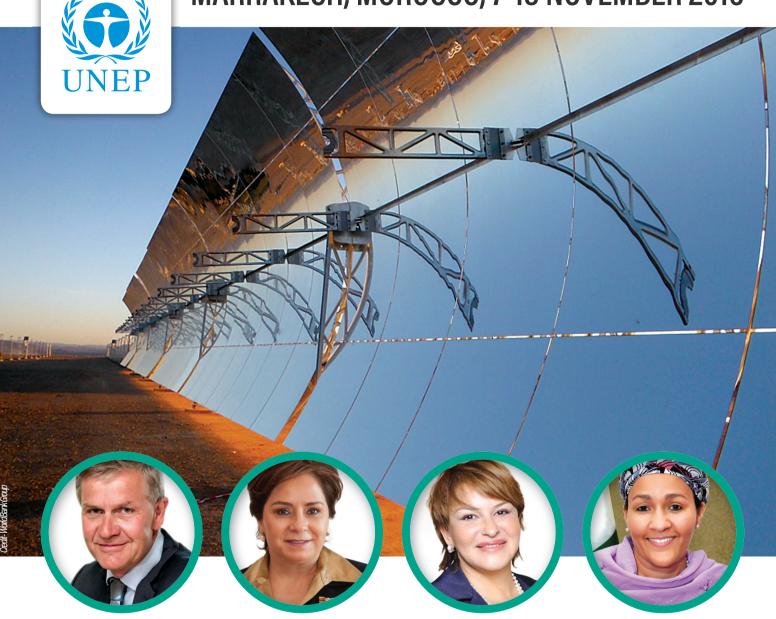
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CLIMATEACTION



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limate Action has provided a global reference point for sustainable innovation since its launch at COP13 in Bali. It is recognised as a leading international platform to assess and promote sustainability, environmental protection, clean technologies, and the innovations that are driving low-carbon growth and the green economy. This 10th anniversary edition features world-class thought leadership from ministers, United Nations leadership, business leaders and experts in finance and industry.

Climate Action works in a unique partnership with UN Environment (UNEP) – the world's foremost body on environmental protection and stewardship. We would like to thank the outgoing Executive Director, Achim Steiner, for his unwavering support of Climate Action since its inception, and extend a warm welcome to Erik Solheim in his new position as Executive Director.

Last year's COP21 in Paris proved historic, as a legally binding global climate target was agreed by all 196 member parties with the aim of capping climate change well below two degrees of warming. Countries are now tasked with developing strong low carbon strategies, driving the partnerships and funding opportunities to accelerate this transition. This year's COP22, taking place in Marrakech, Morocco, represents the first COP at which these pathways will begin to be identified, and this publication acts to galvanise consensus on international decision making and catalyse decisive action.

Official supporters include the world's leading international non-governmental organisations; C40 Cities, the International Renewable Energy Agency, the World Energy Council, the World Resources Institute, the World Business Council for Sustainable Development, the World Green Building Council, the European Automobile Manufacturers' Association, the World Water Council, The Center for International Forestry Research and Climate Policy Initiative, and with their support the edition will be distributed around the globe.

This edition presents the nationally determined contributions from a wide range of countries around the world, as well as the most innovative and sustainable private sector organisations, including ACWA Power, Coca Cola, The BMW Group, Siemens, Vattenfall and Amundi, which each present their own actions and solutions for combatting climate change.

We hope you find this 10th anniversary edition of Climate Action an engaging and stimulating read.

Nick Henry, Founder & CEO, Climate Action

Find out more at www.climateactionprogramme.org

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The C40 Cities Climate Leadership Group, now in its 11th year, connects more than 85 of the world's greatest cities, representing 650+ million people and one guarter of the global economy. Created and led by cities, C40 is focused on tackling climate change and driving urban action that reduces greenhouse gas emissions and climate risks, while increasing the health, wellbeing and economic opportunities of urban citizens. Michael R. Bloomberg serves as President of the Board and C40's work is made possible by our three strategic funders: Bloomberg Philanthropies, Children's Investment Fund Foundation (CIFF), and Realdania.



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a CEO-led organisation of some 200 forward-thinking global companies, is committed to galvanising the global business community to create a sustainable future for business, society and the environment. Together with its members, the council applies its respected thought leadership and effective advocacy to generate constructive solutions and take shared action. Leveraging its strong relationships with stakeholders as the leading advocate for business, the council helps drive debate and policy change in favour of sustainable development solutions.



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Climate Policy Initiative's mission is to help nations grow while addressing increasingly scarce resources and climate risk. This is a complex challenge in which policy plays a crucial role. CPI works to improve the most important energy and land use policies and business practices around the world, with a particular focus on finance. Analysts and advisors support decision makers through in-depth analysis on what works and what does not. CPI works in places that provide the most potential for policy impact, including Brazil, China, Europe, India, Indonesia, and the United States. Services include advisory and convening, analysis and assessments, and design and implementation of new solutions.



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The Center for **International Forestry** Research (CIFOR) is a non-profit, scientific facility that conducts research on the most pressing challenges of forest and landscape management around the world. Using a global, multidisciplinary approach, CIFOR aims to improve human well-being, protect the environment, and increase equity. To do so, they help policymakers, practitioners and communities make decisions based on solid science about how they use and manage their forests and landscapes.

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395

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FOREWORD CLIMATE ACTION FOR COP?

By Erik Solheim, Under-Secretary-General of the United Nations and Executive Director of UN Environment (UNEP)

his 10th Anniversary Edition of Climate Action comes at an extraordinary time, On the 5th October 2016 the landmark Paris Climate Change Agreement came into force, as 55 Parties covering more than 55 per cent of global greenhouse gas emissions ratified the Agreement. This is an incredible political achievement. The speed at which countries have made the Paris Agreement's entry into force possible is unprecedented, and reflects a consensus among governments that robust global cooperation is essential to tackle the climate challenges we face. But this is also just the start. We must not allow this to become a wasted opportunity, and we have to keep up the momentum. Countries must act on their promises quickly and in unison if we are to stand any chance of blunting the most serious impacts of climate change.

Whilst COP21 marked an incredible turning point, paving the way forward from this momentous occasion is just as important. This year's COP22

"Climate change is an issue that no one country or organisation can solve by themselves and we must work together to tackle this global threat."

- taking place in Marrakesh - aims to do exactly that. With a central focus on driving policy implementation and enhancing ambition, the COP will strongly encourage and facilitate international cooperation and support to achieve this. Climate change is an issue that no one country or

organisation can solve by themselves and we must work together to tackle this global threat.

In this edition of Climate Action, world-class thought leaders - from Government, the United Nations, business, finance and industry - explore proactive collaboration for the delivery of more effective, scaled-up climate action in line with the Paris Agreement and Sustainable Development Goals. A key aim of this edition is to demonstrate the need for enhanced private sector involvement. Delivering on the Paris Agreement will require significant investment and finance, as well as commitment from all sectors. The creation of public-private partnerships will be a key part of the process, particularly in the development of clean technologies.

A second theme apparent throughout is the need to support and invest in emerging regions, including Africa and parts of the Middle East, Latin America and Asia. The need for less developed countries to access international



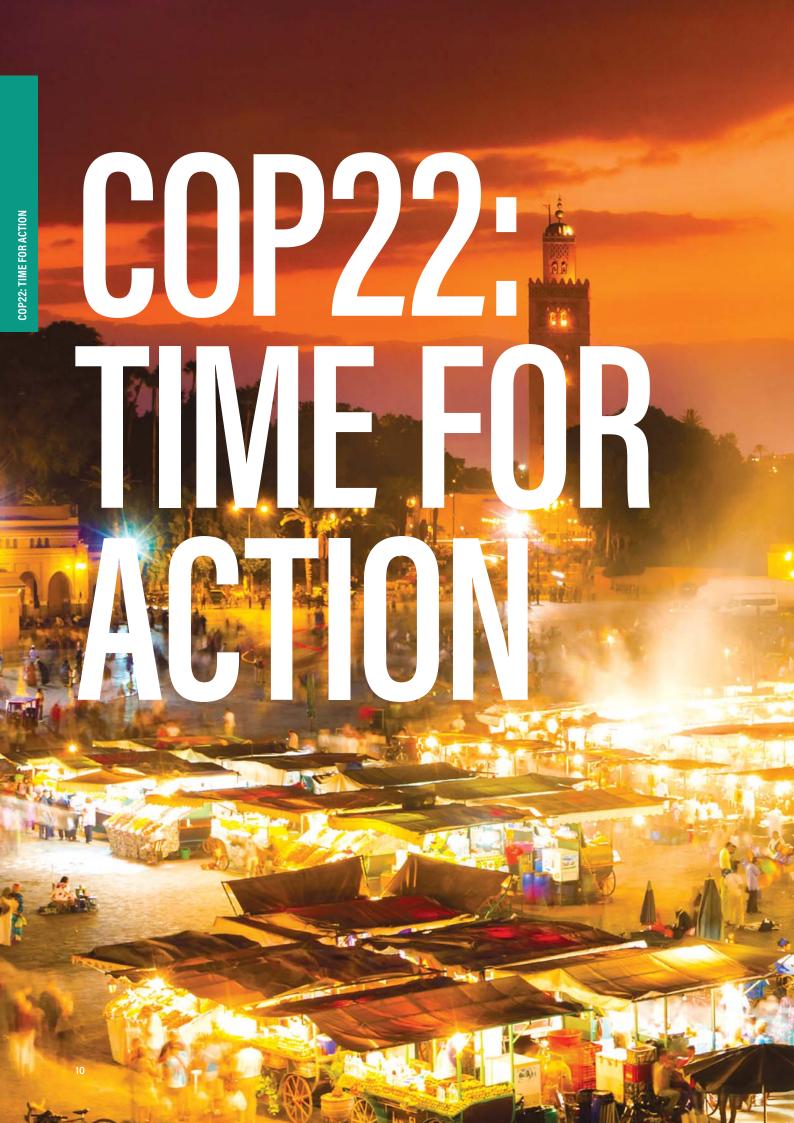
climate funds for addressing renewable energy production, agriculture, water security and low carbon innovation is critical and immediate. In response, Climate Action explores some of the financing mechanisms, including the \$100 billion pledged by developed countries, and how we can leverage even larger sums from investors, banks and the private sector.

Thirdly, the Paris Agreement has opened up numerous opportunities and challenges for all countries in various ways and at differentiated levels. This edition focuses on the necessity of *adaptation* policies to move forward immediately with the technologies and tools we already possess, as well as plans for future developments. By showcasing the national climate action plans of Morocco, Germany, Iceland, Nigeria, Finland, Brazil, Chile and Canada, Climate Action aims to encourage different countries and leaders to learn from each other to achieve common goals.

Having spent most of my career fighting for the environment in national and global politics, I am honoured to be leading UN Environment into the future at this critical juncture in history. During Achim Steiner's 10 years at the helm, he succeeded in inspiring and leading significant transformation of UN Environment into a strategically powerful and substantively confident organization, and I aspire to continue his legacy. I look forward to working with member states and welcoming partners from all sectors to strengthen climate policy and action. The expectations are high, but together, I am confident we can achieve them.

Erik Solheim was elected as Executive Director of UNEP on May 13, 2016. Prior to joining UNEP, he was the chair of the Development Assistance Committee (DAC) of the Organization for Economic Co-operation and Development (OECD). From 2007 to 2012, Erik Solheim held the combined portfolio of Norway's Minister of the Environment and International Development, and from 2005 to 2007 served as Minister of International Development. He has served as UNEP's Special Envoy for Environment, Conflict and Disaster since 2013 and a Patron of Nature for the International Union for the Conservation of Nature (IUCN) since 2012.

The United Nations Environment Programme (UNEP), or UN Environment, is the voice for the environment in the United Nations system. It is an advocate, educator, catalyst and facilitator, promoting the wise use of the planet's natural assets for sustainable development. UNEP's mission is "to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations".





Hakima El Haité, Minister of Environment of the Kingdom of Morocco, Moroccan Climate Champion, and member of the Steering Committee of COP22, discusses the need for momentum, mobilization and adaptation at this year's COP and encourages partnerships to achieve all Sustainable Development Goals.



Between hunger eradication and universal access to quality education, two of the 17 sustainable development goals supported by the UN, everyone will agree that there is not the same degree of urgency. For one thing, hunger is the expression of an absolute and vital need. Education is, in turn, a form of accomplishment. But it cannot take effect if the issue of hunger has not itself been previously resolved.

Today, according to the UN Food and Agriculture Organization (FAO) in its 2016 report on the global *State of Food and Agriculture*, which has just been published, the effects of climate change on agriculture could plunge into extreme poverty 35 to 122 million additional people by 2030, especially in sub-Saharan Africa, South and Southeast Asia. In addition, in 2050, world food demand is expected to have risen at least 60 per cent from its 2006 level, due to population growth, rising incomes and rapid urbanisation.

In the same document, the FAO calls for a profound transformation of agricultural and food systems – themselves highly polluting – to help small farmers in developing countries, representing 475 million households, to make a transition to sustainable management of land, water, fisheries and forests. "Climate change brings back some uncertainty from the time when we were all hunter-gatherers," explains José Graziano da Silva, Director-General of FAO. "We cannot guarantee that we will reap what we have sown."

This worrying observation reminds me of the famous motivational pyramid proposed by Abraham Maslow, who told us that a human being succeeds in life when he or she has progressively climbed a pyramid of five steps. First, the base represents the satisfaction of basic physiological needs: eating, drinking, sleeping, breathing, living. Then, on the second level, we find physical safety, and also security through work or health. The third and fourth stages are more personal but equally essential. One concerns the emotional needs of love and belonging. The other brings esteem through trust, respect for others and selfesteem. The fifth and last stage is that of personal fulfilment, achieving all that we are capable of. Maslow said that no one can reach the top of the pyramid if all the other levels have not been consolidated in succession.

What is true of individuals can also be applied to sustainable development across the globe. We will not achieve the Sustainable Development Goals (SDGs) fully until we pass successively through a number of steps. Food security is an essential. But we must also create nationally and internationally the many facets of sustainable economic development. It is particularly important that growth in the South is pursued in a manner sparing in carbon, or indeed carbon-free.

"The effects of climate change on agriculture could plunge into extreme poverty 35 to 122 million additional people by 2030."

For this, we must innovate, build, act, to change the world. This mobilisation will be the watchword of COP22 in Marrakech. COP22 will follow on from 2015, a historic year for humanity with the adoption of the Paris Agreement, the most impressive multilateral agreement in decades, not only because of its ambitious goals but also because, as noted by UN Secretary-General Ban Ki-Moon, it carries the potential for a global transformation.

2015 was the year of political will, in which we adopted the Sendai Framework and the Addis Ababa Action Agenda. We undertook the SDGs, something plenty of people thought was impossible; and we adopted the Paris Agreement.

DIMENSIONS OF URGENCY

After 21 years of development in international climate negotiations, 2016 has opened up a time for action. It has already shown this with the announcement of the entry into force of the Paris Agreement – a world speed record in the history of treaties – but also with the giant step that is the amendment in Kigali of the Montreal Protocol, accelerating the fight against HFCs, those super-pollutants of the atmosphere. Finally, we are holding COP22 in Marrakech, a catalyst for action, and a demonstration to the world that the transformation to a low carbon society is already a reality.

"After 21 years of development in international climate negotiations, 2016 has opened up a time for action." Faced with so many dimensions of urgency, Morocco became engaged on the road to COP22 with this positive vision. As COP22 host and with the incoming COP presidency, it is our duty and our passion to make sure that COP22 responds to the mounting demand with concrete results. Morocco therefore has a special responsibility.

Morocco is prepared, not only from a logistics point of view, but also by decades of ambitious environment and climate-resilient policies under the leadership of King Mohamed VI. We have a long history of adaptation, since the 1960s when we implemented our water and agriculture policies to guarantee drinking water and food security. In 2008 we developed our famous energy policy, which is now brought to fruition through the installation of the largest concentrated solar power (CSP) plant in the world. In 2011, we wrote sustainable development into the Constitution, and today Morocco has its sustainable development law and its green investment plan.

Capacity building, combined with meaningful technology transfer, is the backbone of the success of our efforts in the fight against climate change. Concerning adaptation, we would like to encourage a large number of countries to announce their National Adaptation Plan at COP22. Together, we will demonstrate that climate change can be transformed from one of mankind's biggest perils into one of humanity's most promising and transforming challenges.

Financing tools are high on the agenda of developing countries, and one of the key components of practical application of the Paris Agreement. We need to secure the phased achievement of the annual US\$100 billion goal by 2020, and to stimulate the pooling and more efficient use of a vast number of existing financial instruments.

This involves the accelerated development of climate finance tools, both public and private, including innovative financing, carbon pricing, taxes and, of course, the redirection of the US\$4,000 billion of fossil sector global subsidies (6.5 per cent of global GDP!) to clean and renewable energy, infrastructure, energy efficiency, and all other components of the transition to a green economy.

As we have the upcoming presidency, we consider it important to develop strong arguments for the business case for adaptation, to attract investment and scale up the spread of adaptation finance to a level that is more adequate to global requirements. We plan to promote a global effort to quantify adaptation needs, and a robust push to develop adaptation finance. The funding will probably be the largest technical assistance campaign in history.



"I welcome you to Marrakech where the world is waiting for all of us to bring solutions, innovations, and hope for a better world."

"Together, we will demonstrate that climate change can be transformed from one of mankind's biggest perils into one of humanity's most promising and transforming challenges."

INCLUSION OF NON-STATE ACTORS

We need to maintain the momentum of progress. We are deeply convinced of the crucial importance of the inclusive mobilisation of non-state actors. What we call the Lima-Paris Action Agenda (LPAA) should become Everyone's Climate Action Agenda – because we need to fill the gap in emissions action between now and 2020.

Because we are innovators; and because we are the driving force for a real and profound transformation of society, as promised in the SDGs and the Paris Agreement.

That's why it is important to think about the governance of the LPAA to guarantee its sustainability, and to reinforce the bridges between non-stakeholder actions, the goals of the Paris Agreement, the NDCs and financing and policies.

A DECISIVE STEP

I want COP22 in Marrakech to go down in history as a decisive step in the implementation of everything we have imagined, discussed, written for 21 years in the fight against global warming. In 2030 the middle classes will form two-thirds of the world's population, about 5.5 billion people. This means that all over the world, especially in developing countries, we have a critical mass of educated citizens who could reach level five of the Maslow pyramid.

It is up to us, here and now in COP22, to implement the promise of future personal achievement, for ourselves and for the development of the human community.

Collectively, we mobilised to ratify the Paris Agreement. We have added a level of credibility

by the amendment of the Montreal Protocol. COP22 must be the COP of forging a new partnership between state and non-state actors.

It is the COP of action, where we lay the foundations of global coherent progress. It is the COP where everyone becomes involved. Let's create hope in Marrakech; let's build confidence.

I will end by welcoming all of you to Marrakech, where the world is waiting for all of us to bring solutions, innovations, and hope for a better world.

Bienvenus à Marrakech.

H.E. Dr. Hakima El Haité is the current Minister Delegate in Charge of Environment of the Ministry of Energy, Mining, Water and Environment of Morocco and the high-level Climate Champion of Morocco and COP22. Dr Haité is a member of the executive board of the Popular Movement (MP), Chairwoman of the International Relations Committee, Vice-president of U.S-NAPEO (North Africa Partnership for Economic Opportunity), chairman of Connectingroup International and deputy chairwoman of the Liberal International for Women.



THE GAME HAS CHANGED FOR GOOD



As the Paris Agreement enters into force, Patricia Espinosa, Executive Secretary, UN Framework Convention on Climate Change (UNFCCC) reinforces that climate action is at the heart of global development and highlights the priorities that are central to its success.

The Paris Climate Change Agreement changed everything. The international effort to bring it into force in under a year carries the clear message that we must now be swift in the execution.

Climate action – faster and smarter, bigger and better – is now at the heart of humanity's essential response to the existential threats that climate change and environmental decay present for sustainable development, peace and the well-being of all people.

In 2015, the countries of the world constructed a fresh, integrated vision which aims to set all societies and economies on the path to a low-carbon, resilient future. This vision, captured in the Paris Agreement, the 2030 Agenda for Sustainable Development and Sendai Framework for Disaster Risk Reduction, reflects a unique unity of purpose to shift completely the way we produce, consume and build onto a clean, efficient and durable model.

These momentous agreements now require unprecedented scale and depth of universal action involving all actors at all levels in all regions of the world. The challenges will be enormous. The rewards of success will be greater.

The timetable is pressing, a fact which the UN climate change COP22 conference in Marrakech must have at the front of its concerns. In a short time, by the normal reckoning of human history, we need to see unprecedented reductions in greenhouse gas emissions and unequalled efforts to build societies that can resist rising climate impacts.

There are two absolute priorities. First is a much faster, fundamental shift in flows and incentives of investment away from unsustainable power generation, infrastructure, pollution and waste.

Second, the leadership and commitment of all governments remains central to success.

PARIS TO MARRAKECH - ENTRY INTO FORCE

Climate action contributes directly to the goal of greater human well-being captured in the 17 Sustainable Development Goals. It protects lives and livelihoods, improves public health, creates new industries and sustainable farming, cuts costs for governments, business and citizens and opens up new avenues of clean industry and stable investment.

The Paris Agreement's primary goal – to limit global warming to well below 2°C and as close to 1.5°C as possible to prevent dangerous tipping points in the climate system – means that global emissions must peak soon and be driven down drastically thereafter. A balance must be achieved in the second half of this century between global emissions and removals through sequestration into ecosystems or through other means.

"Climate-friendly national policies are central to the successful delivery of the Paris goals."

That is why the annual UN climate change conference in Marrakech represents a new departure for the international community.

COP22 opens only days after the Paris
Agreement enters into force and the first
meeting of the Agreement's governing body,
known as the CMA, will take place during the
conference. This is a moment to celebrate –
but more importantly a moment to commit
to the new agenda of rapid and robust
implementation and action that the goals of
the Agreement demand, not least in pressing
forward with adequate support to help the most
vulnerable countries take climate action.

Marrakech gives governments the opportunity to present a roadmap to mobilise the pledged 100 billion dollars in annual support by 2020, to increase clarity for adaptation finance and for a mechanism to strengthen capacity building, which assists developing countries to build up the skills and institutional strengths to take greater climate action.

We will see initiatives that support the implementation of Nationally Determined Contributions – national climate plans – and help integrate them into each country's development agenda alongside the Sustainable Development Goals also adopted in 2015.

Marrakech is also the opportunity to strengthen the partnerships that accelerate the transition towards a low-emissions future and promote the sustainable development goals which governments have committed to meet.

