influence on the international financial scene, it can also play a constructive role in developing green finance through its other initiatives such as the "Belt and Road Initiative", the New Development Bank and the Asian Infrastructure Investment Bank. In 2016, as the President of the G20, it headed a study group known as the Green Finance Study Group with the United Kingdom, to mobilise private capital for green investment.

To date, China is probably the only major world economy to have aligned its growth strategy, its contribution to climate change and its financial policies to this extent, at least in its planning exercises.

Generally speaking, Chinese leaders have now accepted that there is no hope for their country to enjoy a prosperous future without its system quickly becoming greener, and that this will require consistent management of its financial system. So the route has been mapped out... now it needs to be followed! But the scale of the project is definitely inspiring. If China can do it, the world can do it!

The Vision of the South

The Inquiry clearly demonstrated that emerging and developing countries concerned about the low-carbon transition make no bones about using very prescriptive ways to guide their financial system toward their policies: cre-

dit orientation in China, preferential loan rates in Brazil, green refinancing by the Central Bank in Bangladesh… Are these financial and monetary policies to be seen as innovative methods or old recipes from times gone by?

Since the 1980s, most of the developed countries have chosen to liberalise the financial markets, opening them to foreign capital and encouraging de-intermediation in the financing of their economy. They considered that the unfettered confrontation between supply and demand was the most efficient way of better allocating capital and directing the economy towards the best performing activities. However, with the issue of global warming, the matter of public policy steering finance has come back to the table. For the emerging countries, the question is above all one of efficiency: for instance, it is less difficult for Brazil to guide the flow of credit and control its banks than to regulate all the economic sectors and players to encourage improved energy efficiency or to ensure the adoption of sustainable agricultural methods.

The Inquiry has shed light on the content of the sustainable financial policies in many countries in the South: in addition to Bangladesh, Brazil and China, information was compiled on India, Kenya, Mexico and South Africa… Why the financial authorities of the Southern countries seem so unafraid of being unorthodox is open to discussion. The most orthodox and conservative financiers in the North see it as an illustration of the lesser maturity of the regulators, who have not been fully converted to putting their trust in market forces alone. The more pessimistic observers fear that in the name of climate, these public interventions are meant to benefit new circuits for corruption and the misappropriation of funds by banks faced with fragile balance sheets and opaque governance.

Although it does not deny these hazards, the Inquiry is betting on an attitude of pragmatic confidence in financial policies as long as they are directed towards sustainability goals. It shows that these policies may exert far more powerful leverage than the traditional subsidisation or concessional[26] financing policies. But what is most interesting is that this work also provided support to the financial authorities of those developing countries most convinced of the need to adopt a carbon-free sustainable growth model, and converting it into an endogenous development lever by first mobilising their own resources. Last but not least, the three reports on Bangladesh, China and the United Kingdom led the Inquiry to contribute enormously to bringing the central banks, a category of players who had thus far been particularly quiet on the subject, to the climate finance debate.

The Debate on the Role of Central Banks and the IMF

The central banks have a twofold role to play in contemporary economies: as the final lenders, they control and guide the monetary creation process; most of them are also supervisors of the financial system, directly or indirectly, ensuring compliance with the prudential rules that they help design and adjust.

As far as we know, only the central bank of Bangladesh is using the monetary policy lever to benefit climate by granting banks green loans with privileged repayment conditions. Why do the other central banks not use these

26. Financing benefitting from rates below those of the market.

tools to promote lending to the green economy? The idea is a taboo to the more orthodox among them, and has been the subject of several investigations and proposals since 2010. These proposals were investigated and summarised in 2014 by the I4CE think tank under the acronym "Sumo" (Smart Unconventional Monetary Policies). Three categories were observed: the use of Special Drawing Rights (SDR) issued by the International Monetary Fund (IMF); green quantitative easing; and the issuance of carbon certificates.

At this stage, we will only go into details of the investigation note entitled "A Proposal to Finance Low Carbon Investment in Europe"[27]. Its level of ambition leads to a better understanding what could be at stake with "Sumo" policies, regardless of how convinced one might be about its feasibility.

The note starts by observing that it is difficult to set a carbon price at a level high enough to direct investments toward an economic model emitting less GHGs. The observation holds regardless whether prices are determined by taxation or by an emissions trading scheme. It goes on to underscore the reticence of banks to finance low-carbon investments, due to their technological risks, uncertainties regarding their novelty and the lower internal rates of return of the projects – the latter being caused in particular by the lack of a sufficient carbon price level.

27. Published by France Stratégie in early 2015, it is signed by Michel Aglietta, Etienne Espagne and Baptiste Perrissin-Fabert.

An Example of Sumo

The proposal is to set up a financial intermediation mechanism guaranteed by the value of carbon. It works like this: first of all, the Government determines a social cost on carbon, which is neither a tax nor a market price but a theoretical reference price for measuring the value attributed to each tonne of carbon avoided. Essentially, it is a measurement and steering tool applicable to every economic activity and to new investments. In parallel, for a given period of time the Government commits to guarantee an amount of low-carbon investment, mostly private, consistent with what is needed for the national transition, up to the social value of the carbon emissions avoided by these investments. An independent body is in charge of measuring and certifying the contribution of each project to carbon emissions reduction, and of delivering "carbon certificates" (based on this measurement and on the social value of carbon).

These certificates become new assets, like the UN carbon credits created as part of the Kyoto Protocol (see chapter 2). The internal rate of return of the low-carbon projects is improved by the certificates and the banks deduct them from the reimbursement due by borrowers because the central bank guarantees banks for the corresponding liquidity. And at any time, the central bank can call the Government's guarantee for the carbon certificates in its balance sheet. The Government then pays up the corresponding debt by issuing long-term green bonds.

The advantage of this proposal is that it takes many elements into consideration. It accelerates the rise in the price of carbon by injecting it directly into the financial

sphere thanks to the social value of carbon (Governments are actually incentivized to bring the real price of carbon to the social value they have set on it, to reduce the cost of their guarantee and the additional public debt it generates). The proposal makes use of the experience gained with UN credits for the certification of avoided emissions. It assigns a critical role to private investment and to the banks, while reserving the creation of "green currency" for the central bank, and limiting it to the support of new projects only.

The proposal appears to be very difficult to implement however, at least in the European context. It amounts to bringing a new category of assets into the ECB's balance sheet, which could actually be analysed as new accounts receivable from the Member States, since the guarantee alone gives value to the certificates. Overall, this would be equivalent to financing their deficit directly by the Central Bank, without going through the secondary market, as is henceforward the case with the latest developments in quantitative easing.

Other Options Are Being Explored

Similar proposals have been made for using IMF tools on the international scale. The idea was to allow the developed countries to use the Special Drawing Rights (SDRs), a sort of international currency issued by the IMF, to cover part of the promised $100 billion of North South transfers[28]. By lending part of the SDRs they hold, for instance to the Green Climate Fund, developed countries would

28. See chapter 1, p. 23.

be able to allocate financing to development without needing to use internal budgetary resources. The meeting point between these two ideas is using a central bank, in this case the IMF[29] in its capacity as a "final lender", as an intermediary for issuing an additional public debt piece (justified by the avoided emissions value).

The third idea, "green" quantitative easing, might be more easily accepted with respect to a policy of public debt control. It would involve a commitment by a central bank to buy securities funding low-carbon assets (like green bonds or targeted bank loans). In a nutshell, the assets used for the low-carbon transition would be counterparts to the money supply privileged by highly favourable refinancing conditions.

The first point made by opponents to this type of measure is the risk of generating a "green bubble": if monetary creation is directed towards assets that are still rare, their price is liable to rise quickly and with no relation to their economic value. The second point is more ideological, and results from a refusal in principle (on the part of most European regulators) of a return to credit selectivity, judged to be less efficient than purely market-driven capital allocation to the economy. One could object however that in 2014 the ECB instituted Targeted Longer-Term Refinancing Operations (TLTRO), in particular for the SMEs, thus showing that it is not necessarily entirely reluctant to privilege certain assets.

29. Since 2013, the IMF has launched multiple pieces of work and taken positions in favour of climate. In particular, it is investigating fiscal, financial and macroeconomic issues related to the low-carbon transition. All its meetings (Spring meetings and annual general assemblies) now include generous coverage of the matter.

The idea came up in 2014-2015, in a context of high liquidity and very low interest rates, where the priority of monetary policies was to favour growth in general. But what would have been the point of adding to the supply of money or reducing interest rates for green investments when the European economy is already flooded with liquidity from the ECB at historically unprecedented rates? Perhaps the "fossil" use of capital should be penalised by other mechanisms and a green orientation privileged, by steering the particularly abundant savings and liquidity, rather than by focusing on money supply?

Even so, the question is not yet definitively closed. Attitudes could change in the new context where quantitative easing is being scaled back and interest rates are forecast to increase. It is even more likely to arise through the screening for climate risk embedded in banks' balance sheets, which is progressing thanks to Mark Carney in particular.

Mark Carney and the FSB: The Supervisors Step In

Mark Carney is a leading specialist in financial risk management: he was the Governor of the Bank of Canada when the 2008 crisis broke out. The very rapid recovery of the Canadian economy during the crisis has in part been credited to the Bank's unconventional monetary policy. Based on this success the G20 appointed Mark Carney as President of the Financial Stability Board (FSB) at the end of 2011 and the UK's Chancellor of the Exchequer chose him to become the Governor of the Bank of England (BoE) at the end of 2012.

Shortly before he entered the post in London, British NGOs including, unsurprisingly, Carbon Tracker, challenged the BoE. They asked whether investments considered to be polluting and bad for the environment could be exposing the United Kingdom's financial system long-term growth perspectives to a systemic risk. This question was then taken up by members of Parliament's Environmental Audit Committee (EAC) who asked the BoE for its assessment regarding stranded assets, and whether a carbon bubble was likely. These were British concepts if ever there were any. In 2014, in response to these questions, the Prudential Regulation Authority (PRA), the branch of the Bank of England in charge of prudential regulation and supervision of the British banking and insurance sector, asked the insurance companies to volunteer to participate in an enquiry on how the United Kingdom was adapting to climate change.

In parallel, while France was getting ready to chair COP21, the French Minister of Finance, Michel Sapin, asked the G20 members to investigate the question during the meetings on April 16th and 17th, 2015. The G20 members accepted to appoint the FSB to deal with the topic and asked it "to convene public and private sector participants to review how the financial sector can take account of climate related issues".

As Governor of the Bank of England and Chairman of the FSB, Mark Carney held all the cards to tackle the climate finance issue. In the beginning of 2015, the Bank of England organised roundtables and meetings on the subject with insurers. The resulting report, which was much awaited, was published on September 29th, after the general elections and commented in a historical speech by Mark Carney at Lloyd's of London.

The Tragedy of the Horizon

Mark Carney first reminded the British insurers of the reality of climate change and of the mounting evidence of human responsibility for the phenomenon. He maintained that insurers are among those most determined to act quickly against global warming because they are directly impacted by its consequences: over the preceding decade, the sector's losses related to weather events, had increased from $10 billion to $50 billion per annum on average, and the numbers are likely to worsen in the future.