NATIONAL POLICY CRITICAL TO RAPID PROGRESS

Climate-friendly national policies are central to the successful delivery of the Paris goals. This is especially so because the Agreement's success rests on full implementation of the global set of national climate plans. This requires continued political leadership and momentum, supported by a clearly presented and growing public understanding of the enormous social, health and economic benefits that will accrue to citizens everywhere from strong, escalating climate action.

Key to the transformation will be the way governments integrate climate action and implement sustainable development and risk management goals across sectors and ministries.

More climate-friendly, coordinated laws, policies and incentives are needed. All forms of unequal treatment favouring old growth and development models based on fossil fuels and high-carbon lifestyles and aspirations must be removed as quickly as possible.

In addition to environmental policy, energy, industry, fiscal, trade, transport and farm policies should all work in a concerted, coherent manner to enable every country to accomplish their Paris Agreement and Sustainable Development Goal contributions.

FINANCE, FINANCE, FINANCE

Undoubtedly, a much faster flow of finance for climate action is required, if the world is to meet the ambitious goals of these agreements.

UN estimates show that achieving sustainable development will need US\$5-7 trillion a year, a large slice of which must fund the essential transition to a low carbon, resilient global economy. Governments, multilateral and private sector institutions need to be able and willing to raise and allocate tens of billions of dollars at a time towards climate and sustainable investments.

Meanwhile, smaller-scale funding must be available to allow the individual investor, smaller companies and poorer countries without easy access to big money to take a full and willing part in this economic transformation.

The shift is already under way from across the public and private sector, including governments, multilateral development banks, dedicated funds like the Green Climate Fund, companies and private sector financial institutions. Innovative financial instruments are being issued in record amounts – Green Bonds and Climate Bonds – and new ones for new challenges are being considered, for example Catastrophe Bonds.

Only this month, the UN launched the Financial Innovation Platform to bring together all key public and private financial actors to identify and pilot innovative finance instruments.

The past year has seen new, major commitments. For example, the Green Climate Fund has over US\$10 billion pledged from governments. All the multilateral development banks will allocate many billions of dollars more over the next few years for climate action – which will leverage many times more that amount of private sector funding. A suite of financial instruments and channels is therefore being created to ensure that the wide range of climate needs can be addressed across the globe and to mobilise larger-scale flows.

The only sector with the money, resources and reach to support governments in full implementation of climate action is the private sector. The great



breakthrough before and beyond Paris is that business and investment are increasingly convinced that their own profitable future is inextricably linked to low-carbon, sustainable development and universal human well-being.

Increasing private sector appetite to fund the transformation directly is essential. Tens of trillions of dollars sit in banks and on corporate balance sheets at low, zero, even negative, interest rates looking for bankable projects with real returns if the right incentives and sureties are provided by national governments, supported by the international community and its multilateral lenders.

PARIS, MARRAKECH AND BEYOND - THE GAME CHANGED FOR GOOD

The game has changed for good. Let us remind ourselves why that is so.

In Paris, governments publicly accepted responsibility to lead climate action. They presented a global set of national plans to take immediate action, pledging never to lower efforts over time and, whenever possible, to raise ambition.

They agreed to complete the details of a transparent global regime, a rulebook which will account for, review and underpin greater action by all sides. Governments are keen to complete this – and the early entry into force makes it important that this is done by 2018 at the latest to sustain the required momentum.

And governments agreed not only to complete but also to strengthen adequate technology and financial support to developing nations.

To reach its full potential, governments will now engineer the ambitious design of the Paris Agreement into a well-oiled machine of these fully functioning working parts capable of accelerating climate action to meet the agreement's stated aims and goals.

Achieving the aims and ambitions of the Paris Agreement is not a given. The world needs to understand the urgency and complexity of what the international community has embarked upon. This is a multi-decadal effort to turn around two centuries of development based on fossil fuels and the excessive exploitation of finite natural resources into an all-embracing, sustainable path for every nation, man, woman and child.

But I am confident that world leaders and the enormous groundswell of support from cities, companies, investors and citizens can propel ambition further and faster in support of our shared vision of a climate-secure and sustainable future.

Patricia Espinosa of Mexico is Executive
Secretary of the United Nations Framework
Convention on Climate Change (UNFCCC). She
took office in July 2016. Ambassador of Mexico to
Germany since 2012 and from 2001 to 2002, Ms
Espinosa was Minister of Foreign Affairs of Mexico
from 2006 to 2012, bringing more than 30 years
of experience at highest levels in international
relations, specialised in climate change, global
governance, sustainable development, gender

equality and protection of human rights. As Mexico's representative on multilateral bodies and international organisations in Vienna, Geneva and New York, she has been engaged as leader in the global challenge to address climate change and its consequences, notably as Chair of the 16th Conference of the Parties to the UNFCCC leading to the adoption of the Cancún Agreements. Ms Espinosa's previous roles include member of the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda, Chair of the Third Committee of the UN General Assembly, Ambassador of Mexico to Austria, Slovakia, Slovenia and UN Organisations in Vienna, and Chief of Staff to the Undersecretary of Foreign Affairs.

The United Nations Framework Convention on Climate Change (UNFCCC, http://unfccc. int) has near universal membership with 197 Parties, and is the parent treaty of the 1997 Kyoto Protocol. The Kyoto Protocol has been ratified by 192 of the UNFCCC Parties. The ultimate objective of both treaties is to stabilise greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system. On 5 October 2016, the threshold for entry into force of the Paris Agreement was achieved, bringing it into force on 4 November 2016. The first session of the Conference of the Parties serving as the Meeting of the Parties to the Paris Agreement (CMA1) will take place in Marrakech in conjunction with COP22 and CMP12.

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THE IPCC'S SCIENTIFIC ASSESSMENTS OF CLIMATE CHANGE



Dr Hoesung Lee, Chair of the Intergovernmental Panel on Climate Change (IPCC), sets out the Panel's contribution to the implementation of the Paris Agreement, and gives details of the next stages leading to the global stocktake in 2023.

The Paris Agreement, taken together with the Sustainable Development Goals of the 2030 Development Agenda and the Sendai Framework for Disaster Risk Reduction, shows how the international community can come together to meet environmental and development challenges. In this article I will examine how the Intergovernmental Panel on Climate Change is contributing to the practical details of implementing the Agreement.

The Paris Agreement makes it clear that the global stocktake – the five-yearly review of contributions and commitments by state to reach the common goal of holding global warming well below 2°C and if possible to 1.5°C – will be based on the future reports of the IPCC. And COP21 asked the Climate Panel to undertake an immediate assessment of the impacts of warming of 1.5°C and related emissions

pathways, to be delivered in 2018, in time for the facilitative dialogue at COP24 on the stocktake.

The IPCC has already started work on the 2018 special report, scoping out the outlines – the table of contents and the structure – and calling for nominations of authors. The report is attracting intense interest and has kick-started activity in the research community.

TWO SPECIAL REPORTS

At this point we have very little knowledge of what warming of 1.5°C means, compared with 2°C or more. We know that the survival of many small island states is vulnerable to sea-level rise, which could be initiated by warming above 1.5°C, but we need a much better understanding of what it would entail, how it would affect other parts of the world, and of the emissions pathways, including overshoots, that would take us there.

"Effective policies to control emissions depend on our ability to measure them accurately, and to compare them across countries."

Besides the assessment of 1.5°C, governments asked the Climate Panel to

PATHS TO PARIS

It is worth recalling how the IPCC's work laid the foundations of the Paris Agreement. The 200 nations that reached agreement at COP21 were able to do so because that agreement was soundly based on science. The Paris Agreement was informed through and through by the findings of the Climate Panel's last comprehensive assessment the Fifth Assessment Report (AR5). This was rolled out in 2013 and 2014 and presented to policy-makers and the public around a series of events, including, significantly, a series of presentations for negotiators at the UNFCCC, known as the Structured Expert Dialogue. That gave negotiators the opportunity to drill down into the detail of AR5 in discussion with the authors, allowing them a solid and in-depth understanding of the science and its implications.

prepare two other special reports – one on climate change and oceans and the cryosphere, and one on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. The report on oceans will examine the interplay of melting ice sheets and sea-level rise, as well as the impact of climate change on important sources. The one on land-related issues will consider, among its range of topics, vital questions of food and water that are highly relevant to an understanding of how communities can survive and thrive.

Both these reports will be delivered in 2019, a year that will also see the IPCC complete an update of its methodology reports. These methodologies are produced by the Climate Panel to enable countries to measure their greenhouse gas inventories – emissions less withdrawals. After all, effective policies to control emissions depend on our ability to measure them accurately, and to compare them across countries.

AR6 AND SYNTHESIS

The full sixth assessment, or AR6, will roll out in 2021, to be capped by the Synthesis Report in 2022, in time for the global stocktake in 2023.

We will hold a scoping meeting for AR6 in May 2017, but already we can describe some key features. AR6 will pay special attention to climate change and cities, which already house half the world's population, a proportion that will rise to two-thirds by 2050. Cities thus

offer particular challenges and opportunities for mitigation and adaptation. We will cosponsor a conference on climate change and cities in 2017 to encourage research on this topic to feed into a special report on cities in the next assessment cycle starting in 2023. The infrastructure stock of developed countries is five times that of developing countries, so it seems reasonable to conclude that efforts to tackle climate change will depend on how developing countries build out their infrastructure.

We also hope in this report to fill some of the gaps in regional knowledge. We have a good understanding now of climate change impacts at the global scale, but for policy-makers what is most relevant is the local level and we must provide that information.

Similarly, we have a broadly good understanding of the mechanics of climate change, even if there are some important areas where more understanding of climate phenomena and their causes is required. But in AR6, as the world looks to implement the Paris Agreement, we must put an emphasis on solutions as much as on basic climate science. For this reason the IPCC will be tapping social scientists, political scientists, economists and psychologists to help us understand the decision-making framework, and how policies can be delivered effectively. This in turn means grappling with questions of equity and justice, for effective policies ultimately derive from values.

One whole complex of questions that we need to examine more closely is the economics of climate change. We must look at how ecology and economy interact so that we can get a better understanding of the costs of climate change, including the costs

"The IPCC has already started work on the 2018 special report, scoping out the outlines - the table of contents and the structure and calling for nominations of authors." "An appreciation of the economics of climate change involves not only the costs of action, but the opportunity costs of inaction."

to ecosystem services. An appreciation of the economics of climate change involves not only the costs of action, but the opportunity costs of inaction, and thus the benefits of action. One example would be the advantages in terms of healthcare and quality of life that arise from clean energy. The World Bank has calculated that air pollution costs the global economy US\$5 trillion a year, with about 5.5 million lives lost to related diseases in 2013.

An understanding of these linkages can make clear why it is in countries' own interests to avoid locking in high-carbon infrastructure as they build up power capacity, just as doing so would put the 2°C goal out of reach for the world, by burning up the remaining carbon budget.

Already we have a good idea of what we need to do to respond to the challenges of climate change, to adapt where we can, and to mitigate to ensure that adaptation remains possible. The assessments that the IPCC will produce in the coming years will build out that knowledge and provide policy-makers with the information base they need to take the necessary action.

Dr. Hoesung Lee was elected as IPCC Chair in October 2015 after being its Vice-Chair from 2008 to 2015. He is an Endowed Chair Professor at Korea University Graduate School of Energy and Environment. His research encompasses the economics of climate change, energy and sustainable development.

The IPCC is the world body for assessing the science related to climate change. It was set up in 1988 by the World Meteorological Organization (WMO) and UN Environment to provide a clear scientific view on the current state of knowledge on climate change and its potential environmental and socio-economic impacts.

RESOURCES



A meaningful transition to low-carbon, resilient economy requires innovative technologies, investment and a strong commitment. We commend the world leaders present at COP 22 for their response to the climate change challenges we are facing today and those for generations to come.



MAINTAINIG THE PARIS MOMENTUM



Janos Pasztor, Senior Advisor to the UN Secretary-General on Climate Change, celebrates the uniqueness of the Paris Agreement, but warns that swift action is necessary if the temperature goals are not to be missed.

he importance of the 2015 UN Conference on Climate Change in Paris and the resulting Paris Agreement cannot be sufficiently underscored. It was a tremendous success in that it showed that multilateral action under a United Nations framework can deliver results. At least four specific success areas need to be highlighted.

Firstly, Paris was a political success that surpassed all expectations. On the first day of the conference 150 heads of state and government leaders came together, all under one roof, on one day - a historical record - and they all spoke of the importance of climate change and the urgency for action; and they instructed their negotiators to negotiate an ambitious agreement. These leaders did not negotiate the agreement themselves, but they gave strong political guidance at the appropriate time. Moreover, by the beginning of the meeting, some 188 Parties had also deposited their initial Nationally Determined Contributions (NDCs), or bottom up national climate change plans. This itself was a big success, showing that all countries were serious about undertaking climate action.

"The goals together provide a clear signal to investors, technology developers, insurance companies, as well as various other non-state actors about the low carbon, low emissions era that the world has agreed to."

Secondly, the Paris Agreement has a clear vision about the direction the world needs to go. It agreed on a very ambitious goal to keep global temperature rise to well below 2°C, and if possible consider keeping it below 1.5°C above

historical average. This temperature goal was then combined with the objective to reach a balance between global emissions and sinks of greenhouse gases in the second half of this century – in other words to reach a net zero emissions scenario at the global level. The goals together provide a clear signal to investors, technology developers, insurance companies, as well as various other non-state actors about the low carbon, low emissions era that the world has agreed to in Paris. The direction of travel has become clear.

Thirdly, the Agreement has a series of legally binding provisions on countries having to take action on mitigation, adaptation, provision of financial resources, and on participating in a transparent reporting and monitoring framework.

Fourthly, the Paris Agreement was a success not only because of the full participation of governments in the final agreement, but also because of the tremendous active participation of representatives of the non-state sector, especially through the 'Action Agenda', where they demonstrated what they were already doing on climate action, and what else they were prepared to do in the future.

TOWARDS THE FUTURE

The political momentum of the Paris Agreement continued in 2016. The UN Secretary-General, together with other leaders, encouraged countries to speed up their formal signature of the agreement (the intention to ratify), and then to speedily undertake domestic processes of different kinds to formally ratify the agreement. These efforts have paid off. The double trigger of reaching 55 ratifications and 55 per cent of global emissions to be covered by those countries ratifying necessary for the entry into force of the Paris Agreement was reached in October, and 30 days thereafter, on 4 November the Agreement has formally entered into force. This means that COP22 in Marrakech in November 2016 is also the first meeting of the Parties to the Paris Agreement.

The speed at which the Paris Agreement has entered into force is unprecedented, and indeed unique for a treaty of this importance. The original Framework Convention (the UNFCCC) took three years to enter into force, while the Kyoto Protocol took eight years! So the rapid entry into force demonstrates political will by a large number of countries to continue the momentum of the Paris Agreement, so that implementation can start as soon as possible.

One of the unique features of the Paris Agreement is that while it is a legally binding requirement for Parties to present and implement national climate plans (NDCs), the content - that is, the ambition level of the mitigation, adaptation and financing efforts - is up to the country to decide (the reason why these plans are called 'nationally determined' contributions). So the real success of the Paris Agreement will start if leaders, together with their relevant ministers, ensure at the domestic level that the NDCs are supported by appropriate legislation, so that proposals in the initial NDCs can be fully implemented. This will require that leaders engage all sectors, and many different state and non-state actors at the domestic level to reach the objectives included in the nationally determined climate change plans.

MANAGING THE TEMPERATURE

But we also know that the overall ambition level of the 188 NDCs presented in Paris is not enough. Studies indicate that if the NDCs are all implemented 100 per cent, the global temperature increase will be approximately between 2.7 to 3.1°C. While this is much better than the business as usual 4-6°C, it is clearly not enough. And it does assume 100 per cent implementation, which is not going to be easy – in part because many countries included actions in their NDCs that will happen only on condition

ACTIONS, NOT RATIFICATIONS

The real success of the Paris Agreement will not be measured according to the number of countries that ratify, or the date of entry into force. Rather, success will be about what Parties to the Agreement actually do in terms of reducing their emissions; adapting to climate changes that are already with us; providing the necessary financial resources to those in need; and of course participation in the reporting and monitoring mechanism so that the world will be informed about what countries are doing.

of the availability of the necessary financial resources. Moreover, the NDCs cover the period up to 2030, and the assumptions about what happens afterwards are unclear. Many experts suggest that present NDCs are exploiting the easy, 'low hanging fruit' options, and even if we initially manage to keep the temperature rise on a path to the 2.7-3.1 degree range, maintaining those levels beyond 2030 will be increasingly challenging.

And let us not forget that the goal agreed in Paris is to keep temperature rise to well below 2°C and if possible to 1.5°. Technically it is possible to meet those goals. However, from a social and political standpoint, the window allowing us to reach them is closing rapidly. Many experts indicate the increasing likelihood of overshooting these temperature goals – at this point it is not yet clear by how many degrees, and for how many decades. The environmental, social and economic impacts of overshoot are likely to be significant, and therefore the Parties to the Paris Agreement need to do all they can to increase ambition now, because the longer they wait the more difficult and expensive it will be.

Even if ambition is increased and implemented, the chances of some overshoot beyond the 1.5/2°C goals are real. More significantly, if the international community is to manage global climate change

"Many experts indicate the increasing likelihood of overshooting these temperature goals – at this point it is not yet clear by how many degrees." in a responsible manner, it is imperative that not only the ideal (100 per cent implementation of NDCs) but indeed a broader range of risk management scenarios be considered and planned for. This would imply that in addition to maximum levels of mitigation ambition, as well as considerable adaptation efforts, the international community must also consider techniques of carbon dioxide removal from the atmosphere (or negative emissions) and possibly even other climate geoengineering techniques as possible complementary options.

For real success of the Paris Agreement, the political momentum generated at Paris and subsequently through the process of entry onto force of the Agreement must be maintained and transferred to the domestic level to encourage implementation and to increase levels of ambition as soon as possible. We can achieve the ambitious objectives of the Agreement, but this will not happen by itself. Continued political pressure from leaders, combined with sustained innovation and taking up of the essence of the Paris Agreement by the private sector and other non-state actors, will be essential.

Janos Pasztor is Senior Advisor to the UN Secretary-General on climate change. He is also Carnegie Council senior fellow and director of the Carnegie Climate Geoengineering Governance project. He has over 35 years of work experience in the area of energy, environment, climate change, and sustainable development. In 2015, he worked as UN Assistant Secretary-General for Climate Change in New York. Pasztor was acting executive director for Conservation (2014) and policy and science director (2012-2014) at WWF International. He directed the UNSG's Climate Change Support Team (2008-2010) and later was executive secretary of the UNSG's High-level Panel on Global Sustainability (2010-2012). In 2007, he directed the Geneva-based UN Environment Management Group (EMG). During 1993-2006 he worked at the Climate Change Secretariat (UNFCCC), initially in Geneva and later in Bonn.

The United Nations Secretariat (www.un.org) is one of the main organs of the UN, organised along departmental lines, with each department or office having a distinct area of action and responsibility. Offices and departments coordinate with each other to ensure cohesion as they carry out the day to day work of the UN in offices and duty stations around the world. At the head of the United Nations Secretariat is the Secretary-General.

NEW COUNTRY PARTNERSHIPS TO ENHANCE CLIMATE POLICY COOPERATION



Barbara Hendricks, German Minister for the Environment, outlines international efforts to help countries build capacity and fulfil their Nationally Determined Contributions, and welcomes the new NDC Partnership.

n the run-up to Paris, 187 countries submitted Intended Nationally Determined Contributions (INDCs), representing their part of the global effort to combat climate change. Germany and other donor countries have been supporting partner countries in the process of compiling their INDCs since 2014. Bilateral and multilateral cooperation with developing countries is becoming more action-oriented because of these national climate policy plans submitted under the United Nations Framework Convention on Climate Change (UNFCCC).

"With their NDCs, the parties to the agreement are advancing a global endeavour in a transparent process."

A number of partner countries requested support in tackling this complex preparatory process. For example, assistance areas included the preparation of country-specific needs analyses, expert consultation on inter-ministerial coordination and organisation of stakeholder consultations. This kind of cooperation yielded new methodological concepts, increased knowledge, expanded institutional networks and peer-to-peer exchange on specific topics underlying the joint approach. Ultimately, in many cases, this cooperation resulted in

ambitious INDCs and made the INDC process a cornerstone of the success of Paris. Germany and the other donor countries will continue to support developing countries in implementing what now – following the ratification of the Paris Agreement – have become Nationally Determined Contributions (NDCs).

THE HEART OF THE AGREEMENT

NDCs are at the very heart of the Paris
Agreement and are the working basis for
our efforts to combat climate change. With
their NDCs, the parties to the agreement are
advancing a global endeavour in a transparent
process. The contributions form a baseline for
action that will be ratcheted up further to meet
global goals. Implementing NDCs will require
a whole-government approach that must
engage sectoral and coordinating ministries and
stakeholders including civic organisations, local
governments and the private sector. In our own
efforts to implement ambitious climate policies in
Germany, we have already begun to understand
what a major challenge this is.

Many less developed countries have yet to assess in detail the investments most urgently required for the societal transition towards climate resilience. Many have yet to draw up detailed investment plans in line with their national development strategies, build institutional capacities, and set up suitable finance instruments for attracting necessary public and private funding.

Climate-friendly technologies must be developed and transferred. In order to build a climate resilient future, industrialised and less developed countries alike need new technologies and enhanced access to existing technologies. The introduction of necessary technology must contend with economic and market barriers in less developed countries. In addition, the human and institutional capacity for applying these technologies is often limited.

Last but not least, suitable transparency systems need to be established for tracking and reporting the impacts of actions taken. This will provide the basis for informed decision-making. Transparency will allow us to better understand national circumstances, and is also necessary for continuing the global process of implementing the Paris Agreement. Some countries lack the means to set up greenhouse gas inventory systems or to identify, monitor and evaluate climate adaptation and resilience indicators. This makes it difficult for them to track and communicate progress. I intend to make sure we do all we can to put systems in place across the board.

"Cooperation yielded new methodological concepts, increased knowledge, expanded institutional networks and peer-to-peer exchange."

LAUNCHING THE NDC PARTNERSHIP

We stand firmly behind our commitment to support less developed countries in their efforts to make their contributions. Germany is taking several steps here. First and foremost, we will double our annual funding dedicated to climate finance by 2020 in order to raise the level of ambition in both mitigation and adaptation efforts. Moreover, we have initiated an NDC Partnership in cooperation with the German Ministry for Economic Cooperation and Development (BMZ, www.bmz.de) and the renowned global think-tank World Resources Institute (WRI, www.wri.org).