He described the reasons why action against climate change was insufficient as a "Tragedy of the Horizon". The greatest climate disasters will happen beyond our usual decision-making horizons: business cycles, political cycles, central-bank decisions, and the horizon for monetary policy may extend to two or three years while financial stability cycles rarely exceed a ten-year period.

"*In other words, once climate change becomes a defining issue for financial stability, it may already be too late*". He went on to point out that it is a political responsibility to make the right choices for the transition of society and the economy, basing these choices on science. Finance can also take climate risk into consideration. It is faced with three types of risks:

– physical risks caused by climate events like flooding and storms, affecting both insurance and financial asset values;

– liability risks because, in the future, victims of climate change may seek compensation from those who caused it (emitters, but insurers too); and

– transition risks resulting from the process of adjustment to a low-carbon economy because policy changes, and technological or physical risks could cause many assets to lose value. With this simple and sound formulation, Mark Carney gave an official formulation of the theory of stranded assets which was substantial, but measured in that it does not take the short term carbon bubble into consideration.

These risks will be reduced if the transition begins quickly and follows a predictable path so that economic actors can prepare for a 2°C global temperature increase. The message was addressed to the world's investors: no matter how long you hold your assets (shares, bonds, etc.) you must start seriously making your portfolios greener, now! And he concludes in stipulating that "*by managing what gets measured, we can break the Tragedy of the Horizon*".

The Bank of England's main contribution with this report was to establish a very simple and clear typology of financial risks related to climate. Coming from such a respected authority, this designation of the risks brought climate within the scope of the fiduciary duties falling upon every asset manager. Until 2015, climate had been one topic among the many "extra-financial" issues. It is now at the heart of finance's mindset and the threefold risk typology is now widely used by financial players. Understanding and measuring these risks, especially the transition risk, continues to be a challenge. As chairman of the FSB, Mark Carney began to address the issue three months later during COP21.

Creation of Task Force on Climate-Related Financial Disclosures

After the 2008 crisis, the FSB was founded to coordinate the action of national financial authorities, and to promote the implementation of efficient supervision and regulation policies that would be beneficial to financial stability. Having been appointed by the G20 in April 2015 to investigate how the financial sector could take climate matters into consideration, Mark Carney suggested in November that a task force be established, the Task Force on Climate-related Financial Disclosures, and that it be chaired by Michael Bloomberg. The former Mayor of New York and founder of the famous economic information agency dedicated to the financial sector had been committed for many years to action against climate change.

The proposal was outstanding, both by its goal and by the method applied. Mark Carney did not recommend imposing rules on the financial sector. Instead, he suggested increasing and improving the relevance of climate-related information disclosed voluntarily by corporations, to enable financial market players and the authorities to better understand and manage the risks they represent. The goal was to make this information consistent (i.e. comparable between companies and sectors over time), reliable, clear and efficient.

He developed his recommendation to address a market failure which could be harmful to the efficient allocation of capital. And it concerns a subject that no true financier can afford not to address: the need for transparency and "information symmetry". In 2006, Nick Stern had insisted on climate being a serious subject for "serious" economists;

the Mark Carney effect was the equivalent in the world of finance.

The Task Force set up by Michael Bloomberg in early 2016, includes a fine balance between those who supply the information – the companies, those who use it – the financial players (investors, banks and insurance companies), and analysts from every part of the world. Its interim report, released in March 2016, points out that there are many voluntary or mandatory transparency frameworks available to companies whereas climate information is still incomplete, fragmented and relatively unrelated to the risk element. It has already set forth seven fundamental principles to make the information usable by the financial actors. The information supplied must be relevant, complete, clear, consistent over time, comparable, reliable, verifiable and regular.

The Vice-Chairman of the Task Force, a member of Axa's board of directors, Christian Thimann reported in April 2016 on the initial work performed: "*Our Task Force is not starting from nothing. There are already many voluntary or mandatory frameworks whereby companies release their climate-related information.*" The OECD has identified almost four hundred frameworks and recommendations applicable across the world. Fifteen of the G20 countries have defined regulatory frameworks. He goes on: "*The primary assignment of the Task Force therefore consists in identifying the most relevant frameworks and facilitating the harmonisation of methods within the G20.*" The Task Force is also seeking to strike the optimal balance in terms of information: if it is too complex or too bulky, it may get in the way of analysis. And to conclude, the Task Force will be looking at the relevant horizon for low-carbon

strategies, at the assessment of stranded assets and at decarbonation methods.

After a year's work, the TCFD released its report for public consultation on December 14th, 2016. Although it is acknowledged that organizations are already affected by climate risks today, the report states that the most significant effects are likely to emerge over the longer term. What is at stake with climate disclosure is not only a matter of harmonizing carbon footprinting. The report recommends that companies disclose on their internal processes with respect to four core elements: governance, strategy, risk management, and metrics and targets. This is mainly a qualitative and forward-looking approach encompassing more than the usual set of data indicators that are insufficient to drive financial decisions with impact on the future. The report also recommends for firms to use scenario analysis to assess climate risks and opportunities, that could be based on available scenarios such as the IEA's, or on NDCs, etc.

Donald Trump having been elected president of the United States, it is unlikely that the FSB-TCFD report will be adopted by the G20. But this doesn't affect the relevance of its conclusions and the possibility for market players to implement them.

The Breakthroughs in French Legislation

French financial actors also have to raise these questions, especially since the "Energy Transition Act for Green Growth" entered into force in August 2015, including its now notorious article 173. This article makes it mandatory for asset managers and investors to use their

annual reports to publish their approach regarding the inclusion of ESG criteria in their investment policies, and the resources mobilized to contribute to energy and environmental transition.

The article specifies that: "*Information on the way environmental goals are addressed will cover the treatment of exposure to climate risks, especially the measurement of greenhouse gas emissions related to the assets held, and the contribution to compliance with the international goal of limiting global warming and to the aims of energy and environmental transition*".

In a nutshell, the law and its implementation decree ask investors to adopt a "comply or explain" approach: no single method of reporting is required but the investors must explain their choices and describe their method. They can also break their reporting down by asset class, by geographical zone and by sector. Two dimensions are covered. Investors must apply a risk-based approach to climate, encompassing physical and transition risks (such as the tightening of climate policies or the expected loss of stranded asset value). The other dimension requires them to apply an approach contributing to the 2°C target and to the French energy transition, for instance through their policy of investing into green assets.

The purpose of this provision is to encourage investors to innovate and create management tools that improve alignment with the low-carbon transition. A review of how this measure is applied will be drawn up by the Government, revealing the best practices used. Article 173 is an experimental piece of legislation which stands out as an excellent example of modern financial regulation. Its cost/efficiency ratio should be particularly beneficial. And although France is already a country where large compa-

nies are required to provide transparency about their environmental policies, this provision brings it to the forefront of the related financial issues.

In addition, another paragraph in article 173 requires the banks to add climate-related risks into the measurement and management of conventional risks (credits, counterparts, markets and rates). These risks could be revealed as part of a system of stress tests. The financial authorities have started a dialogue with the banks on this topic.

Designed by the French Treasury within the Ministry of Finance, this smart and innovative provision of the energy transition law illustrates, on the French scale, a much more general phenomenon: the increasing involvement of the ministries of finance around the world in climate matters.

The Finance Ministers Make their Entrys

Since 1992, climate negotiation was put in the hands of the ministers responsible for the environment. Their ministerial departments are often weak, or considered to be so in the margins of power. They were assisted by diplomats who considered it was not the most fruitful topic to boost their career. A few milestones – Kyoto in 1997, Marrakesh in 2005, Copenhagen in 2009 – would focus the one-off efforts of Foreign affairs ministers and, exceptionally, of heads of State and of Government (in the case of Copenhagen), but the process would soon fall back into a form of routine. After all, it was a discussion between specialised technocrats from all over the world, alone in being able to decipher the many acronyms designating complex components created over time as part of the UNFCCC. But the dynamics changed in the lead-up to COP21.

Fears of another Copenhagen type "failure" in reaching an agreement had the rebound effect of raising the adrenaline of world diplomacy. COP 21 became a very important challenge which generated extensive media coverage. Major risks were looming in case of failure, but a new potential for political benefits was becoming evident for many countries. Observers worldwide have commented that French diplomacy, headed by Laurent Fabius, managed to channel this enthusiasm with finesse and skill while exercising total leadership throughout the negotiations. Meanwhile the French minister of the Environment focused on the national and European levels, and on mobilising civil society.

The new part played by the Finance ministers has less often been referred to whereas it was a major novelty and, as we see it, holds great promise for the success of the low-carbon transition. With the arrival of the real paymasters on the scene, negotiations became very serious and moved beyond the framework of UNFCCC. As early as 2014, climate issues were systematically part of all the major annual international financial governance events: G20, G7, general assemblies of the IMF and of the World Bank, etc.

At a very early stage, Laurent Fabius understood and got others to understand that the Finance ministers had to be fully on board with respect to climate issues, that their contribution was essential given the intellectual resources of their administrations and, through them, the financial institutions they manage or supervise. He made the first step by closely associating Michel Sapin, the French minister of Finance, in controlling the negotiations.

The first move of the French Finance minister was to propose and successfully defend for G20 to call upon the FSB, in full knowledge of what the "Mark Carney effect" could cause given what the French Treasury knew with respect to the initiatives he had taken as Governor of the BoE.

Although it was encouraged by Laurent Fabius, the salutary entry of financial administrations into the proceedings was root in objective requirements. As a matter of fact, the negotiation system opened at Copenhagen at the end of 2009, and officialised in Cancun in 2010, was of direct relevance to the Finance ministers for two different reasons: first, each State was encouraged to define national objectives, a policy leading to a budget, or even a financial policy and second, developed countries made a commitment to financial transfers toward developing ones. It was about time for Finance ministers to play their cards.

The $100 Billion Question in 2015: The Calm after the Storm

The Copenhagen promise was in fact never forgotten by the developing countries who joined forces to form the "G77 + China" coalition. Their position was to accept negotiating a new climate agreement as long as developed countries kept the promises regarding commitments they had made – most importantly their financial commitments, considered as a guarantee of their accountability.

Initial discussions on the topic were at cross-purposes. The South was practically demanding an additional $100 billion for climate in addition to the annual official development aid amount. G77 negotiators pretended to forget

that the Copenhagen agreement explicitly stated that this money would come from "*a great variety of public, private, bilateral, multilateral sources and include alternate sources of financing*".

It was in no way reasonable to claim $100 billion of public transfers, whereas the total of official development assistance currently amounts around $140 billion, i.e. 0.3% of the GNI of the OECD countries. The first chapter above described how a consensus came into being to merge the development and sustainable development agendas to end up with a single concept. The climate issue, it was explained, became one of the transversal Sustainable Development Goals (as SDG 13 in fact). The same was to apply to international aid: wherever possible, international development aid would henceforward take climate issues into consideration. Conversely, there was a concern that an increasing share of climate finance should not result in the aid granted being reduced in some areas, such as education or health. The concern was legitimate, and it was heard.

To add even more to the confusion, the $100 billion promise was often mixed up with endowments expected from the North to the famous Green Climate Fund (GCF), which was also created based on a 2009 decision made in Copenhagen. But from the outset, the GCF was designed to be an additional tool among others.