The NDC Partnership is a new coalition of governments and international institutions working together to ensure countries receive the tools and support they need to achieve ambitious targets related to climate and sustainable development as quickly and effectively as possible. To be successful here, less developed

"The NDC Partnership is a new coalition of governments and international institutions working together to ensure countries receive the tools and support they need to achieve ambitious targets."

countries, industrialised donor countries, UN partner institutions, development banks, civil society and the private sector will have to find new ways to share information and coordinate their actions within the NDC Partnership.

Membership will be open to all countries that support the approach and its principles.

The objective of the NDC Partnership, slated to launch at COP22, is to enhance cooperation among countries and international institutions and to support developing partner countries in successfully implementing their NDCs and related Sustainable Development Goals (SDGs). There are already many active initiatives that support national climate action and more inclusive and sustainable development. The role of the NDC Partnership is to align these efforts in order to improve understanding of countries' needs and existing resources. In particular, the partnership aims to better coordinate climate and development support activities.

MULTIPLE APPROACHES

Success in ambitious climate action requires a multi-pronged approach. First, state-of-the-art knowledge must be gained and disseminated, and we also have to fill in gaps in knowledge and information. Second, technical assistance must be provided, and capacity-building facilitated at national, regional and global levels. Finally, financial support for NDC implementation must be enhanced.

All of this will have to be implemented in a truly country-driven approach. It will be important for national governments to define their priorities and for partners to adapt their activities accordingly.

In this regard, I am confident that the NDC Partnership will play a receptive, constructive and forward-looking role in merging climate and development goals and will help make multilateral and bilateral climate development programmes more effective.

Dr Barbara Hendricks is German

Federal Minister for Environment, Nature
Conservation, Building and Nuclear Safety
(http://www.bmub.bund.de). She is supported
by the State Secretaries Jochen Flasbarth and
Gunther Adler and the Parliamentary State
Secretaries Rita Schwarzelühr-Sutter and
Florian Pronold. As well as being a Federal
Minister, Barbara Hendricks is also the
Federal Government Commissioner for the
Relocation of the Federal Government and
Parliament to Berlin and Compensation for
the Bonn Region.

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MOBILISING NIGERIA'S CLIMATE ACTION



Amina J Mohammed, Minister of Environment, Nigeria, demonstrates the country's ownership of the NDC policy, which she sees as the heart of a commitment to the Sustainable Development Goals and the Paris Agreement.

ddressing climate change by putting people and planet at the centre of policy actions gives future generations a chance to make an effective response – in a way that informs, connects and empowers everyone for a more sustainable society.

On 22 September 2016, President Buhari signed the Paris Agreement at the UN in New York. The Paris Agreement is unquestionably a tremendous opportunity for the development of Nigeria. I am confident that this marks a new chapter in the future.

PLEDGES FOR THE FUTURE

As a nation we have unconditionally pledged a 20 per cent reduction on business-as-usual emissions by 2030, and a 45 per cent conditional commitment, which can be achieved with financial assistance, technology transfer and capacity building. We took these ambitious pledges to the Paris climate conference last December in our Intended Nationally Determined Contribution (INDC). This policy document demonstrates Nigeria's commitment to action for sustainable development.

"As a nation we have unconditionally pledged a 20 per cent reduction on business-as-usual emissions by 2030."

The Sustainable Development Goals (SDGs) are integral to Nigeria's development and the mission of this government is fully aligned with these goals. We are focusing on empowering people by reducing poverty, increasing food security, creating jobs by diversifying the economy, providing a healthy environment and importantly driving economic development by providing access to energy. Nigeria's INDC encompasses all of these crucial development objectives.

Nigeria's Environment new narrative is couched in the change agenda and reflects the need to empower people, take climate action and

protect the environment. In taking climate action, Nigeria's INDCs are now embedded in national plans, through a vigorous consultative process with other sectors.

I am now overseeing the work to move forward with our NDC targets. We have already prepared an implementation roadmap. In order to push ahead with effective delivery of our NDC vision, the Ministry of Environment is working with key ministries to develop five sector action plans. Full ownership and commitment to the NDC by relevant ministries, departments and agencies is crucial to delivering on pledges – and indeed essential in mobilising the international support that was part of the Paris package.

A VIBRANT ECONOMY

While Nigeria has moved from being Africa's largest economy in 2014, due to the recent global decline in oil and the contraction of both global and local business, we still remain Africa's largest market of choice – and we are labelled by many as the continent's most vibrant economy. The recent situation provides an avenue to address a multi-headed



Nigeria will use the Paris Agreement to push forward with a low carbon but high growth development agenda.

hydra – raise resources, allocate effectively and efficiently, and achieve the development objectives while limiting the impact on climate change. These are by no means easy in the face of the challenges facing our economy.

The recent global downtown and conflict requires new innovation to fund training gap and begin a transition to a green economy while the target of zero emissions by 2050 allows Nigeria through its NDC to transition to a green growth path.

We are also working hard to attract private sector partnerships in addition to support from our development partners. The 2017 budget begins to reflect Nigeria's efforts to realise our NDC. In addition, we are set to launch our first ever sovereign Green Bond in the first quarter of 2017 to fund a pipeline of projects, all targeted at reducing emissions and making progress to a greener economy.

We must use the Paris Agreement to push forward with a low carbon but high growth development agenda. The development of our people is my highest priority; for me the national development plan and the implementation of our NDC is about leaving no one behind. It's not about doing things by halves or three-quarters, it's about everyone mattering.

INSPIRED LEADERSHIP

Determined people can change the course of history – and the new political mandate which the Paris Agreement gives us will inspire leaders to emerge. Globally we have very little leadership today. We need to be courageous, and practise what we preach. Most importantly we need to bring people along with us, and especially the poor and forgotten in society.

PEOPLE FIRST

Putting people first should be at the heart of everything we do. How should we act, caring as much as we do, and with our special set of skills? How can we move from caring to action?

I see the NDC as a crucial process to raise these questions – and to achieve so much more than emission reductions. The NDC is Nigeria's national action plan, unique to ourselves. The Paris Agreement is succeeding, since the development agenda can no longer be set by the global North for the global South; it has to be set for all, and it is young people who will need to do the heavy lifting.

That said, there is no free lunch – everyone has a part to play. You have to get involved and help make this change happen. I can already see fantastic stories of innovation coming from Nigeria such as the rapid emergence of so many off-grid solar and waste-wealth initiatives. This innovation is thriving despite tough economic times and the challenges we are currently facing.

"There is no free lunch - everyone has a part to play. You have to get involved and help make this change happen." Let me end by using the great words of Nelson Mandela: "It always seems impossible until it's done."

Amina J Mohammed is the Honourable Minister of Environment for Nigeria, under President Mohammed Buhari, Prior to her current appointment, she was the Special Adviser to the United Nations Secretary-General Ban Ki-moon on Post-2015 Development Agenda. She was appointed to this position on 7th of June 2012. Ms Mohammed's previous roles include Senior Special Assistant to the President of Nigeria on the Millennium Development Goals—serving three presidents over a period of six years, Founder and CEO of the Center for Development Policy Solutions, and Adjunct Professor for the Master's in Development Practice programme at Columbia University. Ms. Mohammed was named in March of 2016 as one of Fortune Magazine's '50 Greatest World Leaders' and she remains committed towards a more sustainable and peaceful Nigeria.

The Nigerian Federal Ministry of Environment

(http://environment.gov.ng) was established at the inception of the new Civilian Administration under the leadership of Chief Olusegun Obasanjo in June 1999 to ensure effective coordination of all environmental matters, which hitherto were fragmented and resident in different line Ministries. The creation was intended to ensure that environmental matters are adequately mainstreamed into all developmental activities. The protection of the environment is paramount to the achievement of the objectives of the country's socio-economic reforms.

CANADA – A CLEAN ENERGY LEADER



The Hon Catherine McKenna, Minister of the Environment and Climate Change, outlines Canada's commitment to promoting climate change solutions, including support for carbon pricing and market-based approaches as important tools for addressing climate change.

n summer 2016, a 1.2-square-kilometre iceberg sheared off the Porcupine Glacier in northwest British Columbia, Canada's westernmost province. It is believed to be the largest ever to break off a Canadian glacier, and it was a dramatic reminder of the effects of climate change. In Canada, as in the rest of the world, climate change is evident – its impacts are seared across our land.

In the Atlantic Provinces, coastline erosion is a real and significant challenge. Prince Edward Island is literally shrinking, losing 46 centimetres of coastline in 2014 alone – twice the historical long-term average. By 2100, the sea level in Atlantic Canada could rise by up to one metre with serious repercussions.

On the Canadian Prairies, extreme weather in the form of droughts and floods is increasing in frequency. These climate events can have devastating effects on crop yields; they can lead to more deaths of livestock; and they also bring increased prevalence of pests and disease. In the country's Arctic north, the average annual temperature has tripled, compared with the global average, since the middle of the last century. Snow, sea ice, glaciers and permafrost are all in rapid decline.

"In the country's Arctic north, the average annual temperature has tripled, compared with the global average."

PROMOTING SOLUTIONS

These are the environmental conditions that drove Canada to send a broad delegation of government, indigenous and industry leaders to Paris last December, for COP21. Canada came to those discussions prepared to put forward and promote solutions. Among these was our country's commitment to support carbon pricing and market-based approaches as important tools for addressing climate change.

In Paris, Canada announced a contribution of C\$2.65 billion over five years to help developing countries reduce their greenhouse

gas emissions and to better adapt to climatechange impacts. This contribution is part of our commitment to supporting climate efforts around the world.

CLEAN ENERGY R&D

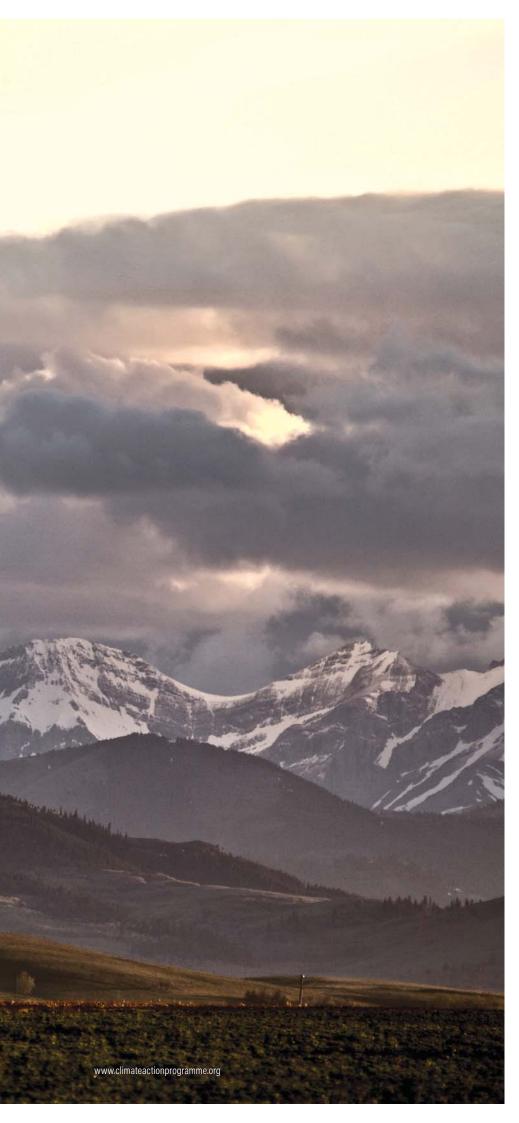
Canada also stood with 20 countries and the European Union as part of an effort called Mission Innovation. Each player agreed to double their respective investments in clean energy research and development over five years. They also committed to encouraging private-sector investments in clean-energy technology and increasing collaboration among participating countries.

As part of its Mission Innovation commitment, Canada will double its 2014-15 funding of C\$387 million for clean energy and clean technology research and development to C\$775 million by 2020.

THE VANCOUVER DECLARATION

Since Paris, Canada has also embarked on a great national effort: laying the groundwork for the economy of tomorrow. Our government believes there is no more pressing reason





"With hard work and determination, we can give our children and grandchildren the legacy they deserve."

to come together than to combat climate change. We have worked tirelessly to develop a national agreement on climate change that every province and territory could endorse. That agreement, called the Vancouver Declaration, was signed last March. For the first time in Canada's history, we had the federal government and all 13 provinces and territories united in tackling climate change.

The Vancouver Declaration is the centrepiece of our work on climate change in 2016. It committed the senior levels of government to participating in working groups dedicated to four key areas:

- Carbon pricing mechanisms
- · Specific mitigation opportunities
- · Clean technology, innovation and jobs
- Adaptation and climate resilience.

Those four working groups have been hard at work ever since last spring. They have developed ideas and solutions that will be considered by Canada's Prime Minister and the Premiers of all 13 provinces and territories. The federal and provincial governments are discussing measures that will then form a new Pan-Canadian Framework for clean growth and climate change.

This framework will include not only a series of measures that can reduce greenhouse gas emissions, support innovation and improve our capacity to adapt and be resilient to a changing climate. The Pan-Canadian Framework will be a plan to lead our country into a historic transition, one that will see us protect the environment and strengthen our economy.

TRANSITIONING TO A LOW-CARBON ECONOMY

The transition to a low-carbon economy is what lay behind our government's announcement in early October 2016. In the same week we ratified the Paris Agreement, we also set out our plan to put a price on carbon pollution across Canada by 2018. We believe this will put Canada on the path to significant reductions of our greenhouse gas emissions.



Prime Minister Justin Trudeau, Environment Minister Catherine McKenna, and some of Canada's delegates to COP21 in Paris.

We set a benchmark price for carbon pollution: a minimum of C\$10 per tonne in 2018, rising by C\$10 each year to C\$50 per tonne in 2022. To make sure that this plan is contributing effectively to meeting Canada's targets, it will be reviewed at the end of five years, in 2022.

The provinces and territories can choose how they want to price carbon pollution. They can either put a direct price on it through a levy or implement a cap-and-trade system. Many of Canada's provinces and territories are already leaders in addressing greenhouse gas emissions. In fact, more than 80 per cent of the country's population currently has a carbon pricing system in place.

An integral part of our approach is that revenue from pricing pollution will remain with the provinces and territories of origin. Provinces and territories can then decide how to invest that revenue.

As options, they can invest in clean technology or energy efficiency improvements; they can invest in clean transport infrastructure; or they can give the money back to small businesses or residents through tax cuts. Many business leaders support this measure as they know that pricing carbon pollution makes good business sense.

ENGAGING INDUSTRY AND FINANCE

In our government's discussions with Canadian industry and finance leaders over the past few months, a common theme has emerged: carbon pricing is one of the most efficient ways to reduce emissions and to stimulate the market, to make investments in innovation, and to deploy low-carbon technology and create good jobs for Canadians.

Many leading national corporations consider an internal price on carbon in their investment decisions; and business leaders have joined the Carbon Pricing Leadership Coalition, a World-Bank-led international partnership of governments, businesses and civil society organisations who have agreed to work with each other towards a carbon price applied throughout the global economy.

Our businesses are known around the world for collaborative research and development, particularly in the clean technology sector.

Canadian businesses spent C\$1.2 billion on clean technology research and development in 2014 alone. And Canada is already seeing major foreign investments and partnerships in clean energy technologies. The rate of growth in Canada's clean energy sector is outpacing that of every other.

Canada is home to more than 750 clean technology companies and more than 87 per cent of them are already exporters. This tells us that the forecast for success in sustainable energy in Canada is very good. Canada will create a low-carbon economy that provides good jobs and opportunities for all. Our country must make smart, strategic investments in clean growth and new infrastructure. We have already begun to make those investments, including:

- C\$2 billion for a low-carbon fund to work with provinces and territories as we transition to a low-carbon economy
- Billions of dollars more for public transit and other green infrastructure, including charging stations for electric vehicles and fuelling stations for alternative-fuel vehicles

 C\$1 billion for clean energy and technology and more than C\$100 million toward energy efficiency.

These investments, coupled with our plan to price carbon pollution across our country, reflect our belief that immediate action is required to address climate change. With hard work and determination, we can give our children and grandchildren the legacy they deserve. To accomplish this, Canada will be a leader during the clean energy century.

Catherine McKenna is Canada's Minister of Environment and Climate Change. She practiced competition and international trade law in Canada and Indonesia and was senior negotiator with the United Nations Peacekeeping Mission in East Timor. She also served as senior advisor on the former Chief Justice Antonio Lamer's review of Canada's military justice system. Catherine co-founded Canadian Lawyers Abroad, a charitable organisation that works in developing countries and with indigenous communities in Canada. She served as Executive Director of the Banff Forum, a public policy organisation for young leaders. Catherine taught at the Munk School of Global Affairs.

Environment and Climate Change Canada

(ECCC, www.ec.gc.ca) is a diverse organisation where our programmes, services and people lead the way in implementing the Government of Canada's environmental agenda. We collaborate with our partners at home and abroad, to realise concrete progress on initiatives that will protect the health of our people and our planet.

CANADA HOSTING WORLD ENVIRONMENT DAY 2017

- Canadians are passionate about protecting our planet. We are honoured that UN Environment has named our country to host World Environment Day 2017.
- We are working hard to make our country cleaner and healthier for this generation and the next.
- The Canadian government will lead global environmental protection by example, starting with its efforts in Canada.
- As part of the effort at home to tackle climate change and elevate the environment as a priority, the government is:
 - working with Canadian industry to develop a cleaner economy,
 - increasing our marine protected areas, and even
 - providing free admission to our national parks in 2017, our country's 150th birthday.
- World Environment Day 2017 will be an opportunity for all Canadians to celebrate Canada's leadership on
 the environment and climate change. They know this is not just a national issue but one that encompasses
 the entire planet.

STRENGTHENING CLIMATE ACTION IN CHILE



Pablo Badenier Martinez, Minister of the Environment, Chile, highlights four areas that are fundamental in the fight against climate change: planning, mainstreaming climate change, implementation tools and experience sharing.

ast year, 2015, was very positive for global climate action. The outcome from Paris is the end of a process and at the same time the starting point of a global effort towards a new climate economy. Efforts are now moving towards the successful implementation of the Agreement, a major challenge for all countries supporting this international commitment. It is a powerful and constructive signal confirming the extent of the climate challenge: we must all be part of the solution.

Chile expects to ratify the Paris Agreement as soon as possible. In any case, we are already working on measures to deliver on our commitments. Our climate agenda for the coming years is concrete. This agenda is briefly described in this article, highlighting four elements that we think are necessary for taking forward the climate agenda: planning climate action, mainstreaming climate change, implementation tools and experience sharing.

PLANNING AHEAD

Planning is of course very important for policymaking. We are talking about interventions that may "Climate change should be integrated into the design of public policies, especially those related to energy, infrastructure, transport and agriculture."

have long-term impacts. It is useful to take a gradual approach, building on previous experiences and taking into account the best information available.

We were one of the first countries to propose a draft INDC, as early as December 2014. Our national contribution is the product of responsible and serious technical work, supported by evidence which includes inputs from the civil society, received through a four-

month national public consultation process. During 2016 we will deliver our 2017-2022 National Action Plan on Climate Change (NAPCC). The NAPCC will be the strategic tool for implementing our INDC. It will act as a road map for climate action, helping to identify priorities and measures to fulfil our INDC in the coming years.

Chile's INDC contains a specific commitment to develop adaptation policies. This is a response to address our country's vulnerability to climate change. We are currently developing sectoral adaptation plans, particularly in agriculture, fisheries, infrastructure and health.

In our INDC we have also set the goal of reducing the carbon intensity of our economy. We believe we can secure economic growth at a lower level of emissions. In 2015 the Ministry of Energy introduced its long-term vision for the energy sector. We expect to reach a 70 per cent share for renewable energy by 2050. By 2015 the installed capacity of renewable energy was five times greater than in 2011, reaching 2.6GW and a 10 per cent share of total generation, excluding large-scale hydroelectric power. The momentum was



first led by wind technologies, then more recently by solar. We believe in the potential of solar energy and we seek to enhance the deployment of this renewable-based source, which is in abundant supply.

MAINSTREAMING CLIMATE CHANGE

There is already abundant literature on the opportunities offered by the transition to a low carbon economy. The 2014 New Climate Economy report, that includes inputs from former Chilean President Ricardo Lagos, is a good example of this evidence.

What is the best way to identify and grasp these opportunities? There is no single answer. We believe in a comprehensive approach, seeking to address the various dimensions of climate change. Climate change should be integrated into the design of public policies, especially those related to energy, infrastructure, transport and agriculture, sectors that in the case of Chile make the largest share in total national greenhouse gas emissions.

The NAPCC is an example of the application of this approach. This Action Plan has been developed with inputs from relevant public actors, in order to adequately integrate their visions and sectoral priorities. Another example is the early set-up of a unit that supports the National Designated Authority to assess potential project bids to the Green Climate Fund. The Ministries of Environment, Finance and Foreign Affairs lead this work through a Technical Secretariat. The process involves the participation of experts from the public and private sector, in order to strengthen the project proposals.

To further strengthen the development of the climate agenda at the national level, we are working on the implementation of best practices and technology transfer in the productive sector, with a focus on small and medium enterprises. An example of this work area is 'Huella Chile,' a private sector focused programme aimed at promoting and supporting the measurement, reporting and management of greenhouse gases emissions. The management of emissions can have significant benefits for companies, including both real economic savings and a better corporate image.

USING AVAILABLE TOOLS

By applying the right tools for each country's context we can accelerate the transition to a low carbon economy. Among these tools are market-based instruments, which can help to provide the right incentives for greener decision-making. Carbon pricing is one of

"We are working on the implementation of best practices and technology transfer in the productive sector, with a focus on small and medium enterprises."

these tools, as prices are a key variable in public and private economic decisions.

We have delivered concrete progress in this area. Chile is the first South American country to have approved a tax on CO₂ emissions - US\$5 per ton of CO₂, applied to thermal generation, mostly sources from the electricity generation sector. In addition, we have set up a green tax linked to the level of efficiency of new vehicles. Thus, buyers of low fuel efficiency vehicles will pay a higher tax. This type of instrument has benefits that go beyond reducing pollutants and black carbon. At the same time we are reducing the levels of air pollution in our cities, one of our ministerial priorities.

LISTENING, TALKING, DISCUSSING

Partnerships and international initiatives are other relevant and useful tools for climate action. Chile participates in the Cartagena Dialogue, the OECD Climate Change Expert

"Countries (including Chile) must further strengthen their institutions to promote the inclusion of climate change in policy decisions and public investment." Group, the Carbon Pricing Leadership Coalition, and the Climate and Clean Air Coalition, among others. These initiatives are great for sharing experiences, either to lead by example or to learn from the experience of others.

Chile is engaged in strengthening Environmental Democracy in Latin America and the Caribbean, which involves stakeholders providing relevant information. We hope soon to put at the disposal of our societies a robust regional cooperation instrument on Principle 10 of the Rio Declaration.