In 2015, with pledges by Northern countries to contribute to the capital of the Fund amounting to $10 billion, the initial promise seemed a long way down the road. Especially for those who did not understand that the $100 billion would not be channelled exclusively through the Green Fund.

Gradually, realism prevailed and it was accepted that financing from multilateral and bilateral development banks would be included in the climate funding, followed by part of the private financing to the extent that it was coupled with public funds.

To clarify the situation before COP21, and to approach the negotiations in a more serene frame of mind, in early 2015 the Finance ministers of Peru and France commissioned a report on the current North-South funding flows and the progress already made toward the $100 billion objective. They hoped that the report would contribute to the transparency of measuring, monitoring and reporting of flows in favour of climate issues. They entrusted this work to the OECD, assisted by the think tank known as Climate Policy Initiative (CPI). The report was then made public during a meeting between Finance ministers concerning the climate, organised in parallel to the general meetings of the World Bank and IMF in Lima, Peru on October 7th, 2015. This meeting was a first: the managers of the public finance systems and public development banks were meeting and for the first time, one of the essential points of climate negotiations was the single point on their agenda.

The conclusion of the report was that the public and private flows mobilised from developed countries to developing countries amounted to $62 billion in 2014, rising from $52 billion in 2013, an average of $57 billion per annum for the two years.

The estimate included public financial flows (from grants through to non-concessional loans) as well as private flows directly triggered by public financing flows.

Public financing, both bilateral or multilateral, represented more than 70% of these flows. More than three quarters were intended for emissions reduction activities (mitigation) and the balance to activities targeting adaptation to climate change or to the two objectives combined.

Naturally, there were many objections to the report and lively discussions continued into 2016. New commitments were reached in October 2015 by the bilateral development banks in the North – KFW in Germany and AFD in France (thanks to a decision by the French government to recapitalise, specifically for that purpose). In the same way, the forecast of flows that could be triggered by the GCF will require an update which is likely to be an ongoing process until 2020. Furthermore, there is the matter of separate accounting of the "South/South" flows – for instance, those of the New Development Bank (founded by the BRICS, the major emerging economies). The issue is emblematic of the change towards a world in which the transfers are more complex and less polarised than in the post-colonial context.

But unlike what was feared until October 2015, the $100 billion issue, which is still at the top of what is generally referred to as the pre-2020 agenda, did not rule out or even really hinder the conclusion of the Paris Agreement.

After COP21, developing countries asked developed country Parties to draw up a roadmap to achieve their $100 billion a year commitment by 2020. In order to prepare this roadmap, the OECD provided a technical note published just before COP22, showing that developed countries' public financing in 2020 is projected to be close to USD 67 billion. But most importantly the note stressed the critical role that would need to be played by ability of

public finance to attract private finance to increase the overall level of climate finance.

The main virtue of this negotiation within a negotiation, with stakes that were more diplomatic than truly economic, was to bring in not only a new way of accounting for financial flows directed towards investments favourable to the low-carbon transition, but also a new community made up of Finance ministers in charge of implementing and monitoring the accounting process. Once they had entered the world of climate, there was no way out. In addition, they would become an essential resource to push forward one of the most difficult issues of climate finance: financing adaptation[30].

The Action Agenda

Back to September 2012: France announces that it wants to host the 2015 COP21 conference on climate change. The intention was particularly daring with respect to this COP aimed at ensuring the adoption of a new agreement to replace the Kyoto Protocol. Few observers considered there was any hope for success.

Because there were no other candidates, the official choice went to France at the end of 2013.

What did make France so confident? Probably a vision of the conditions for success that was clear enough already at that early stage. The French minister for Cooperation at that time, Pascal Canfin, was aware of the difficulties of the negotiation ahead. In mid-2013 he argued for an approach "not for sharing the burden, but for sharing

30. See chapter 1, p. 23.

solutions and opportunities". This position gave a jolt to the concept of positive agenda. In 2010, the UNFCCC had already taken the first steps with "Momentum for Change", an international competition showcasing innovative solutions around the world, including in the financial field. The initiative rewards prize winners every year during the COP. But scaling up implies a far broader involvement of all the players involved in low-carbon transition, extending beyond the States to local governments, companies and NGOs. The idea of a positive agenda of action would gradually come into focus and constitute one of the ingredients for the success of COP 21, where it was enshrined in the Paris Agreement itself.

On September 23rd, 2014, United Nations Secretary General Ban Ki-moon, welcoming the idea of the action agenda organised a new kind of summit, at the United Nations headquarters. The Climate Summit gathered all the economic leaders to present what they were volunteering to do for the climate, whether individually or through coalitions. The stated goal was for this display of good practice to encourage Heads of State to make the negotiations a success. To this end, every possible positive argument in favour of ambitious commitments was used: the cost of inaction, the benefits of green growth, the gains for those who act fastest... And it worked.

For the very first time, the Climate Summit provided an opportunity for global companies (Bank of America Merrill Lynch, Crédit agricole, Coca Cola, Unilever…), to make substantial commitments in favour of the climate from the rostrum of the United Nations, and to launch privately-driven collective initiatives. Beyond the welcome publicity the event drew, with significant media coverage

in this prestigious location, the Climate Summit was particularly valuable in disclosing the ability of the players to act and in kicking off new initiatives that would bring together all those who wished to engage.

The financial sector also played a part in the process, in particular through:

– The signing of the "Global Investor Statement on Climate Change" by 409 investors, from Allianz to the Australian pension fund VicSuper, and including la Caisse des Dépôts. This declaration was made under the impulse of the big investor networks like PRI, IIGCC, Ceres, AIGCC, UNEP FI, etc., who jointly affirmed their will to act, and who described their means of action.

– The spectacular launch of the Divest-Invest movement by 50 or so investors, including the particularly symbolic Rockefeller Brothers Fund, involved a commitment to rid their portfolios of securities from the fossil fuel sector and to reinvest part of the amounts into renewable energy and clean technologies.

– The creation of the Portfolio Decarbonization Coalition by the Swedish pension fund AP4, the asset manager Amundi and UNEP FI, committing investor members to reduce the carbon footprint of their portfolios.

– In parallel, meeting in Montreal, the PRIs initiated the Montreal Pledge on the same day, an initiative bringing together investors who agreed to calculate the carbon footprint of their portfolios and to disclose the information every year.

– Through their global federations, insurers jointly agreed to boost their green asset investments and cover an increasing share of the population of the developing countries by suitable insurance products.

Banks however did not launch any similar collective initiative, except the Bank of America's Catalytic Finance Initiative. The bank aimed at mobilising at least $10 billion for new clean energy projects by innovative financial setups to reduce risks and thereby attract investors, supported by the World Bank and the EIB. As far as we know, it is the only structured finance initiative in favour of the climate taken by a commercial bank rather than by a development bank.

This agenda for positive action continued to work as a catalyst until COP21. It was institutionalised during COP 20, in December 2014, under the name of the Lima-Paris Action Agenda (LPAA), partnered by the two COP presidencies (Peru at the time and forthcoming France), the Secretary General of the United Nations and UNFCCC. The latter initiated the Nazca (standing for Non-State Actor Zone for Climate Action) Internet site, a tool for recording the commitments of the various parties. This register should guarantee that compliance with the commitments made can be checked easily.

The principle of involving non-State stakeholders through commitments was thus placed at the heart of the Action Agenda, giving it a far different reach from what had prevailed until the New York summit. The corporate world had made many extra-financial commitments, for instance the Equator Principles in the world of banking or the PRIs for investors. But most often they involved adherence to principles, in line with the spirit of corporate social responsibility and of responsible investment: there were commitments to respect human rights, to incorporate ESG criteria into investment decisions, etc. Once these commitments are made public, it is true that those who

made them are exposed to closer scrutiny by NGOs, and to the threat of "name and shame". But they did not actually constitute contributions; strictly speaking, they were codes of good conduct.

A new category of corporate commitments, that were both quantified and time-bound, came into being in 2014. It was as if the bottom-up logic of negotiations between States, materialised by national commitments, officially called Intended Nationally Determined Contributions (INDCs), had spread by contagion to economic players who were under pressure to make "material" contributions to reducing emissions or to adaptation to climate change. This dynamic movement generated real emulation among the largest global companies, including financial firms. At the same time, the phenomenon of creating coalitions revealed that, in addition to the principle of generalised competition, there were relatively vast zones of common interest and shared learning in the economy which could help bring about the low-carbon transition: local services (utilities), companies in the digital world, agro-business companies faced with increasing public concerns regarding food security, etc.

In the financial world, the very high concentration within the insurance sector, and the fact that pension funds were not competing with one another facilitated the forming of coalitions in these segments of the industry. In the fragmented and extremely high-competition banking world on the other hand, it was more difficult to imagine collective action, except to resist initiatives taken by regulating bodies.

Initially, and somewhat naïvely, the agenda for non-State action was presented by Ban Ki-moon as a solution for reaching beyond the limits of negotiations between States: the emissions reductions promised by cities or industry were added to those of the INDCs, the green billions promised by private investors to those of public lenders, to reach the 100 billion figure… Actually, the commitments to reduce emissions should not all be added because all the emissions are actually built into the national inventories. Non-State action will always contribute to national action, even if it is not its aim. As far as capital flows are concerned, aggregating the billions announced as new private investments into renewables with essentially public transfers from North to South would be like adding apples and oranges. In actual fact, only initiatives and commitments in the area of adaptation are additional by nature – and there are not so many of them.

The initial intuition of the United Nations did however prove to be relevant: commitments by companies, financiers and communities helped encourage the States to formalise their own. In addition, some companies who were not traditionally keen on moving beyond a one-year time frame for their analyses and forecasts, began to present their likely future pathways.

This was a new and critical element for long-term capital suppliers, enabling them to begin assessing companies on this basis, with increasing demands in terms of rigour.

A new and complex engine seemed to have appeared on the scene, but without being designed by an engineer or built to any detailed blueprint. Its expected effects on the global economy have yet to be analysed. A new subject for economic science is born; hopefully the IPCC will take it on board.

The action agenda, especially its financial dimension, was elevated to the status of "third pillar" of the Paris agreement during COP21 (the treaty and the national commitments are the two others), where, for the very first time, the negotiation process was officially open to economic players. This process involved a series of LPAA events which served to take a metre reading of the commitments already made, and to get new initiatives going. For COP veterans, it was amazing to see that first of all in Lima, then in Paris, the giants of industry and finance, provided their commitments were up to par, were welcome where only representatives of civil society had traditionally been present, in the negotiation zone, the "blue zone", the diplomatic inner sanctum. There was much hand-wringing in the radically anticapitalist fringe of environmentalist circles; the realists were delighted.

The two years prior to COP21 shifted the lines: the question of climate is now at the heart of the global economy. No financial player, from the regulators through to the rating agencies, can afford to ignore it any longer. An agreement in Paris was essential to form a foundation for this movement.

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CHAPTER 5

"ACCELERATION IS THE NAME OF THE GAME"

There was an agreement in Paris. As Winston Churchill said in very different circumstances, it marks "the end of the beginning". From now on, the aim is to truly not overspend the 21st century's carbon budget. Climate finance is one of the ways of doing it. The financial industry will have to adopt the motto of the EIB "Climate in everything we do".