NEXT STEPS

In short, there are concrete and positive developments in the international climate agenda and in our local work agenda. However, we know that there are important gaps. Mitigation commitments included in those INDCs presented to date are not enough to keep us on the 2°C path. The effectiveness of financing mechanisms and other means of implementation is not yet clear. Domestically, countries (including Chile) must further strengthen their institutions to promote the inclusion of climate change in policy decisions and public investment.

While the challenges are significant, it is clear that we are moving in the right direction. The opportunities that accompany the new climate economy and the increasingly widespread evidence of good practices and benefits from climate action will facilitate the changes we need.

Pablo Badenier Martinez, Minister of the Environment of Chile (www.gob.cl/ministers/ ministro-del-medio-ambiente), graduated as a Marine Biologist at the University of Valparaiso (Faculty of Marine Sciences) and holds a Masters degree in Public Policy and Management at the University of Chile. Highlights of his career include his role as Regional Director of the National Environment Commission of Chile (Metropolitan Region) between 2003 and 2006. From 2006 to 2010, he served as Executive Secretary of the Environment and Territory Section of the Ministry of Public Works. Before being appointed as Minister of Environment, he was working as an environmental consultant. He has over 16 years in development of environmental impact assessments and project management; and has also has developed work in research and teaching in his areas of expertise.





José Sarney Filho, Minister of the Environment, Brazil, declares Brazil's determination to play its part in mitigating and adapting to climate change, and outlines plans to achieve the country's ambitious targets in renewables, curbing deforestation, agriculture and water security.

Brazil is one of the first big economies to have ratified the Paris Agreement, after approval in record time in both houses of Parliament. This achievement is the result of a consensus built in the Brazilian society about the urgent need to act to mitigate climate change and adapt to its dangerous effects. Brazil has understood the dimensions of the problem and is ready and willing to face it with ambitious action on the ground.

Although responsible for no more than 2.5 per cent of global greenhouse gas emissions, Brazil has a key role to play in the global climate change agenda, considering the dimensions and diversity of our natural resources, the growing importance of our participation in the global economy and international trade and, perhaps most important, the extraordinary results already achieved by Brazil in reducing its emissions in the past decade. The national consensus that has been achieved regarding this issue emerged from the notion that climate change, while being the greatest global challenge of this century, is at the same time an opportunity for our country to embark on a path of sustainable development with low emissions, towards the creation of a low-carbon economy. Along these lines, mitigating the causes of climate change and adapting to its adverse effects are being mainstreamed into the Brazilian government public policies, in alignment with the national development goals on social inclusion, job creation and poverty eradication.

EMISSION REDUCTION AND MITIGATION

As with any other developing country, Brazil faces many challenges with respect to poverty, education, health, employment, housing, infrastructure and energy supply. Even in the context of such challenges, Brazil has already undertaken actions that have reduced its emissions by 41 per cent, which represents one of the largest efforts by a single country ever made. In the context of the Paris Agreement, Brazil has demonstrated its commitment to the climate regime by adopting an economy-wide, absolute mitigation target of reducing 37 per cent of our emissions by 2025, with an indicative

"Brazil has demonstrated its commitment to the climate regime by adopting an economywide, absolute mitigation target of reducing 37 per cent of our emissions by 2025."

target of reaching 43 per cent reduction by 2030, as compared to our emissions level of 2005.

Consistent with these targets, we have declared our intention to increase the share of biofuels in the Brazilian energy mix to about 18 per cent. We also intend to achieve 45 per cent of renewables in the energy mix. In the forest sector, we have set ourselves the goal of restoring and reforesting 12 million hectares and of enhancing sustainable native forest management systems. We will also strengthen policies and plans to curb deforestation, in particular in the Brazilian Amazon region, with a view to eliminating illegal deforestation and creating appropriate instruments to support the compensation of emissions from the legal suppression of vegetation.

It is also our firm intention, in the agriculture sector, to strengthen the Low Carbon Emission Agriculture programme (ABC), so that it becomes the main strategy for sustainable agriculture development. In this context, we aim to restore 15 million hectares of degraded pasturelands and enhance 5 million hectares of integrated cropland-livestock-forestry systems. These goals are set for 2030, but we are committed to early action and better results.

As our goal is economy-wide, we also intend to promote low-emission action by other sectors. The Brazilian industry sector, for instance, offers huge potential to introduce new standards of clean technology, bring in more energy efficiency measures and promote low-carbon infrastructure. Urban mobility in Brazil is also an area with great potential to contribute to emissions reduction, by improving infrastructure and promoting efficient and quality public transport, in particular in metropolitan areas.

ADAPTATION MEASURES

As climate change is a reality affecting our daily lives all around the globe, it is of fundamental importance to consider adaptation and its negative effects at the same level of importance as mitigation activities. We have developed and published a National Adaptation Plan, which aims at building resilience of our population, ecosystems, infrastructure and production systems. Reducing vulnerabilities and recognising the provision of ecosystem services are essential in this regard.

We seek to enhance our national capacity in water management and water security. Hosting the 8th Global Water Forum in 2018, in Brasilia, indicates our commitment to tackle issues related to the sustainable management of water resources, learning from best practices and using the best available scientific knowledge and technologies.

An important part of the climate equation is the conservation and sustainable use of our biodiversity, which we intend to strengthen through, inter alia, the National Strategic Plan for Protected Areas and the implementation of the Forest Bill, particularly concerning protected areas.

CLIMATE CHANGE AND THE ECONOMY

Our next step is to prepare a national strategy to implement and finance the actions we need to put in place to attain our objectives both in mitigation and adaptation. We do not need to wait. Our goals are set for 2025 and 2030, but we shall start now. We want to do more, and we will achieve our goals ahead of the intended schedule.



Our task is huge. A successful outcome depends essentially on our ability to mobilise resources from all sources, public and private, national and international, bilateral and multilateral, through financial instruments and investment channels catered for each of the priority sectors. We have fulfilled all requirements to receive payment for results achieved in reducing emissions from deforestation and forest degradation. Our Amazon Fund is fully operational in promoting further actions in this regard. We are thankful to the excellent level of partnership we established with contributors to the Amazon Fund, in particular the governments of Norway and Germany, and invite others to support our efforts and acknowledge our contribution to reducing emissions and therefore limiting the increase in the global average temperature.

Business as usual, when it comes to climate change, is not an option. Our real challenge is to mainstream climate change into the economy, in particular the financial markets. We need to promote ways of mobilising global financing for low-carbon activities, in line with one of the key objectives of the Paris Agreement, which is "making finance flows consistent with a pathway towards

low greenhouse gas emissions and climateresilient development", as stated in its Article 2 paragraph 1(c).

Brazil is ready to embark on a clean, sustainable and low-carbon development pathway. The goals are set and the challenge has been accepted by the Brazilian society. Our endeavour, now, is to create the right conditions for partnerships to be built or

"A successful outcome depends essentially on our ability to mobilise resources from all sources, public and private, national and international, bilateral and multilateral."

strengthened. For that, we look for the engagement of all stakeholders in all sectors, at all levels of government.

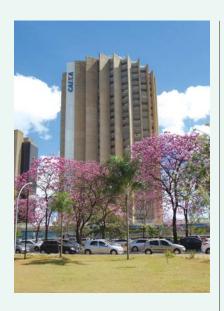
The Paris Agreement opens up a new venture for our common future. Brazil is ready to seize this opportunity. I invite everyone to join in our journey to create a better future for ourselves and for our children.

José Sarney Filho is in his second tenure as Minister of the Environment (the first was from 1999 to 2002). A member of the Green Party, he has served nine terms in Congress, as a Deputy of the State of Maranhão. He is an important leader in the climate change debate in Brazil.

The Ministry of Environment, Brazil

(www.brasil.gov.br), was created in 1992 to meet the challenge of protecting and conserving the environment and promoting sustainable development. In its 22 years of existence, the Ministry has focused its efforts in meeting that challenge, increasing the awareness of environmental issues in the national political agenda, and helping to consolidate Brazil's important role in the international arena.

CAIXA ECONÔMICA FEDERAL, BRAZIL



Brazilian Bank, Caixa, discuss their contribution to the country's social and environmental welfare in partnership with the Brazilian government.

Through its 155 years of existence, Caixa has grown into more than a bank – it is a complete financial institution present in the lives of hundreds of millions of Brazilians.

When it was created in the 19th century Caixa had a clear purpose: to encourage the habit of saving among Brazilians and thus contribute to the formation of citizenship and national development. More than a century and a half later, this purpose is strengthened through our operations as a public company throughout the country, acting not only as a provider of banking services, but also as the Brazilian government's main partner in implementing programmes in sectors such as housing, sanitation, infrastructure, social benefits and income transfer.

CONTRIBUTION TO THE COUNTRY'S WELFARE

The company concentrates on constantly increasing its consolidated structure and

enhancing its contribution to Brazil, maintaining its position among the largest banks in assets in Latin America. In 2015, Caixa injected more than US\$230 billion into the Brazilian economy, through activities such as the distribution of welfare benefits, investments in infrastructure, credit facilities, and the social benefits from Caixa lotteries, among others. The financial results in 2015 showed a net income of US\$2.3 billion, a 0.9 per cent growth in 12 months, and an increase of 13 per cent in own assets, reaching US\$372 billion.

These results reflect recent years' investment in modernisation of assets and technology parks; building an extensive service network that includes branches, lottery shops, correspondents and boat and truck branches, available for secluded locations; qualification of service channels, focusing on digitisation, segmentation and multi-channel offerings; social and environmental responsibility in credit grants, mitigating risks specific to the sector; and also responsible banking inclusion, prioritising issues such as financial education and offering competitive rates for home financing and access to goods and services.

As a partner of the Federal government and an institution with long-term vision, Caixa reaffirms its vocation to believe in the country's resilience capacity, especially in the face of adverse scenarios. The loan portfolio grew 11.9 per cent in 2015, even during a more restrictive environment in the financial sector.

Income transfer programmes totalled US\$8.6 billion, highlighting Bolsa Família, which plays a decisive role in fighting extreme poverty and encouraging social inclusion and child and youth education for low-income families.

Minha Casa Minha Vida ('My House, My Life'), the largest housing programme in the country, had contracted funds of up to US\$12 billion, with 347,000 housing units. Since the programme's inception in 2009, more than 3.5 million families have achieved the dream of owning a home.

As for labour welfare, Caixa paid US\$65 billion in unemployment insurance and the Fundo de Garantia do Tempo de Serviço (FGTS), a worker protection fund. Caixa has also fostered business with positive social and environmental impact,

SOLAR ENERGY FOR CAIXA'S BRANCHES

Caixa Econômica Federal has an investment programme of US\$31 million for solar energy generation in 195 branches, spread over three different regions of Brazil. The forecast is to generate around 19 Gigawatt hours (GWh) a year, which accounts for 3 per cent of the bank's total energy consumption.

The project started in June 2016 with the aim of making 44 buildings 100 per cent sustainable in electricity generation. Photovoltaic panel systems will be installed in 42 branches located in São Paulo, as well as in one of the Headquarters and the Cultural Complex, both in Brasília. The idea is to generate 100 per cent of the energy used in these buildings, which will account for a US\$1.3 million cut in the company's annual electricity bill.

The Cultural Complex in Brasília, for instance, will be the biggest solar energy power plant in the country's capital. Having 360 panels, the energy generated on the building would be enough to supply 50 houses and will supply energy to over 200 shows held in the complex theatre every year. The savings should add up to US\$28,000 a year.

A pilot project was carried out in December 2014 in a branch in Vazante, in the state of Minas Gerais. The branch was chosen for the location's high solar exposure measurements, as well as for its proximity to the project managers overseeing its implementation.

The Vazante branch is the first self-sufficient bank branch in Brazil, with 276 photovoltaic panels installed on its rooftop. Every year, 115 MWh are produced in the building, enough capacity to provide for 95 houses. The project accounts for a yearly economy of US\$16,000.

contributed to the generation of knowledge and developed territories affected by our operations, through the Social and Environmental Fund (FSA Caixa, see box), cultural and sports sponsorships and national and international partnerships.

Caixa is fully aware of the responsibility it holds as the Brazilian government's main strategic partner, so it is always seeking to



strengthen its position as a reliable bank and chart growth routes aligned to social inclusion and encouraging the promotion of economic activity. Through measures such as the inclusion of sustainability aspects in strategic planning, credit lines operation for crucial sectors – such as agriculture and construction – creating opportunities for home ownership and operation of government funds, Caixa acts in line with the needs of the country and the Brazilian citizen.

Caixa Econômica Federal, Brazil (www.caixa. gov.br), is one of Brazil and Latin America's major public banks, whose business success goes beyond strong financial performance. Created in 1861, today Caixa is the third largest bank in Brazil in assets and one of the five largest in Latin America. We work to encourage sustainability in the financial industry and disseminate it as non-negotiable management criteria for all Caixa operations. With headquarters in Brasília, the institution is linked to the Ministry of Finance and operated as a strategic partner with the Federal government in the infrastructure, housing, and sanitation sectors, contributing to the social and economic development of the country.



THE SOCIO-ENVIRONMENTAL FUND (FSA)

Through the Caixa Socio-Environmental Fund (FSA), the institution provides financial support for social and environmental projects aimed at integrated development in partnership with public and private organisations. The FSA fund provides non-reimbursable or partially reimbursable investments in initiatives aligned with Caixa programmes, mainly those benefiting low-income groups. FSA financial support is channelled into designated priority areas, such as:

- · Sanitation and environmental management
- Job and income generation
- · Socially-oriented housing projects
- Health
- Education
- · Sports and culture
- Social justice and advocacy
- Food
- Institutional development
- Rural development
- Sustainable development
- Social measures for low-income groups.

Since 2011, when it was created, FSA has invested R\$139.4 million in 156 projects covering distinct areas of activities, biomes and regions in Brazil. In partnership with the Ministry of the Environment's National Environment Fund, FSA Caixa also provides support for projects aligned with national environmental policy in two specific biomes: the Cerrado, with a focus on extractive activities and ecotourism; and the Caatinga, where the emphasis is on energy efficiency, ecological

stoves and forestry stewardship plans for smallholders and ceramics and plaster producers. The economic model aims to foster sustainable development in these regions by valuing local knowledge, by promoting sustainable income generation and maintaining environmental assets. Furthermore, beneficiaries' participation has contributed to enhancing project effectiveness and ensuring the empowerment of low-income communities.

Sustainable extraction. FSA Caixa has financially supported part of the Mosaico Sertão Veredas-Peruaçu Development Plan, by allocating funds for community capacity building in sustainable cultivation of local fruits; to provide environmental education in partnership with local associations; and to strengthen community organisation, enabling the formation of production and artisan groups. Concluded in 2016, the project delivered training courses for families and, as an example, enabled the production of 7,670 kilograms of buriti palm scrapings to be sold at a profit.

Eco-cultural tourism in the Sertão Veredas-

Peruaçu. Additionally, FSA Caixa has financially supported the Mosaico SertãoVeredas-Peruaçu eco-tourism development plan. This support covered entrepreneurial training for providers of lodgings and meals, tourist guides, local tourism operators, as well as general training in tourism and the development of eco-cultural itineraries; it also improved infrastructure for three community guest houses. As a result about 1,000 people received benefits from this project.

DELIVERING A LOW CARBON OLYMPIC GAMES

By Tan<mark>ia Braga, Sustainability, Accessibility and Legacy head of the Rio 2016 Olymp</mark>ic and Paralympic Games Organizing Committee

The record we do not want to break: the inside story of delivering low carbon Olympic Games in Rio.

The opening ceremony of Rio 2016 Olympic Games will be recalled for delivering "the most widely-viewed climate change message ever". As Greenpeace blog pointed out, "no other global sporting event has put the message of climate change front and centre quite like the Rio Olympics." But a much less widely spread story is the one of the climate actions that took place behind the stage.

Before the strong message on climate change was broadcasted globally, projects have been implemented in Brazil and other Latin American countries to reduce 2.2 million tonnes of greenhouse gas emissions. In parallel, a strategy to minimise emissions in the daily management of the world's biggest sporting event has been delivered. The objective was to host low carbon Games, while creating lasting, beneficial legacies. The power of the Games to inspire change opens up a range of alternatives that contribute to the transition to low carbon production patterns in key sectors of Latin American economy.

ANTICIPATING CARBON IMPACTS

The first step was to anticipate carbon impacts so they could be avoided, reduced or compensated for. A study carried out by an expert firm estimated a reference scenario in which the activities directly related to the hosting of the Olympic and Paralympic Games in Rio would bring an additional 470,000 tonnes of CO₂eq. The construction of sporting and support venues and urban infrastructure was estimated to generate 1,590,000 tonnes of CO₂eq, and indirect emissions from spectators (international and domestic travel, accommodation, food) were estimated to range from 1,500,000 to 2,500,000 tonnes of CO₂eq.

The emissions reference scenario included embodied carbon, attributed them entirely to the event, and took into account all activities related to preparation, staging and disassembling. It followed the principles of the GHG Protocol and used the methodology developed specifically for the London 2012 Olympic and Paralympic Games.

REDUCTION MEASURES

The target of 18.2 per cent reduction of direct emissions in relation to the reference scenario was established after consultation with a broad range of stakeholders.

The delivery of emissions reduction focused on careful planning and efficient processes, reducing embodied carbon in materials through smart design and sustainable purchasing and substituting fossil fuels for renewable fuels. A specialized life-cycle analysis firm assessed alternative scenarios for carbon footprint reduction, considering other parameters such as viability, cost of implementation and awareness potential.

One of the most relevant reduction measures taken was the careful planning of primary and back-up electrical power, with an emphasis on energy efficiency. Smart engineering on temporary generator use was also deployed, and a number of generators were used in "cold standby" mode. This effort resulted in an estimated reduction of 18.3 per cent in the total energy demand for the Games (energy demand plan from December 2015 in relation to the 2013 baseline), to be confirmed by the emissions final inventory.

Other key measures included targeting 100 per cent use of public transport, reinforced by the absence of spectator parking spaces at competition venues, the inclusion of vegetarian meal options and the smaller flame in the Olympic and Paralympic cauldrons. The replacement of fossil fuels by renewable fuels



was another important action. Eighty per cent of the fleet of light vehicles was flex-fuel, allowing for extensive use of ethanol.

Design teams also worked with the challenge of reducing the physical footprint of the temporary structures in relation to the initial design. For example, the floor area requirement for the temporary structures at the Olympic and Paralympic Village was reduced by 52% per cent. The efficient use of existing materials, such as tents, seating, barriers and containers, also reduced the amount of customized manufacturing.

INDIRECT EMISSIONS

However, although reductions in owned emissions were substantial, the size of indirect emissions remained problematic. In response, worldwide Olympic Partner Dow has delivered benefits of 500,000 tonnes CO₂e towards the mitigation of the Rio 2016 owned carbon footprint. In addition, Rio 2016 and Dow collaborated to generate an additional 1.7 million tonnes CO₂e of climate benefits to be applied toward the indirect carbon footprint of spectators' emissions.

These climate benefits were delivered through projects following three principles: economically viability within the Brazilian and Latin American reality; going "beyond business as usual" to deliver GHG emission reductions; and introduced innovations, overcoming barriers and catalyzing long-term change in market practices. Ultimately, the projects were designed to enable industries to do more with less, switch to lower-carbon energy sources, conserve energy and enable material efficiency through state-of-the-art solutions. An independent third party validated the Project Plans, verified GHG emission reductions and conducted an assessment of forecasted generation of climate benefits based on verified evidences.

One of these projects aims to provide expertise and technology to farmers in the Araguaia valley region to restore degraded pasturelands, increase livestock production and reduce GHG emissions. Farmers have been introduced to carbon tracking methodology to monitor over 50,000 hectares of pastureland, model farms that enable soil to capture more

carbon, and consulting services aimed at balancing investments in pasture restoration with intensification of livestock production.

A second project aims at generating sustainable biomass energy on a large scale by adopting innovative power and steam generation technologies from eucalyptus and sugarcane biomass to replace fossil fuels and significantly reduce GHG emissions. The biomass comes from dedicated farmlands in Aratu and Santa Vitoria, which produce enough energy to power all of Dow's local operations as well as excess energy for the grid. Dow is also working with The Nature Conservancy to identify priority land bank areas for conservation to ensure the protection and restoration of vital forests.

A third project focuses on raw material reductions in the packaging industry. Working with plastic film manufacturers in five countries (Brazil, Argentina, Guatemala, Mexico and Colombia), Dow has introduced microfoaming technology that reduces density in coextruded films through a physical foaming process. This results in the production of more packaging material with the same amount of resin.

Improvements in crop productivity are also delivered through a partnership with a leading precision agronomy service provider. Through this project, farmers in Mato Grosso optimize the use of synthetic fertilizer to reduce nitrous oxide emissions and are provided with technologies such as satellite imagery, precision harvest and profit maps, intensive soil sampling and laboratory analysis, weather monitoring, and detailed reviews of cropping plans and goals with variable rate technology experts. Dow is also offering seeds and crop protection solutions to farmers to help optimize production and increase yields – benefits which will be realized in years far beyond the Olympics.

1.5 TO STAY ALIVE

In line with the Paris Agreement, the Rio Olympic Games joined the 1.5 degree campaign, which features Olympians across the world demonstrating the need for "1.5 to stay alive." The Olympics are all about breaking records but GHG emissions is the one record we must not break.

ICELAND'S PATHWAY TO SUSTAINABILITY



Guðni Th. Jóhannesson, President of Iceland, gives a highly relevant insight into two important facets of his country's history, geothermal energy and sustainable fishing.





Aerial view of an Icelandic geothermal power plant.

he history of Iceland, which spans close to 1,200 years, can be presented in two parallel and striking tales: one is a story of energy usage, the other a story of fishing. Both these narratives describe a development from primitive exploitation to sustainable and highly rewarding practices.

THE ICELANDIC ENERGY STORY

To start with energy: when Iceland was settled in the 9th century it had considerable forests which provided fuel for the population. Obviously wood was needed for heating the primitive housing in the rather chilly island, and it was needed for the production of charcoal and, by extension, for iron-working. Unfortunately the forests, which never contained a lot of tall trees anyway, were very vulnerable and Iceland lost practically all its trees in less than 400 years. The loss of trees, along with volcanic eruptions and climate changes, caused some serious desertification as the wind could erode the grasslands more freely when the trees were gone. Ahead of us were centuries of poverty when the population had to squeeze what we could out of peat and other low-grade combustibles.

The forests, in other words, had been harvested without foresight. Without the notion of sustainability, without planting trees

"Without the notion of sustainability, without planting trees to replace those that were used, the valuable forest asset was destroyed."

to replace those that were used, the valuable forest asset was destroyed.

Then, around 1900, fossil fuels triggered a historical shift for us like so many others, and the use of coal and oil in our growing fishing fleet made possible the wonder of trawler fishing, with large-scale harvesting of our productive fishing grounds.

We also used fossil fuels to heat our houses, of course. Fortunately, however, we also started harnessing some of the hydropower resources we had to produce electricity so we could light up our streets and houses.

This all worked very well far into the 20th century until oil prices started climbing dramatically in the

1970s. The oil crisis had a serious impact on our national economy, and we realised that something had to be done: we had to look at other sources of energy to survive. Accordingly a large project to produce electricity from geothermal steam was started not far from the capital city, Reykjavik, and under its auspices. This geothermal power plant became a huge success and was soon followed by other similar and more technically advanced power plants in other regions.

At the present moment we are looking at the option of adding wind turbines to our primary energy mix; and we are also working hard to reclaim some of the forests that we so sadly lost in earlier centuries.

Hydropower and geothermal energy now account for more than 99 per cent of our electricity production. They are sustainable and clean energy sources that we are proud to present to visitors. Most of our houses are heated by geothermal district heating systems.

FISHING: PROBLEMS OF SUCCESS

The other area of interest, in the case of Iceland, is the management of our marine resources. For the first thousand years, Iceland was to a large extent a society dominated by farmers. The people who went fishing at designated harbours around the country were farm hands

who brought their catches back to the farms, and during this period the law prevented any urbanisation from taking place.

During these centuries, boats were small and dangerous and fishing gear was primitive and inefficient, but there was plenty of fish. In the first decades of the 20th century this changed dramatically as the fishing fleet was motorised and generally modernised. Of course this strong fishing sector brought great wealth to our society, and we managed to build schools and roads, and import cars and such like; in short, to establish a modern and fairly advanced society in the decades following the Second World War.

But then, in the early 1970s, it became clear that the fishing sector was heading for collapse. First, it was necessary to exclude foreign fleets from the waters off Iceland and establish an exclusive economic zone, in line with international developments. Domestically, it was clear that if the trend continued at the same pace for a few more years the industry would be catching fewer and fewer tons of fish, even while investing more and more. Each company had to invest more money in better ships to have a chance of catching the few fish that were left more quickly than the others. It was a classic case of the law of diminishing returns: the industry was facing imminent bankruptcy while depleting the stocks.

At this point, in 1983, an entirely new set of rules for the fishing sector was introduced by law. These stated that no one could fish in Icelandic waters without have a fishing quota, a designated percentage of the total allowable catch of each species. The percentage each boat was allocated was based on the quantity it had landed in the preceding years; the total allowable catch was determined by the Ministry



of Fisheries, based on annual recommendations from the Marine Research Institute.

A few years later, a new law was passed providing for the transfer of quotas, which meant that an efficient fishing company could buy quotas from another company that was going out of business or one that wanted to switch to another fish species. This system of transferable quotas had several faults and brought problems to many, especially to small fishing towns which might suddenly discover that their quota had been sold to a larger town somewhere. Also, there are recurrent debates in the country about the extent to which the fishing companies should pay levies for their access to the fishing stocks, the common natural resource of the Icelandic nation. But there were two decisively positive consequences the quota system entailed: the fish stocks were preserved, and the industry was brought out of the red and into the black - back into profit.

POSITIVE OUTCOMES

What we as a nation have gained in economic terms is considerable. It has been calculated that Iceland saves what amounts to its annual GDP every 20 years by using geothermal house heating instead of oil. Furthermore, many of our fishing companies are very well off now, and they have been expanding into other industries and to other countries. At the same time, many of them strive to make better use of what is brought ashore, to make valuable products from what used to be thrown away a couple of decades ago, such as the bones, heads, intestines and skin.

What I find interesting in these stories, in the development I have briefly outlined, is that the movement from short-sighted exploitation to controlled and sustainable use of valuable resources has not been driven by subsidies. The net result for us as a nation of using green energy and of carefully controlling the utilisation of our marine resources has not been increased costs but, quite the contrary, sharply rising profits – in both cases.

While appreciating the fact that natural resources are not equally distributed among nations, I strongly believe that it is worthwhile to give our experience in Iceland some careful thought.



Geothermal power plant.

Dr Guðni Th. Jóhannesson took office as President of Iceland in August 2016 (http://gudnith.is). He was previously a Professor of history at the University of Iceland and has also taught at Reykjavik University, Bifröst University and the University of London. He has written numerous books and essays on Iceland's history, including works about the Cod Wars, the Icelandic presidency and the 2008 banking collapse.

FINLAND ADDRESSES CLIMATE ACTION IN AGRICULTURE



Kimmo Tiilikainen, Minister of Agriculture and the Environment, Finland, describes the efforts made by Finland and international organisations to keep agriculture and efficient food production in the forefront of climate negotiations.

griculture is a sector where the impacts of climate change are very much apparent, as the increasingly frequent droughts, floods and extreme weather events are putting more pressure on communities all over the world. High temperatures may also have a direct negative impact on yield levels and animal health. At the same time, emissions from agriculture and land use represent a significant share of total emissions in all countries. In agriculture the synergies between mitigation and adaptation are evident – climate action is needed on both dimensions.

African agriculture (sub-Saharan Africa in particular) is expected to be disproportionately affected by climate change, which will have farreaching consequences on global food security. In the international climate change negotiations the progress made on agriculture has been fairly

"In the international climate change negotiations the progress made on agriculture has been fairly slow."

slow, despite references to food production in the objective of the UNFCCC Convention. The Paris Agreement recognises the fundamental priority of safeguarding food security. The Agreement

also recognises the particular vulnerabilities of food production systems to adverse impacts of climate change. With these statements, it is clear that agriculture is at the core of climate action and future climate negotiations. In COP22 in Marrakech agriculture will very likely be one of the main themes. The Marrakech COP coincides with an agreement among the Parties to reflect on how to frame the future work on the SBSTA agriculture agenda item. There are several quite recent agriculture initiatives, including the French '4 pour 1000' and 'Adaptation for African Agriculture' initiative launched by the incoming Moroccan COP Presidency.

CARBON SINKS AND 4 PER 1000

The Paris Agreement stresses the importance of carbon sinks. According to the Agreement, there needs to be a balance between anthropogenic

emissions by sources and removal by sinks of greenhouse gases in the second half of this century. Sinks certainly mean forests, but soils also function as sinks. Soil is a major carbon reservoir, holding more carbon than is contained in the atmosphere and terrestrial vegetation combined. According to the UN Food and Agriculture Organization (FAO, Status of the World's Soil Resources), erosion carries away 25-40 billion tonnes of topsoil each year. Erosion causes huge losses in crop yields and the soil's ability to store and cycle carbon, nutrients, and water. Cereal production losses due to erosion have been estimated at 7.6 million tonnes each year. If action is not taken to reduce erosion, a reduction of more than 253 million tonnes in cereal production is projected by 2050.

Agriculture can make a contribution to carbon sequestration. Reducing erosion and increasing soil carbon helps to mitigate climate change and adapt to it, as well as improve productivity and nutrient intake. The French 4 per 1000 initiative (www.4p1000.org) focuses on soils and has a target to increase soil carbon by 0.4 per cent every year and, with that, to halt the annual increase in CO₂ in the atmosphere. The aim of the

initiative is to demonstrate that agriculture, soils in particular, can play a crucial role in mitigating adverse agricultural impacts, and to engage stakeholders in a transition towards a productive, resilient agriculture based on soil management.

To inspire the discussions on the role of agriculture post-Paris, the Nordic Working Group for Global Climate Negotiations (NOAK, www.norden. org/noak) has launched a project called Agriculture Initiatives and COP22. The project will take stock of regional and global initiatives related to agriculture and climate change, place these initiatives in the context of agriculture-related components in the INDCs, evaluate the extent to which the most promising initiatives could be further developed and replicated, and suggest ways to address the challenges in the implementation of these initiatives. The project will also organise a Nordic event and ministerial roundtable at COP22 to discuss agriculture and climate change and to present initial findings of the project.

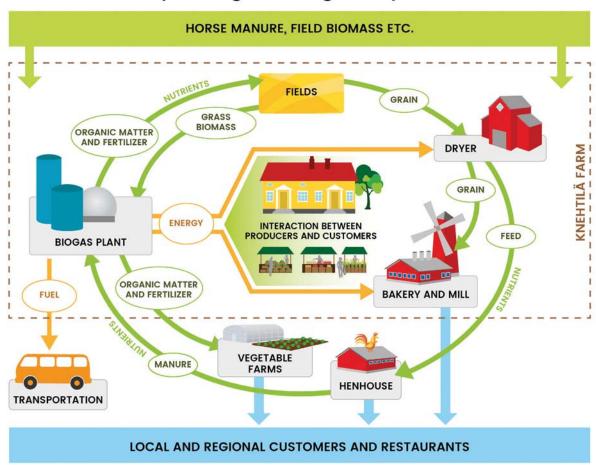
Thus quite a lot of action is already being taken, from the regional to global level. These agricultural initiatives will have an important impact when paving the way for agriculture in upcoming climate negotiations.

FINNISH ACTIVITIES

In Finland both top-down and bottom-up initiatives are running in the context of climate action in agriculture:

Enhancing sustainability. The Ministry of Agriculture and Forestry published the Climate Programme for Finnish Agriculture, Steps towards Climate-Friendly Food, in 2014. The objective is to enhance the sustainability and profitability of the Finnish food system. A climate-friendly production system is productive relative to the land area and non-renewable energy use. It is resilient and adaptive in changing climate conditions. It is efficient, minimising the emissions relative to a kilo of raw material produced. Climate-friendly consumption means healthy, sustainable diets and the avoidance of food loss and waste. The Climate Programme for Finnish Agriculture serves as an information bank for those who aim for a more sustainable and productive food system. The programme brings together the most recent research information on the climate issues in food production and consumption, from the perspective of both adaptation and mitigation. It presents concrete climate change adaptation

Palopuro Agroecological Symbiosis





and mitigation measures for the food system, while also reflecting on potential future means for adaptation and mitigation. Some of the measures included in the programme are already being implemented, while others are still in the pipeline.

The 4 per 1000 initiative. Finland is pleased to be among the signatories of the 4 per 1000 initiative. We have many good examples of productive, carbon-wise and sustainable agriculture systems and innovations to showcase globally. One of these is a network of nutrient and energy-effective colleges and school farms located in different parts of Finland. The aim is to serve as a model and testing ground with pilots, teamwork and communication in sustainable development. The network's main themes are biogas, energy efficiency, composting, solid biofuel, manure logistic, organic fertilisers and protein self-sufficiency.

Nutrient recycling. Among the priorities of the Finnish Government is to increase nutrient recycling. The aim is to develop a resource efficient food system based on circular economy. The objective set in the government programme is that "the recovery of nutrients will be increased especially in areas that are sensitive with regard to the Baltic Sea and other waters, so that at least 50 per cent of the manure and community waste water sludge will be covered by advanced processes by 2025." This will be attained with targeted research, innovations,

dissemination of information and investment support. Experimentation funding is also available to new progressive ideas of how the objective can be reached.

Local climate action. 'Climate-wise Solutions to the Countryside' is a national communication project which aims to enhance local climate action in rural areas, stemming from the needs of the local communities. In the project communication is provided pragmatically about climate action, thus helping farms to adapt to climate change and to be resilient in the face of changes. The project uses workshops and webinars for communication. A network of climate-wise pilot farms has been set up to communicate about their experiences and experiments.

Knehtilä Farm has created a network of several organic producers and processors. In the integrated system, cereal from the fields would be milled in Knehtilä and baked to bread by an organic bakery operating on the farm. Energy from gas charred using local, low-value wood as feedstock would be used both for the drying and milling of the cereal and for the ovens of the bakery. Biomass from green manure leys in the farm's crop rotation, combined with hen manure and manure from local horse stables, is processed in a biogas plant. The result is biogas to be used for farm machinery and for local sale to passenger cars. The nutrient-rich produce from the digester is used as organic fertiliser

and soil conditioner on the fields. With this agroecological symbiosis model biomass loops are closed and the cooperative is able to operate in a sustainable manner.

USING FARMERS' SKILLS

For agricultural production there are technical solutions to improve production efficiency, facilitate adaptation to climate change and restrain greenhouse gas emissions. In all this, the best possible use should be made of the knowledge and skills of the farmers. Farmers are innovative, and we should encourage them to take climate action. Well-managed soil is highly productive and capable of adapting, thanks to the better water retention capacity. Good growth potential of the land also supports the carbon objectives as more carbon is sequestered into the soil. Appropriate use of plant nutrients improves productivity and contributes to mitigation, while diverse crop rotations reduce the risks to farmers and enhance their adaptation capacity. Healthy and well-cared-for animals as part of carbon-rich production systems produce valuable food with a minimised carbon footprint.

The Paris Agreement urges us to take climate action in food production. This has regional and local benefits in the form of improved self-sufficiency, well-being and risk management. To take effective and successful climate action we need farmers, informed consumers, researchers, politicians, and all other stakeholders in the whole of the food system. With these committed and innovative actors we will work in the spirit of the Paris Agreement and achieve its goals.

Kimmo Tiilikainen has been the Finnish Minister of Agriculture and the Environment since May 2015. He has been a member of parliament since 2003, and former Minister of the Environment from 2007 to 2008. Tiilikainen graduated in 1991 from the University of Joensuu as a Master of Science in Agriculture and Forestry. He is also an organic farmer and forester.

The Ministry of the Environment of Finland

(www.ym.fi) is responsible for preparing submissions to be considered by government and parliament, concerning such matters as communities, the built environment, housing, biodiversity, sustainable use of natural resources and environmental protection. The Ministry of the Environment leads national efforts and encourages cooperation in promoting sustainable development; securing a good living environment; and safeguarding biodiversity for both current and future generations.

THE PRIVATE SECTOR'S ROLE IN PROMOTING SUSTAINABLE DEVELOPMENT



Peter Bakker, President and CEO of the World Business Council for Sustainable Development (WBCSD), outlines the private sector's role in the sustainability and climate agenda.

The ratified Paris Agreement makes the transition to a low-carbon economy inevitable. The Sustainable Development Goals (SDGs) add to that a framework for developing our societies and economies. They turn all countries in the world into developing nations. As businesses around the world find their focus in the implications of this new framework, one thing has become crystal clear: the Paris Agreement and the SDGs will not be realised without the involvement of all state and non-state parties alike, especially the private sector.

THE SUBSTANTIAL ECONOMIC OPPORTUNITY

With an annual US\$5-7 trillion needed to finance the SDGs alone (according to UNEP), and an estimated US\$90 trillion needed to support the aims of the Paris Agreement over the next 15 years (The Climate Group), business has a critical role to play as a source of investments and as a driver of technological development and innovation, not to mention as an engine for economic growth and employment.

MSCI – a world leader in stock market and investment benchmarking – created the

Sustainability Impact Index (www.msci.com), which identifies listed companies whose core businesses directly address environmental and social challenges. The goal is to enable investors to incorporate sustainable impact into their processes and measure investment alignment with the SDGs. Remarkably, the Sustainability Impact Index is outperforming the conventional index by 14.8 per cent, showing that investing in sustainability is an excellent bet.

But even though sustainability investments can offer better returns, when it comes to the



SDGs it is a daunting task for any CEO to focus on 17 goals and 169 targets. With this in mind, the WBCSD collaborated with the UN Global Compact and GRI to develop the SDG Compass (http://sdgcompass.org) which provides guidance on how to align business strategies with the SDGs and measure their impact. We complemented these efforts by developing the SDG Business Hub (www.wbcsd.org/sdghub.aspx), a dynamic online platform showcasing business insight, emerging tools and resources in this space. Each of these valuable resources are designed to point

business in the right direction for achieving the SDGs and enhancing company practice.

To stand a chance of limiting our planet's temperature rise to below 2°C, investments to address climate change and pursue clean energy become some of the most important investments needed in the near future – and the business case for addressing these issues is clear.

A price on carbon is a cost-effective way to accelerate low carbon innovation, shift investment towards low carbon technologies, and help ensure sustained economic competitiveness. The business community believes that global, robust and stable carbon pricing will be fundamental for the successful implementation of the Paris Agreement.

INNOVATIVE PRIVATE SECTOR INITIATIVES

The Low Carbon Technology Partnerships Initiative (LCTPi, http://lctpi.wbcsd.org) is one of the initiatives that demonstrates how the private sector can drive systemic transformations of the kind we need across all of our economic systems. Involving more than 150 businesses

GATHERING MOMENTUM

The good news is that the world is catching on to the possibilities for business involvement. In 2015, clean energy investment surpassed fossil fuel investment - but this is only the beginning. It's possible to go much further, and we must go faster. Numerous opportunities are available for businesses to streamline efficiency in transport and logistics, while offering new ways to manage natural resources and increase the world's capacity to mitigate harmful greenhouse gases - not to mention the fact that addressing climate change represents a US\$4 trillion opportunity, while the cost of inaction could create between \$6 trillion and \$14 trillion in losses (http://newclimateeconomy. report/2014/).

and 80 partners from around the world, LCTPi is a collaboration led by WBCSD to accelerate the development of low-carbon technologies and scale up their deployment.

An independent impact analysis by PwC shows that the LCTPi plans could deliver as much as 65 per cent of the necessary emissions reduction, while stimulating between US\$5 trillion and \$10 trillion of investment into the low carbon economy and creating between 25 million and 45 million jobs around the world each year.

This is just one of many initiatives operating around the world. A recent report by We Mean Business, titled *The Business End of Climate* (www.businessendofclimate.org), shows how bold climate action, supported by smart policy, can keep the temperature rise below 2°C. The report looks at five initiatives that companies have joined as part of their efforts to address climate change: Science-Based Targets, EP100, RE100, Zero Deforestation and LCTPi.

The analysis shows what would happen if these five initiatives achieved their most ambitious plans. Effectively a 'business-determined contribution', the report shows that by 2030, business will cut its greenhouse gas emissions by 3.7 billion tonnes of CO_2 equivalent a year – half a tonne of CO_2 for every man, woman and child on the planet. The report goes further, estimating that if all relevant companies that were able to join the initiatives actually signed up to them, the total impact on emissions could go as far as 10 billion tonnes every year.

Analysis like this shows that business is the best implementation partner for governments around the world as they strive to hit their climate targets.

"Sustainable business must become mainstream and companies must join the global initiatives described here."

THE IMPORTANCE OF BUSINESS IN CONSERVATION

Our impact on nature is overlooked too often in the global fight against climate change. At this year's IUCN World Conservation Congress in Hawaii, the importance of moving the conservation agenda forward was emphasised by all stakeholders. The need to invest in nature to preserve our chances to fight climate change and provide enough for the growing population to develop sustainably is well understood by non-state actors. However, while the private sector's engagement in global conservation efforts is on the rise, the business case for investing in nature is not yet fully understood.

If the private sector starts integrating nature in its business approach and its impact on the natural environment, others will follow suit. To move the conservation agenda forward, the business case must be backed by science and understood by all stakeholders. To address the gap, WBCSD launched the Natural Infrastructure Guide for Business to help raise awareness of why investing in natural infrastructure makes good business and ecological sense (www.naturalinfrastructureforbusiness.org).

These initiatives are important touchstones for companies on their individual sustainability journeys. However, to reach scale, more companies must begin to use the Natural Capital Protocol (http://naturalcapitalcoalition.org/protocol) and integrate their impacts and dependencies on nature in their decision-making processes.

As the topics of natural capital, certification, sustainable food systems, nature-based solutions and oceans continue to grow in urgency, business collaboration and engagement will continue to be a key theme in discussions and delivering solutions.

BUILDING THE CASE

Essentially, we need to change course completely. But this isn't news. Today, companies are in the process of understanding and prioritising which SDGs are the most relevant, and where they can have the widest, most positive impact. They are assessing how they can innovate to meet the

ambitions of the Paris Agreement. However, the business case for the SDGs is not as clearly made as the one for climate action. For this reason, WBCSD is one of the contributors to the Business and Sustainable Development Commission that is put in place precisely to do that: build the business case and engagement pathways for business to lead the SDG solution implementation. By getting sectors to create sector roadmaps, innovation to focus on SDGs as well as the financials to be completed by natural and social capital elements, then we will position the SDGs at the heart of business strategy.

The private sector must take its role even further in terms of innovation, investment and engagement. Sustainable business must become mainstream and companies must join the global initiatives described here. Financiers must unlock the capital that will drive solutions, and governments and business must work together to help these initiatives achieve their targets.

We must make a global concerted effort. The technology and the solutions are available today – it's up to us to implement them at scale, and accelerate the transition to a sustainable world.

Peter Bakker is the President and CEO of the World Business Council for Sustainable Development (WBCSD). Until June 2011, he was the CEO of the Netherlands-based TNT NV. Under his leadership, TNT rose to the forefront via a partnership with the UN World Food Programme and ambitious CO₂ reduction targets from its Planet Me initiative. Mr Bakker is the recipient of the Clinton Global Citizen Award (2009) and the SAM Sustainability Leadership Award (2010). He is an Ambassador Against Hunger for the UN World Food Programme (since 2011). Mr Bakker is an appointed Commissioner for the Global Commission on Business and Sustainable Development, and in 2016 he was named an SDG 12.3 Champion for his commitment to reducing food loss and waste. In addition, he is the Chairman of War Child Netherlands.

The World Business Council for Sustainable Development (WBCSD, www.wbcsd.org), a CEO-led organisation of some 200 forward-thinking global companies, is committed to galvanising the global business community to create a sustainable future for business, society and the environment. Together with its members - who represent all business sectors, all continents, a combined revenue of more than US\$8.5 trillion and 19 million employees - the council applies its respected thought leadership and effective advocacy to generate constructive solutions and take shared action.

INDUSTRY CAN LEAD ON CLIMATE CHANGE

Dr Roland Busch, Member of the Managing Board of Siemens AG, presents Siemens' attitudes and achievements as the group aims for a net zero carbon footprint.

Sustainability is regarded as one of the most critical and globally relevant topics on the political and business agenda of the last few years. More than ever, companies are called upon to fulfil their role as corporate citizens. At Siemens, we accept this role without reservation or restriction. We are convinced that a company is only entitled to exist if it creates sustainable value for society over the long term.

We apply the principles of sustainability at Siemens across the entire value chain – from our suppliers, through our own operations, to our customers – by designing sustainable products and solutions. In the last fiscal year, our Environmental Portfolio enabled our customers and partners throughout the world to significantly reduce their CO₂ emissions by 487 million tonnes. This corresponds to around half the annual CO₂ emissions of Germany. As a result, they have been able to enhance their energy efficiency while increasing their competitiveness.