The Paris Agreement: A Perfect Trade-Off

It is December 12th, 2015, at around 7 PM. On stage in the main negotiation hall at COP21, at Le Bourget, Laurent Fabius states the following: "I am looking at the room, I see that the reaction is positive, I do not hear any objections. The Paris Agreement for climate is accepted." He drives home the message of his words with a gavel blow on the table, an odd little green leaf-shaped gavel... The room explodes into applause and, on stage, everybody congratulates one another: Laurent Fabius, Laurence Tubiana, the French ambassador for climate who was to a large extent responsible for this success, Ban Ki-moon, François Hollande, Christiana Figueres, Executive Secretary to the UNFCCC, etc. It is a historic moment and according to many observers, it opens the way to a new international climate regime. Joy and relief.

During the negotiation process, for months the French Presidency, backed by the Peruvian Presidency, had driven home a message about the four pillars on which the success of the conference could be built: a legally binding universal agreement, national contributions benchmarking the efforts of each state (INDCs), a financial package to support developing countries in their transition (the $100 billion per year promise) and an action agenda, that is, voluntary commitments of non-State actors (local governments, businesses, and other actors in society).

Before COP21, 187 countries had made public their INDCs, and their combined effect was estimated at limiting global warming to only 2.7 or 3°C. More efforts were required… Despite criticism by Indian Prime Minister, Narendra Modi, who challenged the calculations of the OECD regarding the measurements of current transfers, the sting had been taken out of the issue of the $100 billion, at least to some extent. Lastly, the Action Agenda, brought to the very heart of the negotiations area, resulted in a diverse collection of 11,000 non-State commitments, including by 7,000 local governments and 2,000 companies, across 70 countries, some grouped together in 70 coalitions. The Action Agenda was considered to be a major step in support of ambitious national policies, guaranteeing that they would effectively be applied to the real economy.

On this glorious Saturday, on December 12th, two texts were actually adopted by consensus: a COP Decision to be applied immediately and the Agreement itself, now open to a process of signature and ratification by the States, upon completion of which it should enter into force in 2020. The

Decision aims at preparing for the implementation of the Agreement.

The Fruit of the Evolving Geopolitics of Climate

The Paris Agreement was primarily the result of what some have called an "alignment of the planets". The countries opposing an agreement at Copenhagen had become the driving forces behind reaching one in Paris, in particular China and the United States, but also: South Africa, federating the group of African countries; Brazil, which had changed its point of view regarding deforestation – and with it most of the Latin American countries; India, a fierce negotiator which rallied at the very last moment to accept the overall agreement; and even, against all expectations, the oil producing countries. These countries, or at least some of their leaders, saw the climate imperative as a means of accelerating their internal debate about the shift of their own economies toward a post-oil rent model.

It is a perfect compromise: it is the first international agreement of the Anthropocene era, a new geological era where human activities have a determining global impact on the Earth's ecosystem; it represents a step toward leaving the post-colonial era because it is universal, in line with the Sustainable Development Goals adopted in September 2015 in New York (thus adding to its credibility); it is a multilateral agreement based on "realpolitik", recognising the "national circumstances" of the States, while establishing supranational control mechanism and drawing on the driving force of non-State actors; finally, it represents a success for French diplomacy, showing the best side of the country.

Climate: the Cement Holding the International Community Together?

In his latest book[31], a former French minister of Foreign Affairs wonders whether the Paris results mark the first steps in a refoundation of the international community, something which has not really occurred since the United Nations were founded in 1945 on the basis of its founding goals in the areas of global peace and prosperity. His conclusion is that this is far from being the case. Awareness of the climate issue is not generalised and remains ad hoc. The low-carbon transition is going to be gradual and will face resistance. But, he predicts, "The greening of society and the economy" will have a very definite impact on international relations, since States will no longer be only considered simply as the only way towards international security or economic growth, but also as a means of supporting or of hindering global greening.

The Content of the Agreement: Financial Flows for 2°C

Article 2 of the text defines three major objectives for aligning economy, development and climate:

– containing global warming to keep it "well below" 2°C, while pursuing efforts to limit it to 1.5°C. This new 1.5°C objective was a demand of the small island States whose survival is at stake due to the rising sea level – but the work of the IPCC already shows that it is almost surely out of reach;

31. *Le Monde au défi*, Hubert Védrine, Fayard, 2016

– increasing the ability to adapt to the effects of climate change. Until now, adaptation had been less discussed in the negotiations. The Paris agreement gives it equal importance to that of reducing ("mitigating") emissions;

– making financial flows consistent with low-carbon development. This last objective is the most innovative. The phrase has become the byword for climate finance.

Article 4 of the Agreement also defines a quantitative objective: "The global peaking of greenhouse gas emissions as soon as possible" to achieve, during the second half of the 21st century, a balance between human emissions and removal. This objective summarised in the term "net zero emissions", may have a definite practical effect inasmuch as it defines a pathway for emissions reduction in the years to come.

Universality?

While making it a less binary matter, the agreement does maintain the principle of common but differentiated responsibilities between countries, the founding principle of the UNFCCC, which is considered as intangible by the developing countries. This principle applies to funding commitments between the countries of the North and those of the South. However, many of the provisions of the agreement apply uniformly to all countries, while others, such as the obligation to report on national climate policies, are reduced for the least developed countries alone.

National Contributions

The agreement establishes a process of transparency in the implementation of national commitments (art. 13) and of harmonised national contributions (art. 14), to facilitate

their comparison and analysis. These contributions,which will be referred to as NDCs (for Nationally Determined Contributions), will be developed every 5 years and will have to become increasingly ambitious by a ratchet mechanism. The first global assessment of national contributions is planned for 2018.

Support for National Policies

The Agreement also contains various provisions to help countries to implement their national policies: enhancement of carbon sinks such as forests (art. 5), co-operative policies between States paving the way for new project mechanisms (art. 6), adaptation (art. 7), loss and damage related to climate change such as extreme events (art. 8), North-South financing (art. 9), technology transfers (art. 10), capacity building (art. 11), education training and public access to information (art. 12).

Official Recognition of the Action Agenda

The COP decision institutionalises the Action Agenda among non-State players as part of the UNFCCC to be led by two "high-level champions" appointed by the current and forthcoming COP presidencies. They are vectors and facilitators of the dynamics of this agenda, which is complementary to the negotiation between States as a way of accelerating the transition to a low-carbon economy.

Is the Paris Agreement Sound?

It has been criticized for the low level of constraint imposed on the States. Indeed, its non-application by a country will not trigger severe sanctions. However, it creates

a framework of transparency which should enable observers to check that Parties do what they announced in their national contributions. The States will therefore become responsible before the international community and before public opinion, which may then decide to apply the name and shame technique, that is to say, public denunciation. Transparency and stocktaking will be crucial to maintain confidence in the Paris Agreement.

Finance Confirmed but Finance Forgotten

In one way, the Agreement confers a form of consecration in principle to finance, since the redirection of financial flows, to drive low emitting and climate resilient development, is elevated from the outset to the status of a major objective. On the other hand, it makes no mention of the resources required to achieve the reorientation. The only area where the Agreement refers specifically to financial techniques – namely to insurance techniques – is Loss and Damage, covered in its Article 8: it calls for continued international cooperation through risk assessment and management, including risk coverage through insurance.

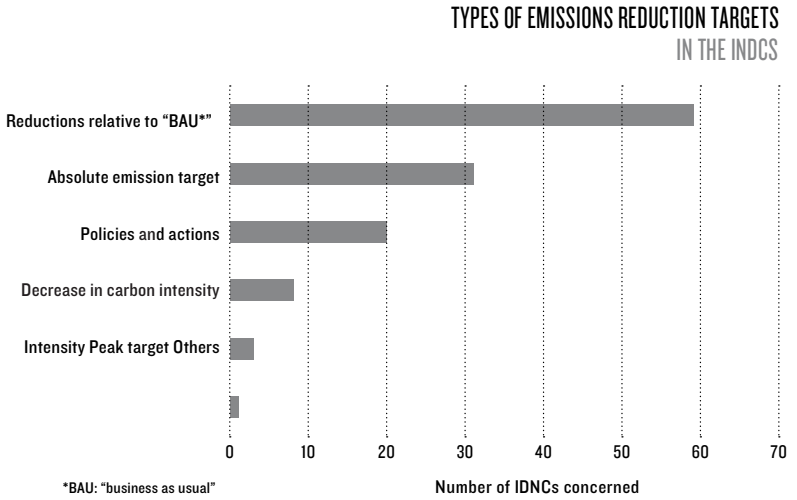
Conversely, the Agreement specifies the issue of North-South financial transfers by setting the objective of €100 billion a year as a minimum to be exceeded starting from 2025. The formulation imposes nothing on the developed countries, thus avoiding any need for ratification by the Congress of the United States.

The Agreement recognizes the growing importance of South/South transfers on a voluntary basis, partly responding with this novel provision to what the developed countries want: to broaden the base of States providing

international support to the developing countries. In addition, the COP decision requested the developed countries to deploy a concrete road map as a means of fulfilling the €100 billion promise, in the framework of dialogue opened at the Marrakesh COP22. Therefore, the negotiations are not through with the Copenhagen promise…

In a nutshell, reaching an agreement in Paris was essential but the hard work is only beginning. "Finance is the glue that will hold the deal together" (Zoe Knight, HSBC).

From INDCs to National Climate Investment Plans



Source: UNFCCC, October 2015.

Let us make no mistake: the global low-carbon transition, and therefore the actual implementation of the Paris Agreement, will come from the implementation of national contributions, and then from their rising levels of ambition.

Starting in October 2015, UNFCCC analysed the 145 INDCs that it had already received and published, covering a large share of global emissions.

Depending on their degree of development and how much their economy depends on fossil fuels, the countries have set themselves either absolute goals for reducing emissions, goals for future peaks in emissions, reduction as compared to a "business as usual" scenario or a reduction in the carbon intensity of their growth. Many developing countries have set themselves conditional targets: they feel they can achieve them only if they receive international support. Others refer to how willing they are to rely on the support of carbon credit mechanisms, if they are available, to supplement their funding. The INDCs demonstrate a wide variety of ways to achieve these objectives. Indeed, most countries have provided information on the process of implementing their contribution, in particular through their national legislation and their selection of priority sectors. Some have already created an outline plan and others are committed to do so in the near future. A few examples among key countries:

– the United States' INDC intends to reduce its emissions by 26 to 28% by 2025, compared to 2005. It relies in particular on the Clean Power Plan adopted by the Administration, which sets the reduction objectives for power plant emissions and standards for new plants, and standards for oil, for lower methane emissions from dumps, for high potential GHGs such as HFC and for building construction. That was before D. Trump's election…;

– China's INDC covers the goals of the five-year plan (see above);

– India is committed to reducing the carbon intensity of its GDP by 33 to 35% by 2030 compared to the 2005 level. It aims to do this first by raising the share of non-carbon-emitting sources in its electricity production capacity to 40% by 2030, thanks to international aid (in particular the Green Climate Fund). In addition, forest carbon sinks will be created, absorbing 2.5 to 3 billion tonnes by 2030. Therefore, India continues as one of the countries relying on coal to feed its growth, while simultaneously reducing imports;

– Brazil has an ambitious target of making a 37% net reduction in emissions by 2025 and 43% by 2030, compared to 2005, especially by halting deforestation, a process which is already well underway and by restoring 12 million hectares of forests by 2030. It also intends to increase the share of renewable energy to 45% by 2030 and to keep on increasing the share of sustainable biofuel in its energy mix up to 18% in 2030.