But we want to achieve more – and we can achieve more. We have therefore decided to reduce our own CO₂ emissions more quickly:



London Array – offshore windpark – World's largest operational offshore wind power plant – Powers over 500,000 British homes – Reduces over 900,000 tons of CO, a year



Riyadh - world's largest metro project - Six lines. Total length: 175 km - 74 Inspiro metro trains. Top speed: 90 km/h

Siemens aims to be the world's first major industrial company to achieve a net zero carbon footprint by 2030. Our goal is to cut our carbon dioxide emissions – which currently total about 2.2 million tonnes a year – in half by as early as 2020.

To achieve this goal, we will invest some €100 million by 2020 in order to improve the energy efficiency of our production facilities and buildings. This investment is expected to generate annual savings of €20 million. We will also install our own distributed and renewableenergy systems at a growing number of our facilities. For example, we already generate around 80 per cent of the total electricity consumed at our plant in Sacramento - which builds locomotives and light-rail vehicles for the US market - using photovoltaic systems, and we are in the process of building wind turbines at many of our production facilities. These investments are sustainable from two perspectives: the ecological and the economic.

We support global initiatives to reinforce sustainability standards around the world and extend our know-how. We are fully committed to the targets and principles of the United Nations Global Compact and its CEO Water Mandate. We support the WEF Climate CEO Statement and the 'We Mean Business' initiative.

We receive continued recognition from external ratings and rankings, such as the Dow Jones Sustainability Index, that we are among the most sustainable companies in our industry group. For fiscal year 2015, we obtained best possible results from the Carbon Disclosure Project, an index reflecting the climate-protection measures implemented by companies.

Siemens will continue to apply sustainable business practices in the future. We are very cognizant of our responsibilities as a corporate citizen. We make sure we contribute towards advancing society. This is our commitment to present and future generations.

Dr Roland Busch is a Member of the Managing Board of Siemens AG. He is responsible for the company's Asia/Australia region as well as for the infrastructure businesses including the Energy Management, Building Technologies and Mobility divisions. In addition, Busch is in charge of the company's sustainability as well as sales activities.

To learn more about Siemens and its sustainability activities, visit us on **www.siemens.com/sustainability**





Sir Roger Gifford, Chairman of the Green Finance Initiative, assures us that the two-degree ceiling is being taken seriously by the financial community, and shows how the City of London is promoting and developing the emerging green finance sector.

n a remarkably short period of time – the past year, especially – perceptions of climate-related finance have shifted profoundly. Clearly, this reorientation is by no means complete; we are yet to reach the trillion dollar investment target set by the IEA. But COP21, creation of the FSB Task Force on Climate-related Financial Disclosure, and China and the UK's co-convening of the G20 Green Finance Study Group each marked a breakthrough in the sector's development.

No longer are 'green' projects considered a form of 21st century tribute, or restricted to a corporation's CSR programme. Instead, the capital required to meet or even beat the two-degree ceiling is increasingly being seen as an investment rather than a cost – and one split voluntarily between the private and public sectors. Because despite growing calls for fiscal stimulus and the state-led commitments of the Paris Agreement, the trillions required are far beyond the capacity of taxpayers. Even the People's Bank of China, custodian of the world's largest sovereign reserves, has admitted that private investors must finance 85 per cent of the country's environmental projects.

Mobilising green capital is thus a political, regulatory and industry priority worldwide. Such efforts are not beginning from scratch, though. Rather, they are seeking to further scale and strengthen one of the financial sector's fastest growing and most vibrant sectors: green finance.

GREEN AND GROWING

The concept itself is simple. Green finance can fund any means of reducing carbon emissions or raising resource efficiency, and its adherents range from world-renowned corporates like Apple and Unilever to cities, states and international development banks. And it is growing rapidly across the full breadth of the financial and professional services sector. Green bonds, for example, were first issued in 2007, and sold not because of political pressure or public subsidy but due to rising demand for high-quality, low-carbon assets. They have generated record-breaking issuance volumes since, are worth in excess of US\$150 billion globally and are coveted for their value as a hedge against carbon-related risks,

as well as their reputation for transparency and integrity. And beyond green bonds and loans, green funds, indices and even crowd funding platforms are providing the tools to link political and societal conviction with investor demand.

These instruments benefit not only the environment but issuers too, typically broadening their investor base, maximising order books and tightening prices. Such was the demand for Transport for London's inaugural green bond, for example, that the agency secured its second-lowest cost of debt capital yet and tapped an entirely new cash pool. Fully 69 per cent of the bond's investors were green-only funds, many of them first-time investors not just in TfL but in sterling markets entirely.

This organic, bottom-up development is one of the sector's great strengths. Issuers and investors worldwide are committing to best practices that incorporate product accreditation, transparency and regular reporting. Voluntary 'green principles', if you like, that ensure investor confidence in the environmental credentials of their holdings.

A RANGE OF VISION

The sector's growth has raised a natural question - what is green? The answer differs by geography, reflecting the fact that each nation's journey toward carbon neutrality is bespoke and that, even domestically, one investor's green parameters may differ from another's. Many emerging markets are also operating on a longer time-frame for reducing emissions than, say, Europe - and even neighbours will disagree about the role of nuclear energy or the acceptability of clean coal. As long as the financial products facilitating this transition are transparent and properly accredited, however, investors can choose for themselves the assets that best suit their green mandate, and the market will price instruments accordingly.

With this approach, the green finance sector can retain its reputation for integrity, a reputation that will be ever more important as the market continues to attract retail investors and multilateral support. Indeed, the sector has so far developed both top-down and bottom-up, linking political conviction with the long-term concerns of institutional investors and the desire that exists within local communities to improve their immediate environs. Green products can therefore connect regional and domestic infrastructure needs (much if not all of which will require green provisions if the climate action plans, or INDCs, submitted in Paris are to be delivered) with a ready investor base. And the dealflow this might generate is enormous; green

"These instruments benefit not only the environment but issuers too, typically broadening their investor base, maximising order books and tightening prices."

issuance could encompass everything from UK housebuilding and Indian smart cities and the work of the self-labelled 'lean, clean and green' Asia Infrastructure Investment Bank.

THE YEAR OF GREEN FINANCE

The City of London Corporation has a history of promoting and developing emerging sectors, from renminbi internationalisation to Islamic finance, fintech and international legal services. We are concerned with the interests of the whole financial industry, whether it is based in London or abroad, and believe passionately that green finance represents one of the sector's best prospects. That is why, in January 2016, the City of London Corporation announced the creation of its Green Finance Initiative, which I am delighted to chair, and designated 2016 the 'year of green finance'.

FOCUS ON LOW-CARBON INVESTMENTS

Green finance is prudent, it can be profitable. and it is one of the best tools available to global policy-makers in the race to cut carbon. Green assets are becoming more than just niche purchases, and are increasingly bought by investors who once passively divested high-carbon assets but now actively seek to learn about and obtain low-carbon products. These investors include not only environment-specific funds (though the assets they command are larger than one might realise), but mainstream asset managers and institutional investors too - asset managers who are attracted by the integrity that transparent, fully accredited green products provide, and who covet their value as a hedge against those carbon-related risks highlighted by Bank of England Governor Mark Carney.

Developed in partnership with HM Treasury and what is now the Department for Business, Energy and Industrial Strategy, the Initiative pools international expertise and is intended to promote the sector's development, strengthen market infrastructure and advocate specific regulatory and policy changes that might better channel funding toward green projects. The initiative has since convened a number of major forums with both international and domestic stakeholders, and is in the process of benchmarking the UK's green financial flows and market sentiment; investigating climate-triggered product mechanisms; promoting and enhancing municipal authorities' access to green finance; and convening a series of green workshops. We intend to better quantify the market's challenges and opportunities, address them and enhance the sector's development globally.

Scaling up the sector, of course, is the market's challenge, and is a key topic of discussion here at Marrakech. But the two-degree ceiling is being taken seriously, and financiers worldwide are positioned to undertake the heavy lifting necessary to meet or even beat it.

Sir Roger Gifford is the Chairman of the City of London's Green Finance Initiative. He is also the UK Country Head of SEB, based in the City of London, and began his career in the financial sector at S G Warburg & Co before joining Enskilda Securities, then a subsidiary of SEB, in 1982. Prior to his appointment as Head of SEB London in 2000, he headed the bank's operations for six years in Japan. He has worked in the primary debt and equity capital markets most of his career. Sir Roger is Vice-Chairman and a Past Chairman of the Association of Foreign Banks in London, President of the Bank Workers Charity and a Non-Executive Director of Multrees Investor Services. He was Lord Mayor of the City of London in 2013 and was knighted in the 2014 New Years Honours for services to international business, culture and the City.

The Green Finance Initiative (http://
greenfinanceinitiative.org) was launched in 2016
by the City of London Corporation in partnership
with business and UK government departments
HM Treasury and the now Department for
Business, Energy and Industrial Strategy. The
Initiative aims to provide public and market
leadership on green finance; advocate for
specific regulatory and policy proposals
that might enhance the green finance sector
worldwide; and promote London and the UK as a
leading global centre for the provision of green
financial and professional services.

DE-RISKING CLIMATE FINANCE

The European Investment Bank (EIB) describes how it shares financial risk by drawing private money to climate-action projects alongside public funds.

The wind farm at Langmarken, Sweden, will be unlike any other. Not because of the turbines – manufactured by Denmark's Vestas, they will be much like any other when construction is completed. It is the financing of the 23 MW onshore facility that is innovative.

The European Investment Bank holds a share in a French fund that took a stake in Langmarken. The Bank then co-invested directly in the wind farm. Now the fund and the Bank jointly own 90 per cent. This is a big step for the EIB, because we typically do not take ownership stakes. But we are using a different approach to climate finance, because this is a different kind of challenge.

The Langmarken co-investment uses the European Fund for Strategic Investments (EFSI), which combines EIB funds and an EU budget guarantee. It is a powerful tool to do climateaction deals bigger and faster. So far the EIB has approved €738 million of climate-action investments in funds with EFSI.



CCCFL wind farm projects in China.



Infrastructure fund investing in larger renewable energy projects, with a focus on wind, biomass and offshore transmission.

The EIB is the world's biggest climate-action financier. Last year the EIB provided a record €20.7 billion for climate action with funding to every EU member state and projects from Nicaragua to Nepal. By 2020 we expect to finance climate projects worth US\$100 billion.

But investment by even the biggest development banks won't be enough to fund the climate targets laid out at COP21 in Paris. Just as the Investment Plan for Europe triggers private investment in innovation and in small and medium-sized enterprises, so, by sharing risk the EIB draws private money to climate-action projects alongside public funds.

The EIB has three primary ways of doing this:

- Coinvestments like Langmarken, which allow private fund managers to get behind bigger projects than they could do on their own
- Layered risk deals in which public funds take a bigger portion of the risk in a project and, thus, make an investment more attractive for private money
- Soft enhancement, meaning deals where the fact of EIB's presence demonstrates that a project has been examined in depth and assessed to be a good one. This can be critical to investors attracted to a deal who lack the EIB's resources or infrastructure expertise

"So far the EIB has approved €738 million of climate-action investments in funds with EFSI."

Impact is key to all EIB layered risk investments. Take Green for Growth, a $\mathfrak{e}368$ million fund run by the Frankfurt firm Finance in Motion. With a $\mathfrak{e}50$ million EIB investment, Green for Growth backs renewables and energy efficiency in the Western Balkans and Turkey. The CO $_2$ saved from its work is equivalent to 1.9 million Frankfurt to London passenger flights. In late 2016 Green for Growth intends to expand into North Africa and the Middle East. The fund has asked the EIB to support the move with a further investment.

www.eib.org

CLIMATE FINANCE FOR EMERGING COUNTRIES



Mafalda Duarte, Head of the Climate Investment Funds (CIF), calls for innovative green financial instruments to attract private investment and 'derisk' new infrastructure projects, highlighting Morocco as a shining example.



wenty-one years is a long time. Long enough to raise a child and send him or her off to college. That's how long it has taken to get to the Paris Climate Agreement. Climate leaders are meeting this November in Marrakesh to talk about concrete action to implement this historic treaty, and much of that discussion needs to focus on money.

I started off my career more than 15 years ago as a development economist, and for a few years climate change and climatefinance never really crossed my mind. But after years spent on the ground and seeing devastating floods, droughts and the effects of unpredictable weather – particularly in sub-Saharan Africa – I realised how climate change would compromise and potentially roll back the hard-won economic and social progress made by poorer countries, something I care about dearly.

While development economics is my pursuit, these days my life and work revolve around finance. I believe in the key role of innovative and scalable ways to finance climate projects to move us away from an ever-warming planet and its dire consequences.

The signing ceremony of the Paris Agreement was not an unalloyed cause for celebration, because of the dissonance and contradictions observed between the investments and policies taking place worldwide. In particular, there is not yet nearly enough patient and long-term climate finance – whether from public or private sources – to trigger the revolution we need.

We need to realise the urgency, speed and scale of action that is needed and act accordingly. Limiting warming below 1.5°C by 2100 is still feasible, but time is running out. And we need to demonstrate that it makes good business sense for the private sector to step in and step up.

HUGE INVESTMENT NEEDED

Research by Bhattacharya, Oppenheim and Stern (2015, www.brookings.edu) shows that in the next 15 years, the world will need to invest around US\$90 trillion in sustainable infrastructure assets if it strives for a climate smarter world – surely the world we all want to live in and most importantly that we want our children to live in. This includes investment in cities, transport systems, energy systems, water and sanitation, and telecommunications. This \$90 trillion of new infrastructure, most of which will be built in developing countries, represents more than the current global stock.

These investments have the potential to bring a lot of benefits but only if they are socially, environmentally and economically sustainable. That means they need to be consistent with a net zero emissions and climate resilient future world. Failure to align the climate action and



Noor provides the foundation for Morocco's plan to produce 2GW of solar power by 2020.

"There is not yet nearly enough patient and long-term climate finance to trigger the revolution we need."

infrastructure investment agendas could lock-in technologies, planning models and businesses to a high carbon and low resilience pathway for decades to come.

We also know that overall it is more expensive to finance infrastructure projects in developing countries where the needs for renewable energy and other sustainable infrastructure are greatest. Real and perceived risks, including country and political risk, technology risk, and off-taker risk (for power projects) are often too high to attract investors and project developers to invest in climate-smart projects in emerging markets. Investing institutions often feel it is safer to invest money elsewhere, leaving many of these countries without the investment needed to move towards a low-carbon economy.

CONCESSIONAL FINANCING

Responding to real and perceived risk is where public concessional financing proves its usefulness. Concessional financing is money that is provided at below market-based rates in order to help de-risk the project and attract other investors that would not provide finance otherwise. Concessional financing can therefore unlock climate-smart investments

that are deemed too risky for investors, and in some cases, even for development banks. Well-targeted use of this type of financing is necessary to push new technologies, create new markets, and to crowd in private sector financing. Concessional finance is also increasingly necessary to support investments in climate resilience and adaptation, especially in the poorest and most vulnerable countries.

Concessional financing that is 'blended' with commercial financing is not an abstract concept, but rather a sound financial strategy that is leading to innovative projects in roof-top solar energy, flood-proof roads and bridges, or reforestation – all of which have real, positive impacts on people's lives.

For the past six years I have been engaged in the implementation of the Climate Investment Funds (CIF) to support developing and emerging countries make these types of investment choice. I am proud because I see us helping countries like Kenya invest in geothermal energy, while also reducing the costs of electricity to its population. Or India, where an investment of around US\$1.2 billion by multilateral financing partners will lead to a serious expansion in rooftop solar energy. Or Mexico, where access to finance empowered local communities in driving sustainable forest management.

SHINING EXAMPLES

As host country of the 2016 COP, Morocco provides one of the best examples of what concessional financing paired with other public and private capital and technical partners can accomplish. Last year, the Noor Concentrated Solar Plant (CSP) in Ouarzazate – the largest CSP plant in the world, so big it can be seen from space – was opened. About US\$435 million of CIF funds have been invested in the Noor project, which will

provide clean energy to 1.1 million households. It is estimated that the plant will achieve over 500 megawatts (MW) installed capacity, reduce Morocco's energy dependence by about two and a half million tons of oil, while also lowering carbon emissions by 760,000 tons per year.

It provides the foundation for Morocco's plan to produce two gigawatts of solar power by 2020, equivalent to about 38 per cent of Morocco's current installed generation capacity. The indirect benefits of the Noor project might even be larger: it has advanced an important and innovative technology, it has driven down costs of CSP, and it holds important lessons for how public and private sectors can work together in the future. It had its own claim to fame when superstar and climate activist Leonardo DiCaprio shared a photo of the plant with his nine million Instagram followers.

Apart from Hollywood glitter, climate finance has truly brought on progress in terms of helping fire off groundbreaking technology and a new market. Concentrated Solar Power is such a promising technology that the International Energy Agency estimates that up to 11 per cent of the world's electricity generation in 2050 could come from CSP. This is especially relevant for the Middle East and North Africa, a region rich in solar resources.

We need innovative green financial instruments to attract billions of the private capital market; products such as green bonds, climate insurance, and securitisation of assets in climate funds. For example, in Mexico, the Inter-American Development Bank – with the support of the CIF – is implementing a Green Bond Securitisation project. Its objective is to promote sustainable energy investments in small and medium enterprises (SMEs). The Green Bond will provide direct long-term financing to a portfolio of sub-projects investing in sustainable energy initiatives. Our concessional financing will be used for credit enhancement to the portfolio,

"We need political leaders to move away from powering our economies with the dirty energy sources we have been using for more than two centuries."



About US\$435 million of CIF funds have been invested in the Noor project in Morocco.

through the use of a partial risk guarantee to mitigate risks faced, first, by lenders, while the portfolio is developed to reach the critical mass needed for bond issuance; and then by bond investors. Our financing should enable the Green Bond to achieve the credit rating required to attract institutional investors, which would be a first for the sector in Mexico.

Projects like these can convince private and institutional investors that green, climate-smart markets are wide open for business across emerging and developing economies and we – multilateral and concessional financiers – are there to help fertilise it. Concretely, we are planning to do this through the creation of a groundbreaking financing vehicle aimed at offering a unique opportunity for institutional investors looking for a sustainable and diversified portfolio in emerging economies.

BEHAVIOUR-CHANGING LEADERSHIP

Finally and most importantly, we need leadership. We need political leaders to move away from powering our economies with the dirty energy sources we have been using for more than two centuries. We need to make sure we save a lot more energy – which means retrofitting existing buildings and ensuring energy efficiency standards are used in new ones. We need to change behaviours in terms of the way we commute, the way we dispose of waste, the way we consume. And we need to do things dramatically differently in a short period of time.

Yes, 'Paris' led to a cornerstone climate agreement, but lots of work is left to be done in Marrakech. They say that "money makes

the world go round" – and I hope an honest conversation about finance at COP22 could ensure the wheels of progress turn much more quickly and smoothly.

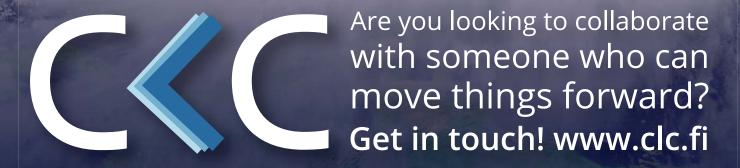
Mafalda Duarte is the Manager for the Climate Investment Funds (CIF) and leads the development of policies and practices to achieve the CIF's objectives. She provides strategy, oversight and guidance on all aspects of the CIF and manages relationships with senior stakeholders at the national, regional and global level including within international financial institutions. She represents the CIF at high-level forums including COPs, annual and spring meetings of multilateral development banks. SE4All and others. She is also the CIF's chief spokesperson and has been quoted in many international media outlets. Previously, Mafalda worked for the African Development Bank and the World Bank, responsible for large climaterelated portfolios, and served as an advisor to the Government of Mozambique.

The Climate Investment Funds (CIF, www-cif. climateinvestmentfunds.org) is providing 72 developing and middle income countries with urgently needed resources to manage the challenges of climate change and reduce their greenhouse gas emissions. Since 2008, the CIF has been leading efforts to empower transformations in the energy, climate resilience, transport and forestry sectors. Total CIF pledges of US\$8.3 billion are expected to attract an additional \$58 billion of co-financing for a portfolio of over 300 projects with more to come.

BUSINESS SOLUTIONS FOR CLIMATE CHANGE

Climate Leadership Council challenges companies and society to act on climate change. We create and implement solutions for climate financing, risk management, carbon pricing, carbon footprint and handprint, built environment, transportation, energy, circular economy and consumer cleantech. We are a rapidly growing network of leading Finnish and international companies and organizations. Our current 31 members represent nearly half of the market cap of the Helsinki stock exchange.

Our first key initiative was to develop the greater Helsinki area into a world-class cleantech implementation showcase resulted the Smart & Clean foundation co-funded by companies, municipalities and the Finnish government. Current key projects address the climate neutral transformation on a country level and making carbon pricing more effective.



THE COMMONWEALTH CLIMATE FINANCE ACCESS HUB



Patricia Scotland, Secretary-General of the Commonwealth, describes how the Commonwealth Climate Finance Access Hub is unlocking climate finance for adaptation and mitigation in developing countries, providing a new kind of hope for vulnerable states.

uccament Bay in St Vincent has been described as a luxury holiday resort. Invariably the focus is on its two beaches - one which has black sand from this volcanic island, and the other brilliant white, imported mineral from Guyana for the benefit of tourists. For locals, such as Conrad Jack, paradise holds many bad memories. On Christmas Eve 2013 a freak hundred-year weather event smashed Conrad's home in two. His girlfriend, Shirla Edwards, and he were swept away in the violent waters of the Buccament River. Shirla's body was never found and she is presumed dead. Conrad was relocated by the government and whenever there is heavy rain, the memory of that fateful day haunts him. What must always be remembered is that Conrad, and others like him, know hurricane seasons are a part

"No amount of money can ever undo what tropical storms achieve in minutes – single-handedly halt decades of progress."

of their lives and they accept it with a brave calm. They have little choice but to acquiesce for, unlike some parts of the world, escape is not an option.

While the international focus and concern are on the number of people who perish in these natural disasters, it is not just about the statistics of death. Every time there is a climatic shock, homes and property are destroyed. In the agricultural hinterland of St Vincent, crops and vegetation are uprooted, while tourism and trades are all but extinguished. Last year I witnessed the terrible cost to lives and the desolation to infrastructure that Tropical Storm Erika inflicted on my place of birth, Dominica. In a matter of moments, this fury of nature wiped out 90 per cent of the country's gross domestic product. In monetary terms, that's equivalent to almost half a billion US dollars. But no amount of money can ever undo what tropical storms achieve in minutes - singlehandedly halt decades of progress.

"Since Commonwealth small and vulnerable countries have similar legal and governance systems, we will be able to create a toolkit which can be transferred."