The presentation of the next NDCs could be the opportunity to move forward in translating country commitments into national action plans. In this regard, the impressive research work undertaken by IDDRI and the United Nations initiative Sustainable Development Solutions Network (SDSN) who are studying the "Deep Decarbonisation Pathways" of different countries, should be particularly useful. These national pathways could then, or at the same time, be translated into investment plans that could be submitted to financial actors, bankers and investors, both domestic and international. Some financial actor coalitions have already begun this dialogue with the national authorities.

What Is to Become of the Commitments by Financial Institutions?

In parallel, private financial actors, grouped together into larger coalitions launched a year earlier, had exceeded their goals. The results were presented at COP21, as part of the Action Agenda:

– the Montreal Carbon Pledge had been signed by close to 120 investors, representing more than $10 trillion in assets;

– The Portfolio Decarbonization Coalition (PDC) had exceeded its goal six times over in bringing together 23 investors covering $600 billion in assets subject to emissions reduction goals;

– Through Divest-Invest, 115 charities had divested from 200 major firms producing fossil energy, investing 5% of the portfolios in climate-friendly solutions;

– the cooperative insurers grouped together by the International Cooperative and Mutual Insurance Federation (ICMIF) had gone beyond their promise, by generating more than $109 billion for green investment and by committing to provide micro-insurance solutions for 25 million people who are vulnerable to climate change.

This does not even include commitments made by major institutions during the year: Axa, Allianz, Bank of America, Citigroup, Crédit agricole, BNP Paribas, Caisse des Dépôts…

At this stage, how can the Action Agenda be assessed as far as finance is concerned? There is no doubt that it has accelerated the low-carbon transition at the scale of the institutions involved. The coalitions also facilitated commitments by spelling out specific objectives: to disin-

vest, to measure... sometimes going as far as to propose the methods to achieve them. But it is more difficult to provide an overall measurement of the contribution that the financial dimension of the action agenda has made to the low-carbon transition. So far no study on the topic has been made public.

The agenda could be usefully followed up in several ways. On the one hand, voluntary commitments can evolve from pioneering initiatives to becoming the rule in these sectors. For example, in France, legislation has made it mandatory and general to publish the climate policies of investors. To contribute effectively to the implementation of transition policies, financial institutions can also establish a dialogue with the public authorities directing their investments. They can also make new commitments, or join the initiatives blending public and private financing. As we see it, these coalitions and initiatives[32] are the heart of the financial part of the non-governmental action agenda. They will all need to get into step with the pace defined by the Paris Agreement and Decision with respect to the measurement of progress. The first "champions", Laurence Tubiana and Hakima El Haite, designated respectively by France and by Morocco, have decided to encourage the coalitions and initiatives to report on their progress in 2018, in parallel to the first review of the implementation of State contributions, in the framework of a new "Marrakesh partnership for Global climate action". So which ones will really act as accelerators? Obviously, it is too early to say. But one thing is for sure: the commitments made in Paris by private financial actors are not on a par with the financing needs

32. See the non-exhaustive list in the Appendix, p. 241.

of the transition – and by a long shot. So how can this momentum be maintained to bring the financing volume in line with the needs?

The Need for the Strategic Use of Public Resources

We have seen that public resources will be insufficient everywhere and that private capital, though abundant, is not sufficiently directed toward the low-carbon transition. So without being totally novel, the idea of massively adopting mixed solutions is making headway. This means blending public and private finance, to use limited public resources strategically and unlock private savings resources worldwide, thus providing the necessary leverage. Blending and leveraging have become buzzwords in climate finance jargon.

Indeed, a consensus seems to be taking shape to assign three main objectives to public financial intervention: to concentrate on sectors and regions where the market is insufficient, to reduce risks for private financial actors, and to increase the performance of assets acquired by private actors where they would spontaneously perform beneath market levels.

Several mechanisms can be used:

– Public support to technical assistance increases their quality and soundness of projects, as well as the effectiveness of the project teams. It can also cover the costs of MRV[33], which allows the impact of investments to be monitored in the light of the climate goal;

33. Measuring, reporting and verification. See definition in Appendix, p. 249.

– Public investments and subsidised loans can enhance the profitability of the private share of financing;

– First-loss instruments and guarantees secure private investment by covering the higher risks of equity and subordinated debt;

– Refinancing bank loans under privileged conditions enables retail banks to provide adequate financing to scattered investments, for instance for energy efficiency in housing or for SMEs.

The advantage of this public-private financing is to create win-win solutions. It actually increases the number of economically viable projects by improving their risk / return profile and by reducing the cost of capital. It also saves on public funds and bolsters their impact by creating a leverage effect on private funds: guarantee and insurance solutions, in particular, no longer need immediate capital outlays but are called up only when a negative event occurs.

To which Extent Can Blending Finance the Transition?

Some assets, the "low hanging fruit", can be considered as easy to finance by the market, as long as favourable legal and fiscal frameworks are in place. It may be considered that these projects aim above all at reducing emissions by the use of proven and competitive technologies.

Although many of them are more likely to be found in developed economies, the rapid drop in the costs of renewable energy, in particular photovoltaic, is making them affordable without subsidies in many of the developing and emerging economies. In 2015, global investment in renewable energy reached nearly $286 billion, a new record. Most of it directed toward solar and wind

generated electricity ($265.8 billion), which now attracts twice as much investment as coal – or gas-fired power plants ($130 billion). The very fast growth of these investments in China, India, South Africa, Mexico and Chile – and across the entire developing world – has largely offset the slowdown affecting Europe.

Intermediate projects, whether they relate to less-developed markets or very new technologies, or include high structuring costs (like the aggregation of small projects), will require a blending of public and private funds.

The third category of projects, those without any commercial potential and therefore no prospect for earnings, like some investments intended solely for adaptation to climate change, will have to be financed essentially by public funding sources or grants.

The intermediate project category is potentially the largest, given the unprecedented nature of the low-carbon transition and the economic situation in many countries. For instance, in the emblematic field of renewable energy, the acceleration required is so fast (with annual investments to be multiplied by four from now to 2020), that improving national regulations will not suffice.

In the developing and emerging world, interest rates continue to be high although the economic model of these infrastructure projects depends entirely on the cost of capital in the initial financing. That is why one of the goals of the International Solar Alliance, launched during COP21 by India and France (joined by 35 countries[34]), is to deve-

34. The International Solar Alliance is a platform for cooperation between developed countries, using solar technologies, and the developing countries located between the Tropics of Cancer and Capricorn who wish to develop their potential in this field.

lop a facility based on public guarantees, capable of lowering the initial project costs and of making them attractive to international investors.

To be beneficial, the action of the public funds must be properly calibrated. Leverage must be maximised while also maximising the impact of carbon emissions reduction. But it is equally important to avoid too much capital being available for a small number of projects, which would tend to distort the market. One particular category of financial actors bears the main share of responsibility for this subtle blend: the public banks.

The Role of Public Banks

Who, better than public banks, can accelerate the low-carbon transition? Financial institutions working for the general interest can contribute directly. Because they have public resources, they often propose financing under more favourable conditions than the market (both in terms of rates and loan maturities) to finance priority sectors or projects.

It is their traditional role. However, since they often have high financial skills, most importantly they are in a position to use their public resources to mobilise private funding, and to design innovative financing tools to this end. They are the best placed organisations to actuate the unlocking of private financing.

Public banks are split into three types of institutions:

– National banks (called promotional according to European jargon) like KfW in Germany or Caisse des Dépôts in France. The goals of these banks are to support national economies in general and to mitigate the shortfalls of private funding in the priority sectors of national policies, in particular for long-term financing needs;

– Green banks, founded recently in countries without public banks or where public banks had no climate or environmental objectives, to direct private capital toward low-carbon projects. The first of these dates back to 2012: the Green Investment Bank in the United Kingdom. Since then, 13 green banks have opened, notably in Connecticut, Australia, New York State, California, Japan and Malaysia… They launched a network of green banks at COP21;

– Development banks, which organise aid for the development of the States that are their shareholders. They can be multilateral (MDB), with a global perimeter (the World Bank and its subsidiary the IFC, specialised in the financing of the private sector) or regional: the Inter-American Development Bank (IDB), the Asian Development Bank (ADB), banks intended for the countries of the former Soviet bloc (EBRD), etc. They can also be bilateral: the French Development Agency (AFD), the Japan International Cooperation Agency (JICA)… Some, such as the European Investment Bank (EIB), or yet again the German KfW, have a dual function: serving as promotional banks in their home country or region and as development banks.

In preparation for COP21, the development banks had been very much in demand to contribute to the €100 billion promise. Most of them took on new commitments in favour of the climate during the general meetings of the World Bank and the IMF in October 2015, or during COP21 itself. According to the 2015 CPI landscape, they devoted a growing share – 28% on average – of their activities to climate finance. In their efforts to support different countries, they sometimes help them to fully articulate their development and climate policies, and to increase the level of professional skills available in the field. These acti-

vities are referred to as "capacity building" in the international jargon.

In addition to these banks there are the export credit agencies, offering loans, guarantees and insurance for companies from their home countries operating in the emerging and developing countries.

This panorama would not be complete without the funds specialising in climate and receiving resources from various donor countries to finance projects, like the Global Environment fund (GEF), the Climate Investment Funds (CIFs) and the potential star among the new tools of this type, the Green Climate Fund (GCF).

Henceforward, all these institutions should aim for maximum leverage on private financing, whether for the climate or for development in general. This seems to be a matter of common sense but it is not easy to enforce this principle. The objectives of the public banks are indeed often formulated in terms of their financing volume. Their efforts to reach these objectives sometimes lead them to stand in for private financing, creating what economists call the eviction effect. Another obvious obstacle is the insufficiency of a common culture between the private institutions and the public banks. From this point of view, the action by the EBRD with the commercial banks of its region – a mix of capacity building and refinancing which is beneficial to energy efficiency – or that of the EIB in the framework of the GEEREF Fund[35] have an exemplary value and pave the way for the future. The Green Climate Fund was designed with these considerations in mind.

35. The Global Efficiency and Renewable Energy Fund is a fund of funds investing into local private investment funds, invested in turn into renewable energy and energy efficiency projects in the developing countries.

The Green Climate Fund: Difficult Delivery of a New Multilateral Financing System

It looked as if the GCF would be fully ready for COP21: since its creation was decided on in Copenhagen in 2009, its governance had been set up from COP to COP, with equal representation between developed and developing countries, and maintaining its independence from the UN bodies.

Its methods of action had been defined: based in Korea, it will seek "*to maximise the impact of public finance creatively, and to attract new sources of private financing*". Its support to developing countries will be equally shared between adaptation and mitigation projects. Its priority action areas had also been specified: energy, cities, agriculture, forests, and small islands. It will provide the rojects or programs presented by accredited entities with "*a variety of financing tools: grants, concessional loans, subordinated debt, equity, and guarantees*".

In 2014, the $10 billion capital needed for its start-up were, if not provided, at least promised. In November 2015, shortly before COP21, the GCF published the list of the first eight projects it would be supporting. Around $1.3 billion in GCF resources was committed to funding proposals in 2016 while its goal was $2.5 billion.

Often criticised for its slowness, GCF must first clarify its risk profile: many donor countries balk at its being too daring, for fear of having to recapitalise the Fund. Furthermore, some of them would like to see their contributions invested in projects consistent with the priority goals of their development aid policy. Lastly, the matter of access to the Fund's one-stop shop is still not fully solved:

how can direct access for the poorest countries be combined with the necessary intermediation of public and private banks accredited to the Fund to feed into their portfolio – their "pipeline" – of projects to be financed.

We think that what GCF has to offer will above all be qualitative.

Its decisions about the nature of the projects chosen and the resulting balance between major infrastructure and small-sized projects, or between adaptation and emissions reduction, will be under close scrutiny and will serve as a reference for climate finance as a whole.

Public Banks Guiding Private Capital

This new approach to the role of public banks as a lever of private financing may assume various forms. A few examples below.

Specialised Financial Tools

– The World Bank Group, for example, has created the Multilateral Investment Guarantee Agency (MIGA), which offers investors and lenders working on the developing markets coverage against various country risks: exchange, expropriation, conflict, etc.

– The Long-Term FX Risk Management Instrument, supported by KfW and IFC, is a currency and interest risk coverage tool for renewable energy projects, especially in Africa.

Structured Funds

– The Climate Investment Funds, managed by the World Bank with other multilateral banks, aim to mobi-

lize concessional resources (grants, loans and guarantees) to attract private actors to the financing of projects in the fields of renewable energy, energy efficiency and adaptation to climate change.They target a leverage effect of 7, which means that one dollar of public money allows private investment of 7 dollars.

– The Land Degradation Neutrality Fund (LDN fund) project, initiated by the United Nations Framework Convention to Combat Desertification (UNCCD), set up in 2016, aims at structuring different types of funding for public and private investors based on projects to restore degraded land. The originality of this project lies in the fact that the UNCCD, from the outset, wanted its private side to be structured before the public side. That is why it selected a Fund Manager assigned to define the public financial support conditions liable to trigger private financing.

Programmes

– AFD's Sunref package proposes a complete environment for financing green projects: concessional loans, guarantees and capacity building for commercial banks, technical assistance and investment premiums for project developers.

– The "Energy Efficiency Green Bond Facility" created by the Inter-American Development Bank (IDB) with the support of the Green Climate Fund, is a program for refinancing loans to boost the energy efficiency of SMEs, with initial loans granted by the commercial banks in the Latin American and Caribbean countries. The refinancing programme will trigger the issue of green bonds as Asset Backed Securities (ABS) and is thus also aiming at the development of local financial markets.

– In 2016, the IDB also created NDC Invest, a one-stop shop for countries to access resources for transforming their national commitments into achievable investments plans.

– The "Global Innovation Lab for Climate Finance", supported by the G7, aims to design innovative climate finance instruments. It includes a group of politicians, financial experts, public and private finance practitioners and project sponsors. Every year, it selects a few climate finance ideas and fine-tunes them to turn them into operational financial tools.

Because of the complexity of this new product offering from international financial institutions, it is understandable that the Moroccan presidency of the COP22 in Marrakesh has wished to create a common website for the developing countries providing information about available funds and the eligibility conditions of projects for different systems.

The Public Banks Creators of Good Practices, or even of Standards

For a dozen years or so, the development banks have been focusing on climate finance goals that they translate in their strategies and in their financing operations as guidelines, decision-making and progress and impact measurement support tools. They are pioneers in these areas.

With COP21 looming, under the impetus of the MDBs and the IDFC (International Development Finance Club), they have begun sharing information about their experience to harmonise their methods and to ensure the transparency

of their methods. More specifically, in March 2015, they jointly adopted a standard to define and measure the climate finance they provide.

They also developed a measurement on green bond impact based on work by the EIB. Finally, they adopted a common approach to track adaptation finance.

This work also led, during COP21, to the launch of the "Five voluntary principles to mainstream climate action within financial institutions", that they invited private financial players to join. Each of the 30 signatories so far undertakes to:

– implement a climate strategy, driven at the highest level, so that it can be spread throughout every operational activity;

– manage climate risks, by assessing its financing and investment portfolio but also its project pipeline and new investments;

– promote climate smart objectives by generating new financing tools in dialogue with stakeholders and by sharing the lessons of experience;

– improve climate performance of its activities, for example through measurement tools, asset allocation and carbon footprinting;

– account for its climate action for instance by disclosing its carbon footprint and reporting on climate strategy.

This is what the EIB, a signatory of these principles, summarises in its catchphrase: "*Putting climate into everything we do*". This promising initiative first intends to be a platform for experience sharing and for the financial institutions joining it, to be a source of rapid learning, aligned with best practice.

Toward the Revival of Carbon Finance?

In the new post-Paris Agreement context, several countries have declared their intention to put a price on carbon, by taxes or emissions trading schemes. Above all, what counts is the multiplication of these national policies driven by the attraction of governments to tax income which can be generated, as long as the proceeds are properly used. In a 2016 study, I4CE stressed that the smart use of proceeds could transform carbon tax from a burden to a benefit, and listed the possible uses: financing low-carbon technology, supporting poor populations to ease the low-carbon transition, developing sustainable infrastructure, supporting developing countries, reducing other taxes…

Similarly, governments are left to decide whether they want to implement project mechanisms. The United States and China have stipulated that they intend to enable them within national frameworks.

The international flexibility mechanisms arising from the Kyoto Protocol left mixed feelings: once they had reached high standards of technical performance, they had become pointless because there was no more international demand for credits. The revival of such mechanisms in the Paris Agreement was discussed right until the end of the negotiations: what was to become article 6 was finally drafted during the night before the Agreement was adopted. In order not to annoy the few States who were definitely against the "market" semantics, the article did not contain the word although it does pave the way for the practice, which was dubbed the "internationally transferred mitigation outcome" (ITMO). This obscure expression meant

that it was authorising the use of the emissions reductions in one country for another country to meet its national commitments, as long as double counting was avoided. In the Kyoto world, the double counting issue was already complex, distinguishing between countries making commitments (the "North") and those who were exempted (the "South"). It has become even more so in the framework of a universal agreement whereby each country has agreed to emissions reductions or limits. Although the mechanism needs to be adjusted, the Paris Decision did set a few guidelines for configuring the future mechanism: voluntary participation of the two parties, extent of the emissions reductions concerned, identification of activities covered, additionality, verification and certification… All of this very much resembles the principles of the UN mechanisms that had finally proved their value. We have no doubt that, by 2020, the rules for keeping track of such transfers will have been clearly specified.

On the other hand, it will be much more difficult to specify the "demand" side, i.e. to decide which economic actors, public or private, are liable to use it to fulfil their commitments, if only partially. This is a particularly complicated matter, but we are convinced of the following: the future of project mechanisms will be primarily and essentially domestic, in other words the "carbon credits" or whatever replaces them will be acquired in countries where a clearly identified climate policy prevails. Furthermore, these national or regional policies may find it beneficial to balance off a given constraint, in particular a price of carbon, through this type of flexibility. There would ultimately be significant value in being able to direct the income from the future article 6 mechanisms to the sectors where

transition is the most difficult to finance, precisely because of a lack of income or of the weakness of the economic models. We believe that agricultural and forestry projects would be good candidates.

How to Replace the G20 to Accelerate the Transition?

The universality of the Paris Agreement is one of its greatest achievements, as mentioned above. But this should not conceal the reality of climate geopolitics: most of the low-carbon transition levers are under the responsibility of the G20 countries, representing 74% of global GHG emissions and 80% of those related to energy. From 2014 till Donald Trump's election, the climate topic was included in the agenda of every G20 meeting. But this global governance body did not managed to take decisions on a par with its responsibilities. This can be explained by several factors including agenda arbitration in favour of current priorities (recovery of the world economy, monetary disorders, migration, the fight against terrorism), diverging viewpoints and conflicts of interests between its members (let us not forget that Saudi Arabia is a member of the G20), and the level of proactivity of the chair country for the year (as was the case of the 2015 Turkish Presidency who put the brakes on proposals to support the Paris conference).

The theme of eliminating subsidies for fossil fuels has been defended with determination by the IMF (a participant in the meetings) and is a regular point on the agenda, which has been favourable to national policy changes, from Mexico to Saudi Arabia. However, the topic has not yet been introduced into any time bound commitments.

The decision to bring the matter before the FSB, prompted by a French proposal, marked a major turning point in climate finance. The G20 was supposed to adopt the conclusions of the Bloomberg Task Force in 2017.

For the very first time, in the year following the COP21, the Chinese presidency introduced green finance as one of the major priorities on the G20 agenda. In particular, China carried out ambitious work as part of the Green Finance Study Group (GFSG), co-chaired by the People's Bank of China (PBOC) and the Bank of England, and published its synthesis report in September 2016. It proposed 7 actions to improve the availability of private capital for green investments by:

– providing strategic policy signals and frameworks;
– promoting voluntary principles for green finance;
– expanding learning networks for capacity building;
– supporting the development of local green bond markets;
– promoting international cooperation to facilitate cross-border investments in green bonds;
– encouraging and facilitating knowledge sharing about environmental and financial risks;
– improving the measurement of green finance activities and their impacts.

This list could be seen as a programme to implement the much discussed article 2-c of the Paris Agreement, which foresees the orientation of financial flows consistently with the 2°C target. The German G20 presidency in 2017 decided to continue the Green Finance Study Group (GFSG).

So at the end of 2016 we could think that far more than the UNFCCC, the G20 was the relevant political authority to drive the climate finance agenda. Let's not jump

to conclusions. There is no doubt that after the Paris Agreement, the COPs are entering a phase of technical negotiation needed to prepare implementation of the Paris Agreement in 2020. Obviously, the matter of the annual $100 billion will still be the central point of negotiations regarding finance in the COPs to come. But in November 2016, at Marrakesh, the Moroccan chair of COP22 found a way to stimulate thinking about finance to achieve the challenge of article 2. In particular, it granted an increased role to the Finance ministers in the COP and to fiscal and budget policies required for implementing the NDCs. It also generated progress on the issue of financing adaptation to climate change. Lastly, it initiated mobilisation among African financial players, both public and private, to steer local financial resources toward low-carbon and resilient growth.

Donald Trump's election and his decision to denounce the Paris agreement in May 2017 reduced the G20, as well as the G7, capacity to decide on climate related issues. The US position will strenghten Russia, Saudi Arabia and Turkey, already reluctant to any progress in this body. The new diplomatic challenge is about the way the 16 other countries will manage this situation to go ahead despite this opposition.