So when Hurricane Matthew stormed its way across the Caribbean recently, leaving a trail of death and destruction in its wake, my immediate instinct was to pray for those who would come face-to-face with Mother Nature at her worst. But at times like these, people don't just need prayer. They need practical help; and thanks to the Commonwealth Climate Finance Access Hub, based in the Mauritius capital, Port Louis, that is exactly what we have promised to deliver. Vulnerable and small island states can now access billions of dollars to repair and build their country once again after a typically violent argument with the weather.

FREEING THE FUNDS

Donors have been set the ambitious target of delivering US\$100 billion a year by 2020. Who can argue against this idea when climate change is arguably the greatest challenge facing the world today? Increasing global temperatures, rising sea levels, extreme weather and loss of ecosystems look set to alter the planet radically and pose an existential threat to many countries. In my view, the Hub is a practical step forward towards delivering the Paris Agreement on climate change, where one of the aims was for the urgent release of funds.

But the frustration is that all too often the money is tied up in a bureaucracy too labyrinthine to get your hands on. Small countries with limited capacity and lack of expertise simply give up. In short, the money isn't getting to those who need it, nearly fast enough. I believe this new initiative will make a difference in unlocking much-needed capital for adaption and mitigation. The costs of building sea walls or enlarging drainage systems are often simply too high.

The Hub will place national climate finance advisers for one to two years at a time in those countries receiving funds. Their job will be to help ministries to identify and apply for funding

streams. Kiribati is a Pacific small island state with a population of 100,000 which needs multilateral funds for climate change mitigation or adaption. Its permanent representative to the United Nations, Makurita Baaro, says the enormity of the task puts governments off from applying for funds. She makes the point that the paperwork needed to apply for a US\$100 million project or a US\$20,000 one remains the same, and that needs to change.

INTERNATIONAL COLLABORATION

The Hub is an innovative approach and one which will build on-the-ground capacity to access multilateral funds such as the Green Climate Fund, Adaptation Fund and Climate Investment Funds, as well as private sector finance. Regional organisations such as the Caribbean Community Climate Change Centre in Belize, the Pacific Regional Environment Programme in Samoa, Secretariat of the Pacific Regional Environmental Programme and the Indian Ocean Commission in Mauritius will collaborate, offering tailored solutions to often common situations.

The beauty of this collaboration is that these advisers will train people in the countries affected, creating a sustainable legacy. I expect that best practice will spread across Commonwealth states. Deep knowledge will be shared and since Commonwealth small and vulnerable countries have similar legal and governance systems, we will be able to create a toolkit which can be transferred island by island, state by state.

Since the Hub was opened, Antigua and Barbuda, Barbados, Dominica, Guyana, Jamaica, Mauritius, Namibia, Nauru, Seychelles, Solomon Islands, St Kitts and Nevis, Swaziland, Tonga and Vanuatu have all asked to access the funds. Namibia is one of the biggest and driest countries in sub-Saharan Africa. It has high climatic variability in the form of persistent droughts, unpredictable and variable rainfall patterns. These climatic changes impact considerably on social and economic conditions and climate finance can help mitigate the problem.

But is the money we are trying to raise enough? Last week at the International Monetary Fund in Washington DC, one of the world's leading experts on climate change told Commonwealth finance ministers that much more was needed. Professor Lord Stern from the London School of Economics said that investments of US\$90 trillion were required and that the time for action was now. I agreed with him when he said that the window of opportunity is as narrow as two or three years. Many small

and vulnerable countries in the Commonwealth are skilled in responding to climate shocks – after all they have been dealing with them for decades – and have built up resilience. They experience climate shock after climate shock with no time to recover.

SCIENTIFIC UNDERSTANDING

To make progress on this, I have invited a multifaceted panel of climate change experts to work with the Commonwealth Secretariat to look at whether science can not only tackle climate change but also help us to reverse it. It is clear that the Paris climate change agreement is not going to be enough. The Commonwealth family led the way in ensuring that the rest of the world signed up to ensuring global temperature rises were kept well below 2°C. Yet the 1.5°C agreed target won't be of much help to nations like Kiribati and its 33 atolls and reef islands. Even with this target, its former president believes this small and vulnerable state will have problems. That is why he consulted United Arab Emirates engineers to see if it were feasible to create artificial islands to save the Kiribati people. COP21 was a good start upon which we must capitalise.

Enabling experts to put their minds to reversing climate change will lead to sound, integrated, programmes, capable of attracting the necessary funds to resolve the problems of member states facing intractable challenges. I believe reversing this existential threat is possible, but only if the whole of the international community acts as one in developing practical solutions which work.

My concern is that the depth of the understanding of the immediacy needed to stop islands from disappearing has not been adequately tackled. That is why I am ensuring that our Hub and Spoke Programme II has a more holistic approach when tackling climate change. The Hub advisers need to work closely with the agencies giving the

"The Commonwealth Secretariat has to be better at providing collaborative, concrete, facilitative support for all our members."



People gather on a riverbank in Bangladesh to recieve aid packets.

money so they have a clearer appreciation of what countries need. For example, nations such as those in the Caribbean, among the most indebted in the world, have come to depend on expatriates sending money home in the form of remittances. Now with banks and financial institutions de-risking, pulling out because they perceive potential perils with the tightening up of regulations, or it simply not being cost-effective to trade, these remittances are going to be needed more than ever. The Hub can now come into its own. It is, if you will, one funnel which has the capacity and energy to help the whole.

The Commonwealth states in the Caribbean breathed a sigh of relief as Hurricane Matthew swept out of town and flew to America. But people like Conrad Jack know it was luck that they were left relatively unscathed and only

a matter of time before they are pummelled, once again, by an unwanted visitor to their shores, disrupting and changing lives for ever. My work is clear: the Commonwealth Secretariat has to be better at providing collaborative, concrete, facilitative support for all our members so that we can really feel that, as a family, we have mechanisms which enable us to support each other in our hour of need. The Commonwealth Climate Finance Access Hub is only the start of that journey.

Patricia Scotland QC took office as Secretary-General of the Commonwealth of Nations on 1st April 2016. She is the first woman to hold the post of Secretary-General. Born in Dominica, she moved to the UK at an early age and has had a dynamic career in law, public service and politics. She has served in many ministerial positions within the UK government, most notably as the Attorney-General for England and Wales.

The Commonwealth of Nations (http://
thecommonwealth.org) is a voluntary
association of 52 independent and equal
sovereign states. It is home to 2.2 billion
citizens, of which over 60 per cent are under
the age of 30. The Commonwealth includes
some of the world's largest, smallest, richest
and poorest countries, spanning five regions.
Thirty-one of its members are small states,
many of them island nations. The Secretariat
provides guidance on policy-making, technical
assistance and advisory services to the
Commonwealth countries.



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Rachel Kyte, Special Secretary-General and CEO, Sustainable Energy for All



Kevin Rudd Asia Society



John Authers, Senior



Pre-register for 2017: www.sustainableinvestmentforum.org











INNOVATIVE CLIMATE FINANCE: A SPOTLIGHT ON INDIA



Barbara Buchner, Executive Director Climate Finance, Climate Policy Initiative (CPI), uses the example of India to introduce how CPI supports economic and environmental goals by providing policy analysis and innovative financing solutions.

ith strong policy and innovative finance, India is targeting a cleaner and more resilient economy that will improve livelihoods for millions of its citizens. Even before submitting its pledge as part of the Paris Agreement, India already had one of the most ambitious renewable energy targets of any country – to deploy 100 GW of solar power by 2022. This is over half of the amount of solar power deployed worldwide at the end of 2014, and 15 times India's current solar deployment. India has also set a wind power target of 60GW by 2022, up from 25GW currently.

Then in October 2015, India pledged in its nationally determined contribution (NDC) submitted as part of the international climate negotiations that by 2030 non-fossil fuels would account for 40 per cent of its total energy generation capacity. According to officials

involved in drawing up the plan, this would require almost 300 GW of total renewable energy capacity.

Meeting these targets will require a huge increase in investment. Forthcoming CPI analysis shows the amount of investment required to achieve India's 2022 renewable energy targets is US\$189 billion.

PRIVATE SECTOR INVOLVEMENT

Domestic policies and national and international public finance will all play key roles in delivering India's renewable energy targets but greatly scaling up investment from the private sector is the only way to mobilise the full amount of capital needed. This will require addressing major barriers to increasing investment. Two of the most formidable are the unattractive terms of financing for domestic investors, and

the currency risks faced by domestic and international investors that are able to raise debt on international markets.

The first barrier is due to the high costs, short duration, and variable interest rates of debt available in India, which adds 30 per cent to the cost of renewable energy when compared to similar projects in developed countries.

The second, currency risk, is one of the most persistent barriers to international investment in climate action in the developing world. In countries with underdeveloped capital markets, the only viable option is to finance projects through debt in a foreign currency such as dollars or euros. Indeed, many development finance institutions only provide concessional finance in these currencies.

However, as power tariffs are often in local currency, this foreign debt creates a risk that

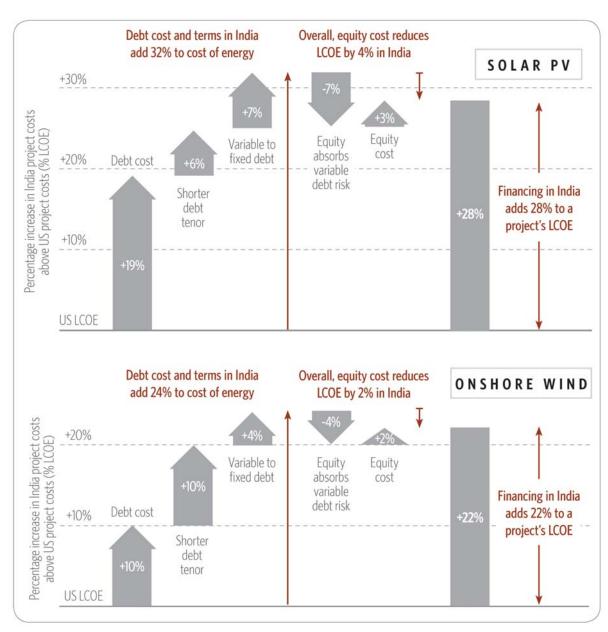


Figure 1. Project cost risk for solar and land-based wind

project revenues will not be enough to pay back loans if the local currency loses value. The long time-frames involved in renewable energy investments mean changes in the value of a currency of 50 per cent or more are not uncommon. And, while the provision of low-cost, long-term debt in a foreign currency can hugely improve a project's economics, the cost of hedging currency risk can almost entirely erode the benefits.

Together with its partners, CPI's teams in Delhi and across the world are working on solutions to these barriers that investors face (http://climatepolicyinitiative.org/india).

For instance, our analysis shows that a federal programme to provide debt of reduced cost and extended duration could support renewable energy uptake while lowering the cost of government support by over 96 per cent. It

would do so by lowering finance costs for private investors, which in turn would reduce the cost of electricity tariffs and subsequently the cost of support. Furthermore, such a programme would enable the government to recover the full cost of support over time through loan repayments, making it possible to reuse this capital to support further projects.

CPI is also working through the India Innovation Lab for Green Finance (http://greenfinancelab.in) to support the development of a currency hedging solution

The cost of Indian government support for its renewable energy targets can be lowered by 96 per cent by using lower cost, longer term debt. to attract more investment and help reduce the cost of renewable energy. The FX Hedging Facility enables allocation of risks to suitable parties and eliminates the credit risk premium otherwise charged in a commercial currency swap. As a result, it can not only reduce the cost of currency hedging by almost 22 per cent, but also has significant leverage potential and could mobilise an estimated US\$28 of foreign debt investment for every dollar of donor grant.

FINANCING FOR SOLAR AND ENERGY EFFICIENCY

The India Lab is also developing other solutions. The Indian government's 2022 solar targets include 40 GW of rooftop solar power by 2022. A lack of investor confidence in the sector and the small size of rooftop solar system deals mean that little debt

finance is available and terms for available financing are unattractive for project developers.

The Rooftop Solar Private Sector Financing Facility addresses these barriers by structuring small projects together to bring the aggregate deal to a large enough size and sufficient credit quality to attract more investment. In addition, the Facility could demonstrate the commercial viability of the sector, enabling it to issue asset backed securities (ABS) to institutional investors, helping reduce the cost of capital and expand the investor base.

These instruments are examples of the sweet spot where CPI works, bringing together public, private and philanthropic actors to seek out and help implement novel solutions for unlocking and scaling up investment for green infrastructure, products and business practices.

The Global Innovation Lab for Climate Finance (the Lab, http://climatefinancelab.org) works in a similar way to its sister initiative in India but seeks to identify, develop, and pilot transformative climate finance instruments that can mobilise private investment in climate action in all developing countries. Indeed, Lab ideas have already attracted US\$600 million in seed funding and will drive billions more in investment.

INTERNATIONAL REACH

Some of these instruments are already driving investment on the ground. For instance, in 2015 the Lab selected, supported and endorsed Energy Savings Insurance (ESI), an instrument that guarantees the financial savings of energy efficiency projects in order to help small and medium-sized businesses invest in more efficient practices.

Led by the Inter-American Development Bank (IDB) with funding from the Danish government, ESI is currently operating in Mexico and Colombia. The Green Climate Fund also recently decided to finance the instrument allowing IDB to partner with the National Development Bank of EI Salvador (BANDESAL) to expand the ESI programme to over 500 small and medium-sized enterprises in that country.

By unlocking investment, ESI will save these businesses money, make them more productive and deliver an estimated 560,000t CO2eq in emission reductions over a 15-year period. Ultimately, it will build a trusted and credible market for energy efficiency investments in sectors where they are not currently taking place.

If implemented in all relevant developing countries, the ESI would drive US\$10-100 billion in investment and provide annual emissions reductions of 27-234 Mt CO2 by 2030. CPI hopes that this will be the first of

In under two years and backed by just around US\$1 million of public grant funding, the Global Innovation Lab for Climate Finance has sourced, developed, and endorsed new financial instruments that have attracted nearly US\$600 million in seed funding.

many investment-ready Lab instruments that the Green Climate Fund and other important players choose to support.

The policy analysis and innovative financial solutions we offer are based on years of experience investigating the financial implications of acting on climate and building the networks of public, private and philanthropic actors that can make a difference.

For instance, since 2010, CPI has worked with decision-makers at international, national and local levels to help them track their flows of climate finance, for two main reasons. Firstly, to enable decision-makers to see how they are progressing against investment goals and needs and, secondly, to improve their understanding of how public policy, finance and support drive climate-relevant investment.

TRACKING AND ASSESSMENT

CPI's Global Landscape of Climate Finance (www.climatefinancelandscape.org) has become a benchmark for information about how finance is flowing from actors and sources, toward low-carbon and climate-resilient activities and we have worked with Germany, Indonesia and Côte d'Ivoire to improve their ability to track this finance.

There are many benefits to carrying out such tracking exercises. Around three quarters of total global climate finance and over 90 per cent of total private climate finance is raised and spent in the same country so, clearly, understanding

"We have identified policy adjustments that can reduce the costs and maximise the benefits of the transition to a cleaner, more resilient economy."

how climate finance flows at the national level is key to scaling up investment.

Supporting governments to identify, tag, and track budget allocations that respond to climate change challenges enhances their ability to plan and better coordinate spending at the national and local levels and reallocate finance to areas where it will have more impact. Ultimately, this tracking of climate finance also supports the design of policies and financial instruments by helping to assess whether spending is achieving climate and growth goals cost effectively.

CPI has carried out assessment of the effectiveness of projects, investment portfolios, financial instruments and support policies. This, in turn, helps us to support development of ideas like those from the India and Global Labs, ideas that are driving investment in different countries around the world.

Our analysis in India demonstrates that meeting green growth targets is not just a question of scaling up finance. We have identified policy adjustments that can reduce the costs and maximise the benefits of the transition to a cleaner, more resilient economy. Our support for the development of new and innovative financial instruments will mobilise concrete investment in projects on the ground.

Around the world, hundreds of millions have been lifted out of poverty over the last decades. But many have been left behind and the costs for our environment threaten to undermine the progress that has been made. There is now an opportunity to mainstream clean and resilient growth models to meet climate and development goals.

CPI is committed to bringing its approach to other countries around the world to help others meet the climate and growth goals laid out in the Sustainable Development Goals and the Paris Agreement.

Dr Barbara Buchner is Executive Director of the Climate Finance programme at Climate Policy Initiative and is based out of San Francisco.

Named one of the 20 most influential women in climate change, Barbara advises leaders on climate, energy, and land use investments around the world.

Climate Policy Initiative (CPI, http:// climatepolicyinitiative.org) was founded in 2009. CPI's analysts and advisors work to improve the most important energy and land use policies in the world, with a particular focus on finance. Their efforts help nations grow while addressing increasingly scarce resources and climate risk.



Pioneering change in sustainable energy

The challenge is big, but our goal is simple: to achieve a sustainable energy future for Europe. Innovation is the solution. New ideas, products and services that make a real difference, new businesses and new people to deliver them to market.

At InnoEnergy we support and invest in innovation at every stage of the journey – from classroom to end-customer. With our network of partners we build connections across Europe, bringing together inventors and industry, graduates and employers, researchers and entrepreneurs, businesses and markets.

We work in three essential areas of the innovation mix: **Education** to help create an informed and ambitious workforce that understands the demands of sustainability and the needs of industry. **Innovation Projects** to bring together ideas, inventors and industry to create commercially attractive technologies that deliver real results to customers. **Business Creation Services** to support entrepreneurs and start-ups who are expanding Europe's energy ecosystem with their innovative offerings.

Bringing these disciplines together maximises the impact of each, accelerates the development of market-ready solutions, and creates a fertile environment in which we can sell the innovative results of our work.



ENSURING SUSTAINABLE ENERGY - FOR ALL



Rachel Kyte, CEO of Sustainable Energy for All (SEforALL) and Special Representative of the UN Secretary-General, highlights the importance of universal sustainable energy access and availability, with a focus on renewables and energy efficiency.

ast year, the world's leaders signed up to two critically important things. We need to change the future direction of the global economy in order to combat climate change. And that transition must be just, leaving no one behind. That is the joint commitment of the Paris Agreement and the Sustainable Development Goals (SDGs), and energy sits at the very heart of it: energy that's not only sustainable, allowing us to keep the planet's warming well below 2°C, but available to everyone to power healthier, safer, more productive lives.

The commitment to the Paris Agreement and the SDGs means we need to manage a radical energy transition that decouples our growth and development from carbon. This is urgent – not just because we are fast nearing the point where the gateway to a 'well-below 2°C' climate future could close forever.

ENERGY THE FIRST PRIORITY

Access to clean, affordable energy underpins so many aspects of development that we need to front-load results on SDG 7, the energy goal, to give us any chance of meeting other goals by 2030. SDG 7 calls for access to affordable,

"Paris calls for a swift ramping up of renewables in the energy mix, and investment in the smart grids needed for reliable, affordable, clean power to be the norm."

reliable, sustainable and modern energy for all, with targets closely aligned to SEforALL's three objectives: universal energy access; a doubling of renewables in the global energy mix; and a doubling in the pace of energy efficiency gains.

Delivering on this goal goes to the heart of our ambition in Paris to create a new kind of

economy, one that lifts everybody up. Paris, too, calls for a swift ramping up of renewables in the energy mix, and investment in the smart grids needed for reliable, affordable, clean power to be the norm. It, too, shines a bright light on the need for a revolution in efficiency, especially in the largest energy consumers.

The extraordinary leadership in Paris and the coming together of countries, businesses, city leaders, civil society and others, all working to translate scientific evidence into smart agreements, means there can be no 'business as usual' for future development. Not only how we generate, transmit, distribute clean energy, but multiple other aspects of the way we live – food, water, transport, how we build cities – have to be designed with the ultimate goal of net zero carbon in mind.

So how do we get there?

PROGRESS WITH EFFICIENCY, ACCESS AND RENEWABLES

First, we need to adopt an 'energy efficiency first' approach. Efficiency is the energy source that is usually ignored. According to the International Energy Agency's World Energy Outlook, energy efficiency could account



ENERGY ACCESS MAKES THE DIFFERENCE

More than a billion people in the world today have no access to electricity, and nearly three billion depend for cooking on polluting, dangerous fuels. Think for a moment what that means. Women spend hours every day just gathering firewood. Children cannot study after nightfall. Farmers have no means to pump water. Food and vaccines spoil for want of a refrigerator. This is a scene where lives are stifled and enterprise cannot blossom.

Now turn that on its head. Imagine a village as night falls, in any low-income country you choose. The woman is making dinner on an electric stove. Her children's school books are brightly lit. Her mobile phone is charging. The fruit juices that she makes to sell in the local market are safe in the refrigerator.

This is already possible. The tools that allow people to thrive already exist: cheap solar technology, business models linked to mobile phone platforms, super-efficient appliances. But we need to go further, faster.

for about 40 per cent of the total abatement of greenhouse gas emissions we need. At the same time, improvements in energy productivity could generate an additional US\$18 trillion in global GDP between 2012 and 2035.

Any country, even the poorest, can exploit efficiency, the easiest, cheapest, energy source. Governments must make a total commitment to looking aggressively at energy productivity, realising savings and forcing business to up its game. It is quite possible to do more with less. For business, emphasising energy productivity shifts the focus from energy conservation towards how energy can best be used to maximise not only the greater social, environmental and economic good, but also a company's own bottom line.

Second, we need to place access at the very heart of our energy strategies. Far-sighted governments are already driving this process. Bangladesh, for example, heads the list of countries with the fastest percentage increase in electricity access in SEforALL's *Global Tracking Framework 2015*. Its national solar home programme, executed by the state-owned Infrastructure Development Company Limited

"Paris calls for a swift ramping up of renewables in the energy mix, and investment in the smart grids needed for reliable, affordable, clean power to be the norm."

(IDCOL), is one of the biggest and fastest growing off-grid renewable energy programmes in the world. Since 2003 it has installed around four million solar home systems, working at a rate of more than 70,000 per month.

This is not just a matter for the public sector. Creative businesses are delivering

energy access to poor communities through new models that are commercially viable. Just one of them, the Kenyan company M-KOPA, has connected more than 375,000 homes in Kenya, Tanzania and Uganda to solar power, and is adding over 550 new homes every day. Its pay-as-you-go model, using mobile phone technology, allows even very low-income rural households to rent and then own their own solar power systems.

These new business models, combined with the falling price of renewables, offer distributed solutions that can be developed and financed alongside grid improvements and large-scale generation projects – all as part of a unified energy transition plan.