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Conclusion

The aim of this book was first to describe and explain what we see as a very promising evolution of the financial industry, but also to convince the most sceptical actors in the financial world itself that it is in their interest to integrate climate in all their decisions. We wanted to show them that approaches and tools already exist. There are no more excuses for inaction. Generalising these methods will to a large extent be a matter of strategic vision within the financial institutions, but also of culture to be disseminated among operational teams, and of methods to be mastered. This expertise can also form the basis of comparative advantages for the institutions and the financial marketplaces which choose to act quickly, as evidenced by the recent initiatives taken by London, Paris, Luxembourg and other marketplaces to promote themselves as "green financial centres".

We all know that climate finance is still a minority consideration: 50% of investors still make no allowance for climate change in their decisions and too many banks continue to finance assets which will exacerbate matters even more. The financial actors who are most overdue continue to be the powerful sovereign wealth funds, with the notable exception of the Norwegian fund and the French Caisse des Dépôts. But those that are members

of the International Forum of Sovereign Wealth Funds (IFSWF) decided in 2016 to "*explore the investment implications of the global commitment to curb GHG emissions for sovereign wealth funds*".

Then there are still some public financial authorities that consider large parts of their missions (growth, financial stability) to have nothing to do with climate… The commitment of private finance can also remain marginal in some cases, or even serve as a pretence: actors may be tempted to do as little as they can to respond to pressure from society or to regulations, while underscoring the obstacles and demanding incentives if they are to do more.

But we have seen that there are reasons for hope. Internationally, much momentum was generated by the Paris Agreement, and a supervisory entity was established to monitor the low-carbon transition. Beyond the climate negotiations, other international bodies have been drawn into the climate issue and its financial dimension: the Bretton Woods organisations (IMF and World Bank), along with economic and financial governance bodies such as the G7, G20, FSB… The G20 under German presidency en 2017 is keeping climate issues at the top of the international finance agenda, by pursuing the work of its green finance study group works.

Bound by their international commitments, States are being encouraged to create favourable conditions for investment. The imperative requirement for the low-carbon transition is to reassess the potential of nations: many developing countries are well endowed with renewable energy sources (sun, wind and geothermal), which will be the driving forces behind sustainable development… We are not

naive about this: the international flow of "green" capital will probably first go to countries that are already capable of attracting foreign investment, i.e. the major emerging economies. In fact those countries, China and India in particular, are introducing the most innovative and systematic frameworks for "green" financial policies. It will be very good news indeed if the largest emitters are also the most innovative.

But assurance needs to be obtained in parallel that international commitments in favour of the poorest countries are fulfilled. The entire developing world must also adequately signpost its domestic savings, which will be made easier if public and private financial transfers provide the necessary leverage in this direction.

Conversely, governments and companies that have prospered on annuities from fossil fuels are beginning to think about the post-oil situation. If only one were left standing, Saudi Arabia probably believes it would have to be the last oil producing country which, by virtue of its low production costs, would have managed to exclude all competition. Yet, the Kingdom has just completed an investigation which suggests that it should achieve a massive increase in its non-oil income by 2030, by investing in other sectors (such as mining, finance and tourism)… Russia or Venezuela will also need to give this some thought.

In the private finance sphere, awareness of climate risks is growing concurrently with the ability to understand and analyse it. The recommendations of the Task Force on Climate-related Financial Disclosure, published at the end of 2016, constitute a major step forward. Beyond the sole issue of harmonising emissions measurements, they spell out the conditions for forward-looking strategic

dialogue between businesses and their financiers on transition issues.

Green economy sectors are also increasingly seen as promising areas and opportunities to be seized by the financial industry, although they are still relatively rare. We are aware that the massive reorientation of funding flows will primarily be due to the falling cost of technologies; this spectacular reduction is likely to continue and to be the main driving force behind the transition.

But it will also involve lowering the cost of "green capital", especially in the emerging and developing world where high interest rates weigh heavily on investment in general. There is no single way of achieving this. A favourable environment is certainly required in terms of regulations, taxation including carbon tax, and financial innovation.

To this end, two international agreements were reached at the end of 2016, reinforcing the Paris Agreement, on aviation and HFC refrigerant gases. Last but not least, there is room for hope based on current thinking with respect to the prudential framework. The ongoing work is still in its early stages and hence not ready to be presented in this book; it relates to the possibility of using the prudential rules applying to banks and insurance companies (Basel IV, Solvency III…) to promote the greening of their activities.

Nevertheless, the engine for accelerating transition could also seize. Donald Trump has been elected as President of the United States. The Paris Agreement has resisted this first political shock. In June 2017 he decided to withdraw the US from the Paris Agreement, ending uncertainties surrounding the climate policy of the world's 2nd

highest emitting country, even if economic actors seem to be irreversibly committed to the low-carbon transition. The "We are still in" reaction of US civil society has provided a clear signal in that respect. The Trump Administration has yet the power to cause significant damage and could oppose any advances in international negotiation bodies like the G20, the G7... After Brexit, the EU will find it difficult to maintain leadership in the low-carbon transition if Member States like Poland keep on opposing it. On the other hand, the EU decision to create a High-Level Experts Group on Sustainabale Finance is a clear sign of its will to move forward on this topic. The Group will recommend policy options in early 2018 to introduce sustainability, environmental and climate related considerations into the EU financial system and regulatory framework.

What if the international agenda becomes so saturated by short-term security issues that the issue of climate is put on the back burner? We share all these concerns but we believe that these "accidents" will not stop the global low-carbon transition movement.

We believe that the dynamics of the real economy, coupled with finance, have become self-sufficient enough to continue to act against climate change, in order to pursue its own interests and to avert risk.

Significant new macro-economic signals can be observed: the decoupling of global GDP growth and energy consumption actually seems to be taking place.

According to the OECD, the energy intensity of the world economy is decreasing 3 times faster than during the previous decade. China is changing fastest with a target of -65% by 2030. This structural change is going hand in hand with the fast growth of renewables and the tailing off

of coal. The world appears to be approaching the peak of CO_2 emissions, which does need to be reached as quickly as possible, and to be followed by a rapid reduction so that the remaining carbon budget of humanity is not exceeded.

The greening of the world means a structural transformation, boosted by a digital revolution, to secure a service economy based on functionalities and the limited use of recycled resources rather than the production and private ownership of material assets.

We believe that such a model, feared by many who see it as risky for GDP growth and above all for employment, may on the contrary form the foundation for a new type of prosperity, but on one condition: redistribution and the fight against inequalities must be maintained. This subject would require another book, but there is cause for hope.

The goal of reducing inequalities is now an explicit part of the world consensus regarding the Sustainable Development Goals adopted by the UN in September 2015 (SDG No. 10).

This was not a foregone conclusion after three decades of reverse consensus based on a concept of growth being inevitably inequalitarian, which could only be amended by the resorption of absolute poverty.

At the same time, many governments are setting up policies to fight tax evasion and are cooperating on that struggle, which would have been hard to imagine as late as the early 2010s. Similarly, the debate about basic income, which is beginning in France, in line with many European and global initiatives, including in some developing countries, suggests that the world is on the move and could well lead to a new and shared vision of progress and

modernity, adapted to the Anthropocene era. "*Your hearts must have the courage for the changing of the guards*[36]."

36. Bob Dylan, "Changing of the guards".

Addendum June 2017

The first edition of this book was written in 2016 and the present edition was updated in the first half of 2017.

Although its purpose is to tell the story of climate finance in recent times, it doesn't fully analyse the important events that intervened in the beginning of 2017. After US President Donald Trump's denunciation of the Paris Climate Agreement, we observed a strong reaction within US society. Corporates, local authorities and financial institutions asserted their will to continue to act against climate change by their own means and to fulfill US commitments despite the Federal administration: "We are still in". This clearly shows the relevance of the "Action Agenda" launched in 2014, which encompasses most of climate finance.

Another positive signal was the communiqué of the G7 Environment Ministerial Meeting in June, which reaffirmed the group's commitment to implement the 2030 Sustainable Development Agenda. We see the US opting out of the strong climate section of the communiqué as a sign of isolation and weakness in this international body that will, for the foreseeable future, act as a G6 as far as climate is concerned. We can only hope the G20 will similarly allow for a strong climate G19, or maybe G18, or G17…

Of course the FSB-TCFD recommendations on climate related disclosure from companies to financial actors will not be adopted by the entire G20, but that will not prevent other official bodies or market players, at a regional or country level, to follow them.

The European Union, for instance, could decide to introduce them in its regulatory framework as proposed by its High-Level Expert Group on Sustainable Finance. Europe is now at the forefront of climate finance and we hope the EU will take the lead by implementing at least parts of the expert group recommendations that will be finalised in 2018. It is our opinion that the leadership taken by China, due to its sheer size, can and will need to be shared and adapted to market economies. European countries are well placed to play that role.

Private financial actors have made progress too. We welcome, for instance, the success of the environmental resolutions at the 2017 ExxonMobil AGM that were adopted despite management opposition. The story of long-term investors engaging in favour of a better climate is only beginning.

In the meantime, financial market innovations were also developed. It seems that many financial actors who see green finance as a competitive asset have engaged in a race to the top. Provided this competition for green is regulated, it could be an accelerator for the shifting of the trillions towards a low-carbon economy. We have, for instance, noted progress on: the impact of finance with respect to sustainability and climate related objectives, the creation of new products such as green lending, green securitization, and investment tools to finance the transition, the

adoption of strategies to align with the 2°C target, etc. All of these are organised around concepts discussed in this book. Hopefully we have helped to clarify these concepts and to explain their relevance to the climate transition.

APPENDIX

Finance action agenda for climate – the main coalitions and commitments

▶ Montreal Carbon Pledge

The investors who are signatories of the Montreal Climate Pledge undertake to measure and make public the carbon footprint of their portfolios on a yearly basis.

Launched in September 2014 by the PRIs, the initiative generated 120 signatories at COP21, representing more than €10 trillion in assets under management.

▷ montrealpledge.org

▶ Portfolio Decarbonisation Coalition

The investors who signed the PDC, launched in September 2014 at the Climate Summit, undertake to reduce the carbon footprint of their portfolios.

Headed by the UNEP FI, the initiative brought together, at the COP21, 23 signatories from all over the world, representing $600 billion of assets committed through plans to reduce carbon emissions.

▷ unepfi.org/pdc

▶ Statement by Financial Institutions on Energy Efficiency

The signing banks agree to increase their financing of energy efficiency. Launched by UNEP FI and the EBRD for COP21, the initiative has brought together more than

100 signatory banks in 42 countries, essentially in Central, Eastern and Western Europe, Central Asia, Asia, Africa and Latin America.

▷ www.unepfi.org/?s=Statement+by+financial+institutions+on+energy+efficiency

▶ Insurance

In September 2014 at the Climate Summit, the international federations of insurers, ICMIF for cooperative companies and IIS for commercial companies, set the goals of multiplying by 10 the green investments of the sector by 2020, and of starting work to manage the climate risks of their investments.

In addition, at COP21, the International Co-operative and Mutual Insurance Federation (ICMIF) launched initiative "5: 5: 5 Microinsurance Strategy", designed to extend insurance coverage for 25 million people in 5 least developed countries by 2020.

▷ www.icmif.org/fr/5-5-5-introduction

▶ Climate Task Force, Long-term Infrastructure Investors Association (LTIIA)

The members of the LTIIA, who are specialists in project financing, are committed to bringing support to the deployment of the "infrastructure" component of NDCs in countries willing to participate. The programme was launched at COP21 and initially covers 6 countries.

▷ www.ltiia.org

▶ Investor Platform for Climate Actions

Online platform that identifies and records the wide range of actions on climate change being undertaken by the global investor community, launched in May 2015.

▷ investorsonclimatechange.org

▶ Green Infrastructure Investment Coalition (GIIC)

Launched at COP21, the coalition aims to provide a platform of investors, multilateral development banks (MDBs) and analysts available for countries seeking to finance their green infrastructure investments needs.

▷ www.giicoalition.org

▶ FSB – Task Force on Climate-related Financial Disclosures (FSB-TCFD)

Managed by Michael Bloomberg at the request of the FSB, in the framework of the G20, the Task Force gathers investors, banks, financial service providers and enterprises, to develop voluntary, consistent climate-related financial risk disclosures for use by companies in providing information to investors, lenders, insurers, and other stakeholders. The Task Force published its report on December 14th, 2016 for public consultation and will continue its work until 2018.

Its recommendations focus on four themes: governance; strategy; risk management; and metrics and targets.

▷ www.fsb-tcfd.org

▶ Green Bank Network

Network of national and sub-national green banks formed to foster collaboration and knowledge exchange among existing Green Banks, enabling them to share best practices and lessons learned. The network was launched at COP21, and initially comprised 6 green banks.

▷ greenbanknetwork.org

▶ Five principles for mainstreaming climate action within financial institutions

These five principles for mainstreaming climate action were launched at COP21 by the leading development, multilateral and bilateral banks, and opened to commercial banks.

▷ www.eib.org

▶ Breakthrough Energy Coalition

Launched at COP21, this coalition represents 30 or so CEOs of the largest companies, headed by Bill Gates. It aims at accelerating and boosting private investment into renewable energy, supporting Mission Innovation, a coalition of countries working on similar topics.

▷ www.breakthroughenergycoalition.com

ABS: Asset backed securities.

Action Agenda: The Action Agenda's aim is to boost cooperative climate action between governments, cities, business, investors and citizens, in support of the Paris Climate Change Agreement.

It was formalised and named the Lima-Paris Action Agenda in 2014 and 2015, in preparation for the COP21. After the adoption of the Paris Agreement, it was renewed under the name of the Global Climate Action Agenda. It is now steered by two top ranking champions, appointed for two years by the current Presidency and the forthcoming Presidency of the COP.

Article 173 of the French energy transition law for green growth: this article requires companies and investors to publish information about how they are dealing with climate change, in consistency with the national objectives and international initiatives. It also stipulates that the banks must assess the risks related to climate change by stress tests.

Belt and Road Initiative: economic cooperation initiative launched by China, in 2013 which aims to invest in infrastructures abroad to the West, in Asia and in Europe, to strengthen its economic links with the countries in these zones. It also includes a marine component.

Cap & trade: Emissions trading scheme (see EU ETS).

Carbon bubble: this notion was created by the British Carbon Tracker think tank, an initiative for designating the volume of listed assets consisting of stranded assets.

Carbon credits: carbon emission reduction unit expressed in tonnes. The credits are generated by projects reducing emissions in comparison with a base scenario. They can be used to offset emissions as part of mechanisms like the Clean Development Mechanism (CDM) and the Joint Implementation (JI) system.

CBI: Climate Bond Initiative: an international NGO dedicated to mobilising the bond market for climate change solutions. In 2015, CBI created the "climate bond standard" to assess and certify the environmental integrity of bonds.

CIF: Climate Investment Funds. Financing tools established in 2008, financed by donor countries, under World Bank administration and implemented by the multilateral development banks (African, Asian, European, Inter-American). The CIFs support national and regional programmes in four areas: technology, forests, resilience, renewable energy, in addition to other funding.

COP: Conference of the Parties the deliberation and decision-making body of the UNFCCC which brings together the signatory States every year. COP adopts the legal instruments (protocols, treaties…) for the implementation of the Convention (see Kyoto Protocol, Paris Agreement).

Deep Decarbonization Pathways Project: an international research programme managed by IDDRI and the Sustainable Development Solutions Network (SDSN). The programme aims at studying decarbonisation pathways, country by country, consistent with the goal of limiting warming to 2°C.

Energiewende: German energy transition policy started in 2000.

ESCO: Energy Service Company. These energy efficiency companies can also finance or arrange financing for the operation and their remuneration is directly tied to the energy savings achieved.

ESG: Environmental, Social and Governance criteria, i.e. extra-financial criteria incorporated into investment decisions.

EU ETS: European Union Emissions Trading Scheme. A European system of capping emissions and exchanging carbon allowances.

Feed-in tariffs: a public support mechanism for the production of renewable energy based on an obligation to purchase the electricity generated at a tariff defined in advance as part of a long-term contract and guaranteeing the producer the coverage of its production costs.

FSB: Financial Stability Board. International coordination and monitoring body of financial regulation reforms. Founded in 2010 by the G20.

G77 + China: coalition of developing countries with political support from China to defend their common positions in the UN climate negotiations.

GBP: Green Bond Principles. Voluntary process guidelines that recommend transparency and disclosure, and promote integrity in the development of the green bond market. GBPs have been updated and have gained accuracy every year since they were created in 2014.

GCF: Green Climate Fund. An international financial institution founded by the UNFCCC to provide financing from the developed countries to the developing countries for low emitting and climate resilient projects. GCF began its activities in 2015.

GEF: Global Environment Facility. An independent and international financial institution, financed by its member states, supporting the major international environment conventions (climate, biodiversity, pollution and desertification). GEF grants subsidies and makes concessional loans.

GFSG: Green Finance Study Group. Working group established in 2016 jointly managed by the Chinese Presidency of the G20 and by the United Kingdom. It continues it works under the German G20 presidency in 2017.

GHG: Greenhouse gas.

Global Innovation Lab for Climate Finance: an international group of public and private financial experts, selecting and developing innovative finance funding tools, through to implementation.

GSIA: Global Sustainable Investment Alliance.

IDFC: International Development Finance Club. A network of bilateral development banks (as opposed to multilateral banks) of which there are 23 members from all the continents.

IEA: International Energy Agency, an OECD-linked organisation which "*works to ensure reliable, affordable and clean energy for its 29 member countries and beyond.*" The IEA has four main areas of focus: energy security, economic development, environmental awareness and engagement worldwide. Since 2010, its publications refer increasingly to climate change and the agency has built a 450ppm scenario that sets out an energy pathway consistent with the 2°C target.

INDC: Intended Nationally Determined Contribution. National contribution to the fight against global warming. Document prepared voluntarily by the countries, before COP21, describing their objectives for the 2025-2030 horizon and published on the UNFCCC website.

International Solar Alliance: a coalition launched at COP21 on the initiative of the Indian Prime Minister. It aims to federate the cooperation between developing and developed countries to attract investment and technologies in the solar energy sector.

IPCC: Intergovernmental Panel on Climate Change.

IRENA: International Renewable Energy Agency. This agency supplies products and studies to help the countries develop renewable energy.

ITMO: Internationally Transferred Mitigation Outcome. This term was used in the Paris Agreement (art. 6) with reference to opening the possibility of implementing carbon credits.

MRV: measuring, reporting and verification. A system of measuring, reporting and verification of carbon emissions, allowing climate policies to be managed on every scale: between States, as part of a programme, as a tool, in companies...

OECD: Organisation for Economic Cooperation and Development.

PBOC: People's Bank of China, the central bank of the Republic of China.

PPP: public-private partnerships.

PRI: Principles for Responsible Investment.

SDG: Sustainable Development Goals. Set of 17 goals, valid for developed countries and developing countries alike for conducting economic development, taking into consideration social and environmental requirements, adopted in 2015 by the United Nations.

SDR: Special Drawing Rights.

SRI: Socially Responsible Investment. Designates the steps taken by investors to have their asset management incorporate sustainable development. It consists in applying ESG criteria to the investment choices, in addition to the risk/return criteria.

Stranded asset: a concept created by the Carbon Tracker think tank: assets that "*at some time prior to the end of their economic life, are no longer able to earn an economic return, as a result of changes in the market and regulatory environment associated with the transition to a low-carbon economy.*"

The Kyoto Protocol: an international agreement on climate change, adopted in 1997 and which entered into force in 2005. This agreement set the terms for the reduction of GHG emissions by 38 developed countries (its Annex A), and introduced flexible mechanisms to achieve them: ETS between countries subject to reduction and possible offsetting by credits issued essentially by "low-carbon" projects in developing countries. The Kyoto Protocol applies up to the entry into force of the Paris Agreement, scheduled for 2020.

UNEP: United Nations Environment Programme.

UNFCCC: United Nations Framework Convention on Climate Change. International treaty adopted during the Rio de Janeiro Earth Summit in 1992. It has a secretary general and a permanent administration. Its member states meet every year (see COP).

Warsaw Mechanism: a mechanism created during the 2013 Warsaw COP19, designed to remediate for the loss and damage caused by climate change. The mechanism is included in the Paris Agreement.

World Bank: an international public financial group comprising essentially:

– the International Bank for Reconstruction and Development (IBRD), which provides loans to member and public entities;

– the International Financial Corporation (IFC), which funds the private sector;

– The Multilateral Investment Guarantee Agency (MIGA), which insures foreign direct investments against country political risks;

– The International Development Association (IDA), which provides concessional loans and grants to the least developed countries.

The World Bank Group has set itself the aim of increasing the share of its financing related to climate change from 21% in 2015 to 28% by 2020. Its strategy consists in increasing the leverage of its financing of private funding.

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CLIMATE THE FINANCIAL CHALLENGE

Climate change: a challenge for the financial sector

Long seen by the financial sector as a marginal issue driven by a few pioneers, in recent years, climate change has become a central issue for the entire finance industry. This book, based on the belief that the financial sector has all the means to make an essential contribution to the shift of the world's economy to a carbon neutral model, shows how this transition is already underway and how it can be accelerated.

The book

A massive reallocation of investments is required if global warming is to be maintained within the 2°C objective. The transition consists of ceasing to finance high-carbon emitting activities, promoting "green" financing and supporting new, lower-carbon economic models. This is what we call 'climate finance'.

The 2015 Paris Agreement is a central lever for a successful global economic and ecological transition. Is the financial sector ready to put this transition into action? What is driving this change? Public pressure? Government action? Or simply a recognition by the financial industry of the risks of not acting and the opportunities this transition presents?

"Climate: The Financial Challenge" describes and explains, from an informative point of view and using a style which is accessible to lay readers, the levers for action in various branches of the financial sector and how they interact with international and local public policies.

It also describes how stakeholders in the financial sector recently came to recognise climate issues: the origins and benchmarks of this process, and the acceleration which is underway. It presents the outlook for green finance as the future of the finance sector.

The authors

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Preface by Pascal Canfin, Director General of WWF France and former French Minister for Development.

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