Third, we need coherent policy frameworks that give renewable energy the level playing field it needs and deserves. Finance and policy need to catch up with the technological advances that have slashed the cost of renewables. Figures from the International Renewable Energy Agency show that prices for solar photovoltaic modules have fallen by around 80 per cent since 2009, and wind turbines by 30-40 per cent. Renewable energy producers recently won more than a 50 per cent share of Chile's latest power tender. Jamaica is now doing deals at 8 cents per kilowatt hour for solar. In Zambia, it's 6 cents; in Mexico, 3.5 cents; in the United Arab Emirates, 2.99.

When renewable energy is cost-competitive with, or even cheaper than fossil fuel alternatives, the regulatory frameworks need to be designed with that in mind. We need to end subsidies on fossil fuels, put a price on carbon, set stable and predictable investment climates, deal with uncertainty in the regulation of distributed power, and set clear performance standards for efficiency in buildings, appliances and vehicles.

Commitments by companies to buy power from only renewable sources create a long-term corporate off-take. Under The Climate Group's phenomenal 'RE100' initiative, 53 companies, including worldwide household names such as BMW, IKEA and Nestlé, have already signed up to work towards 100 per cent renewable power, and on average they are already halfway there.

FINANCING NEEDS

The agreements in Paris on markets and carbon pricing were essential building blocks in the necessary transition. Economic decision-making has to internalise this challenge, and we need long-term signals that the political will exists to drive us faster in this direction.

The financing needs for this transition remain huge. SEforALL estimates that more than US\$1 trillion in investment from the public and private

"We want to bring together leaders who may not normally talk to each other, and create space where questions can be aired and solutions explored."

sectors – a tripling of current levels – will be needed every year between now and 2030 if we are to meet our objectives on energy access, efficiency and renewables.

Yet the longer we wait to put in place the policies and financing we need for our infrastructure and land use, the more expensive and disruptive the transition will be. We cannot afford to lock ourselves into carbon-intensive options that are risky and more expensive in the long run.

DOING IT TOGETHER

There's an old African proverb: "If you want to go quickly, go alone. If you want to go far, go together."

To deliver on the promises of Paris and the Sustainable Development Goals, we need to work hand in hand, both by leveraging existing alliances and by forging new relationships. SEforALL is there to help make those handshakes happen: to help broker new partnerships and unlock the financing that will drive the kind of action on renewables, energy productivity and access that we need to counter climate change while lifting over a billion people out of poverty.

As a global, multi-stakeholder platform, we are there to lift up the great work of others.
We are marshalling evidence, benchmarking

"Energy is central to nearly every major challenge and opportunity the world faces today." progress, amplifying the voices of our partners and telling stories of success. We want to bring together leaders who may not normally talk to each other, and create space where questions can be aired and solutions explored, so that better choices on energy policy and action can be made. And we will ensure that the voices of the energy-poor are heard, and that women are full participants and beneficiaries in the energy transition.

The Charter of the United Nations begins with the words: "We the peoples of the United Nations ..." That's not just the fortunate few – the ones with reliable and affordable access to food and shelter and clean drinking water and education and health services and energy. 'We the peoples' means everyone. That's why we are called Sustainable Energy for ALL.

Because there are over a billion people today who still have little or no access to energy. There are some three billion people who still rely on wood, coal, charcoal or animal waste for cooking and heating. Energy is central to nearly every major challenge and opportunity the world faces today. Be it for jobs, security, climate change, food production or increasing incomes, access to energy for all is essential. Sustainable Energy for All is dedicated to securing that access for millions of the world's most vulnerable people. 'We the peoples' deserve access to affordable, clean and reliable energy. And 'we the peoples' know that the time for action is right now.

It will not be easy. But it can – and it must – be done. The transition to a clean energy future that leaves no-one behind will take less talk and more action. And together, we will go further and faster to secure a better world – not for just the few, but for all.

Rachel Kyte is CEO of Sustainable Energy for All (SEforALL) and Special Representative of the UN Secretary-General. She drives SEforALL's work to mobilise action towards its 2030 goals on universal energy access, energy efficiency and renewables, as well as the new global energy goal. She is a leading advocate for sustainable development and recipient of many awards, Her previous roles have included World Bank Group Special Envoy for Climate Change.

Sustainable Energy for All (SEforALL) is a global, multi-stakeholder platform that empowers leaders to broker partnerships and unlock finance to achieve universal access to sustainable energy, as a contribution to a cleaner, just and prosperous world for all.



GROWING SOLUTIONS

Decarbonizing energy production is the number one challenge for any utility today. Vattenfall is committed to becoming Europe's wind champion, but our commitment goes far beyond building climate-friendly power plants. Much of today's fossil energy is used transporting goods and people, for heating homes or feeding industrial processes. There are huge potentials for energy efficiency gains and fossil-free solutions – as well as new business models. The key is collaboration and new partnerships.

Surrounded by icy rivers and dense forests in Luleå in northern Sweden lies the first Facebook server facility outside the United States. Here stands no less than 1 250 000 servers, just some 300 km south of the Arctic Circle where the temperature is normally under 10 C. The nearby rivers have several hydro-electric plants that provide renewable and reliable energy from Vattenfall.

In the same town are the head offices of the minerals group LKAB who, together with steel company SSAB, are our partners in a very exciting project aimed at looking into how the iron and steel industry that currently accounts for a large part of Sweden's industrial emissions, can become completely CO_2 -free.

Further South, in Berlin, you can find our inspirational Urban Gardens; productive oases in the middle of one of the fastest growing cities in Europe. We allocate land close to our city plants, and invite everyone in the neighborhood to grow vegetables and flowers with us. In the spirit of sharing is the new owning we also support 'Power Peers', a service in the Netherlands that makes it easy to share the energy you produce, or to buy self-generated energy from someone else.

Doing more with less is another way to grow. Modern CHP plants achieve a fuel efficiency rate of up to 90 percent, and in the combined heat and power plant (CHP) in Berlin we actually use the fuel twice: the heat produced by electricity generation can be used as district heating for hot water, domestic heating

or as process steam for the industry. We also like to improve flexibility and enable the use of even more renewables; like the coming 22 megawatt battery facility at the Pen y Cymoedd wind farm in the UK that will add stability to the country's national grid.

Mobility is growing steadily, as is our cooperation with Volvo and the Stockholm Public Transportation. It takes half an hour to rapidly charge an electric car. In that time, five of Stockholm's eight new hybrid buses will be ready to go. These buses have go percent lower CO2-emissions, and will replace the regular buses on one of the city's bus lines.

Power has to be available where people need it. In Amsterdam we have installed more 1 500 public charging points for electric cars, and every month more than 2 million kilometers are charged in more than 30,000 visits. In Utrecht we are adding another 300 stations. From 2017, charging card holders will be able to specify their individual charging preferences using their smartphones: fast, cheap or simply with available sustainable energy.

Creating a low carbon dioxide future is also dependent on legislation, incentives and market rules that make new investments and solutions commercially attractive. We are, as we always have been, looking to grow solutions with customers, companies, cities and countries to realize our common ambitions of a low carbon future.



Magnus Hall, President and Chief Executive Officer (CEO) of Vattenfall corporate.vattenfall.com



OFF-GRID RENEWABLE ENERGY FOR UNIVERSAL ACCESS



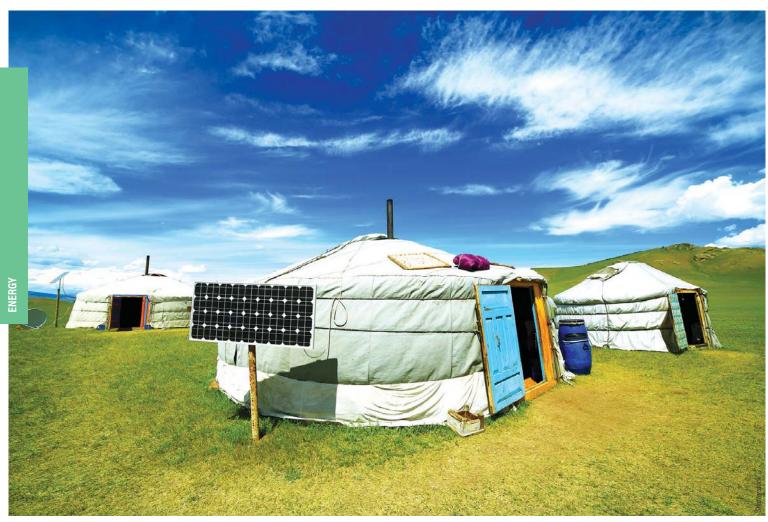
Adnan Z Amin, Director-General of the International Renewable Energy Agency (IRENA), presents the economic, social and environmental cases for off-grid electricity generation, and urges governments and agencies to make sure the right policies are in place.

or those of us living with electricity, it is easy to forget the social and economic impact of going without. Power shortages cut economic growth by 2 to 4 per cent annually. Households without electricity pay 60 to 80 times more for energy-related products – charcoal, candles and kerosene – than people in New York or London. Health clinics without electricity struggle to refrigerate much-needed medicines and exposure to smoke from wood-fired cooking stoves causes more than 4 million premature deaths each year.

Great strides have been made in the last two decades to increase global access to electricity, with nearly two billion more people connected today than in 1990, but there is still too large a gap between the haves and the have-nots. More than one billion people – roughly 15 per cent of the global population – still lack access, while another one billion have unreliable supply. To achieve universal electricity by 2030, the pace of access expansion needs at least to double.

Renewable energy, specifically off-grid renewable energy, has a key role to play

in closing this gap. Estimates suggest that off-grid solutions will provide the majority, roughly 60 per cent, of the additional generation needed to achieve universal access to electricity. Renewables are now the default cost-competitive choice for off-grid installations, both stand-alone and mini-grids, in most rural and peri-urban areas. Estimates suggest that by 2020 as many as 350,000 mini-grids will be needed to achieve universal access in Africa, 60,000 to be deployed in West Africa alone.



Solar powered Mongolian ger camp in Central Mongolia

THE RATIONALE FOR OFF-GRID RENEWABLES

The promise of off-grid renewables is broadly captured by three main cases:

The economic case. Thanks to dramatic cost reductions in recent years, renewable technologies are now the most economic option for off-grid electrification. They can be significantly cheaper than diesel-fired generation or kerosene-based conventional lighting.

OFF-GRID PROGRESS

Success in off-grid deployment is happening across the globe. In Bangladesh, a solar home system programme deployed 280,000 solar home systems in six years between 2002 and 2008. Today, it deploys the same number in fewer than five months. The programme now benefits over 18 million beneficiaries – 11 per cent of the total population. In Africa, M-KOPA Solar has connected more than 375,000 homes in Kenya, Tanzania and Uganda to solar power with 550 more added daily. For a deposit of US\$35, buyers get the system then make 365 daily payments of \$0.43 through mobile money system M-Pesa. When it is all paid off, the system belongs to the buyer.

In Bangladesh, for example, the solar home programme replaces 242,000 tons of kerosene, saving US\$300 million annually. If Nigeria used modern off-grid lighting solutions, it would save more than \$1.4 billion annually.

The social case. The deployment of off-grid renewables directly creates jobs, not just for the installers and those working within the renewable industry, but also for those who gain meaningful employment through industries created from newly gained access to reliable electricity supply. IRENA estimates that at least 4.5 million jobs can be created in the off-grid electricity sector by 2030, in positions ranging from entrepreneurs and technicians to installers and distributors.

Efforts made to increase energy access also benefit other sectors critical to human development. Access to electricity can improve the accessibility and reliability of the water supply for drinking and irrigation. Solar irrigation solutions can help increase farmer yields by 300 per cent. It can also facilitate extension of basic rural healthcare services and enable the outreach of telecommunication services in rural or island contexts, thereby further contributing to the UN Sustainable Development Goals.

"Households without electricity pay 60 to 80 times more for energy-related products – charcoal, candles and kerosene – than people in New York or London."

The environmental case. Another compelling case for off-grid renewables is the impact, or rather lack of impact, it has on the environment. While development is a necessary and achievable goal, it should not be at the expense of irreversible environmental damage. The international scientific community has established that greenhouse gas emissions are responsible for ongoing global climate change. The effects of these changes are region-dependent, but include rising sea levels, ocean acidification, increased and more intense

storm activity, glacial retreat, and disrupted rain patterns, among many more, which come at disastrous cost both economically and to human health.

The energy sector accounts for two-thirds of global emissions. As such, any effort to reduce emissions and mitigate climate change must focus heavily on decarbonising the global energy system. IRENA research has found that doubling the global share of renewables by 2030 to 36 per cent – combined with energy efficiency measures – would cut emissions to the level required to stay on the two-degree pathway as enshrined in the Paris Agreement.

Development with off-grid renewables offers a path that leapfrogs the polluting route historically taken by developed economies – one that is not even a feasible option for countries of certain sizes and regions of the world. Small island states are particularly affected by climate change, and for many of the 750 million people living in the inhabited 10,000 islands around the world, the means or resources for large-scale energy production and a national grid connection are limited. In these cases mini-grids powered with diesel generators offer a route to energy access. Incorporating renewables into these mini-grids through the addition of solar PV, wind turbines, and particularly biodiesel, is an attainable goal.

THE WAY FORWARD

Thankfully, the strong business case for deploying off-grid renewables in rural areas is driving innovative business models, which is encouraging growth in the sector. Key market development initiatives, including the Green Mini-Grids Market Development Programme, Beyond the Grid Initiative and the ECOWAS Programme on Access to Sustainable Energy Services, are steps in the right direction. But to achieve scale, off-grid renewable energy development must be transformed from a project-by-project endeavour to one that is market



Solar cell tree in Indonesia

driven, a message that resonated strongly at the 3rd International Off-grid Renewable Energy Conference hosted by IRENA this year.

This will require collective efforts to create an enabling environment that supports the scale-up of energy access efforts through private sector participation. This includes adopting an effective policy and regulatory framework, along with tailored business and financing models and adapting technologies to the rural context. If the enabling environment is appropriate, off-grid solutions can be deployed rapidly to extend electricity access for meeting basic needs but also for promoting productive uses.

These enabling policies can also create a more secure environment to encourage investment. We currently invest nine billion dollars a year on energy access, but five times that is needed to achieve universal access. This investment is beginning to trickle in. In the last three years, investments in the off-grid solar sector increased 15-fold, and private sector players are raising substantial financing from impact investors, private equity funds, corporates, government development finance, donors and crowd funding. For example, the US-led Power Africa's Beyond the Grid initiative has

committed US\$1 billion over the next five years to seed and scale distributed energy solutions, and the Islamic Development Bank will loan US\$180 million for Africa projects improving access to electricity through off-grid solutions.

These early examples demonstrate that, with the right policies in place to spur investment, off-grid renewable energy can offer a practical, actionable solution to many of today's most pressing issues. This complementarity presents a compelling case for policy-makers to adopt a more holistic approach to energy access and to include off-grid renewables as a means to stimulate economy-wide development, fight poverty and improve livelihoods and protect the planet from the dangerous effects of climate change.

Adnan Z. Amin is the Director-General of the International Renewable Energy Agency (IRENA), currently serving his second term. He has more than twenty five years of experience and recognized accomplishments in the international arena, primarily in the fields of sustainable development, international energy and environment policy, as well as a solid track record in institutional and organisational development and management of international organisations.

The International Renewable Energy Agency

(IRENA, www.irena.org) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international cooperation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity.



Solar cell panels in Thailand

RENEWABLES SURGE IN EMERGING MARKETS



by *Paddy Padmanathan*, President and CEO, **ACWA Power**

Paddy Padmanathan, President and CEO, ACWA Power, describes the massive potential of the renewable energy sector, with a focus on projects in emerging regions.

The climate change deal signed in 2015 at COP21 in Paris confirmed that the leaders of 200 nations are now committed to decarbonising power generation by 2050. They have recognised renewable energy as an important tool in limiting the rise of the ambient temperature on earth, without compromising the need to fuel social development and economic growth with reliable supplies of energy. At the time, it was our view that the deal had the potential to fundamentally change the way the world not only generates but also utilises electricity. Developments since then, particularly in emerging markets, have only served to reinforce this view.

Countries in the Middle East and Africa all need significant new electricity generation capacity to keep pace with the rapidly growing need for industrialisation. This goes hand in hand with the creation of employment and serving the grossly underserved, even as the focus on efficiency starts reducing energy intensity in all areas of consumption. Countries in this region are also richly endowed with renewable resources, benefiting from strong sunshine and long daylight hours, some of the highest stable onshore wind speeds in the world, and more than adequate land space to develop large renewable generation plants.

Given how innovation, technology development and competitive tension have

made solar and wind energy cost-competitive compared with fossil fuel energy, the potential for these sectors' growth is high, both to serve peak loads and for supply to remote isolated communities. Because battery storage is still expensive, photovoltaic (PV) and wind technologies have been criticised as intermittent, since they can be used only when the resource is available. Introducing into the system concentrated solar power (CSP) technology together with molten salt storage offers the prospect of competitively delivering renewable energy for more than 50 per cent of the electricity needs of every country in this region. While these technologies are more expensive now, they are reducing in cost with increasing levels of deployment, and will be able to serve consumers more flexibly. As volumes of deployment increase over the next decade, as more innovation comes into play and as costs are further reduced, there is the real prospect that all the electricity in this region can eventually be generated from renewable carbon neutral resources.

THE PPP INVESTMENT ROUTE

ACWA Power has been leading the way in propagating the deployment of renewable energy. Several years ahead of COP21, ACWA Power was one of the first power generators in the region to declare a voluntary target of at least 5 per cent power generation from renewable sources within five years, and pushed ahead to

"Both the models are achieving much more than simply renewable megawatts, without impacting the cost of the delivered energy."

embark on pace-setting projects challenging the cost paradigm in both CSP and PV solar technologies. As we not only achieve but exceed our targets on developments that will be completed within the next two years, renewable energy plants in our portfolio will avoid more than 2.4 million tonnes of carbon dioxide a year.

Already, 2016 has shown the way forward with a steady stream of projects being inaugurated or announced throughout the Middle East and Africa. The common thread running through these is the model they share, particularly popular in these emerging and frontier markets – public–private partnerships (PPPs).

PPP project agreements typically transfer the responsibility to the private sector to design, build, finance, construct and operate the power generation plants, where the payment for the generated electricity is only made as the energy is dispatched. The private sector thus takes all risks such as technology, timely completion of new build, cost overrun in capital and operating cost and even the resource risk; with the public sector only taking demand risk as the energy is provided on long-term take or pay contracts. This model of contract procured on a transparent competitive procurement basis, where the tenderer is given the opportunity to offer the most competitive price instead of offering capacity within a preset feed-in tariff, has demonstrated the ability to deliver significant cost reductions. This privately financed and competitively procured model of infrastructure service provision not only removes from the state a significant capital investment burden, but also ensures the delivery of the most fit for purpose and efficient solutions that also comply with global environmental impact mitigation regulations and legislation.

EXAMPLES OF NEW AFRICAN PROJECTS

In the context of renewable energy, two shining examples of what can be achieved on this continent are the South African REFIT programme, procured by the IPP unit at the Treasury of the Ministry of Finance, and the Moroccan renewable energy programme procured by MASEN, the dedicated renewable

energy procurement agency. These should serve as models not only for efficient procurement leading to renewable energy at some of the lowest costs in the world, but also for capturing such vital supplementary objectives as meaningful industrialisation, economic development, value retention within the country, and employment creation via the deployment of this generation capacity. In simple terms, both the models are achieving much more than simply renewable megawatts, without impacting the cost of the delivered energy. ACWA Power is privileged to be involved in both.

In 2009 ACWA Power decided to broaden its operations beyond its home in Saudi Arabia, and evaluated a range of countries. Morocco and South Africa scored very highly in the ranking, because they fulfilled a number of critical factors essential to support the large investments required for plant construction of this type, and the long tenor of such investments. These factors include respect for foreign investment, a good standard of protection and governance for private sector investment, a growing economy, a thriving social environment and industrious people with a work ethic. Delivering electricity reliably and at the lowest possible cost relies on an industrialised environment that enables the building, operation and maintenance of the plants at a competitive price.

Having recognised Morocco as an attractive investment destination, we entered the electricity sector in 2010. The first set of projects that became available for participation was the series of CSP technology solar projects at Ouarzazate. Morocco's NOOR 1 solar plant, inaugurated in February 2016 by King Mohammed VI, is the first of these projects and is a part of what will be the world's largest solar complex when all four phases are completed.

"ACWA Power has consistently delivered tenders for providing bulk capacity on long-term contracts which are typically 20 per cent lower in cost."



Morocco's NOOR 1 solar plant, inaugurated in February 2016 by King Mohammed VI.

The first phase of the complex is a parabolic trough CSP plant with 160MW capacity and three hours of thermal energy storage. This thermal storage allows the plant to continue generation after sunset and to satisfy demand during not only the daytime peak hours but also at night. The technology uses parabolic mirrors to focus the sun's light to heat up a liquid to nearly 400°C, which is used to heat water and generate steam. This steam drives a turbine to generate electrical power.

The second phase of the project sees the installation of a 200MW parabolic trough plant with a storage capacity of 7 hours (Noor II), and the construction of a 150MW solar tower with a storage capacity of 8 hours (Noor III). Upon completion, this complex will power more than one million homes and will save one million tonnes of oil equivalent, thus avoiding the emission of 3.7 million tonnes of CO2 per year. The project will form part of the country's ambitious solar energy programme in which Morocco plans to develop several solar complexes with a combined capacity of approximately 2GW by 2020. The country currently depends on 95 per cent imported energy.

In South Africa, the Bokpoort Concentrated Solar Power (CSP) Project developed by a consortium led by ACWA Power is a part of the government's Renewable Energy Independent Power Producers' Procurement Programme, with the aim of augmenting power capacity, attracting foreign direct investment and creating jobs, while also stimulating the country's economy. This 50MW CSP plant with nine hours of molten salt storage is not only already operational, but is also demonstrating the versatility and efficient dispatch of CSP technology. Within the first month of its commercial operation, the newly inaugurated plant supplying over 200,000 households had produced electricity using the heat of the sun captured during daylight, for a continuous

period of 161 hours, equivalent to almost six days, day and night – a new African record.

By utilising this model, and relentlessly focusing on a mission to reliably provide electricity and desalinated water at the lowest possible cost, ACWA Power has consistently delivered tenders for providing bulk capacity on long-term contracts which are typically 20 per cent lower in cost than the next competitor, regardless of country or size of project. More meaningfully, ACWA Power also focuses on contributing to the social and economic development of the country by maximising local content, industrialisation and employment creation; and by local community development through the deployment of renewable energy plants and the delivery of renewable energy.

Paddy Padmanathan is President and CEO of ACWA Power. A professional Civil Engineer with over 30 years of experience, he has served ACWA Power from 2005 as the company grew from a startup to where it is today. A graduate of the University of Manchester, UK, Mr Padmanathan started his career as a consulting engineer delivering infrastructure projects and moved on to develop privately financed power, water and waste water projects. A substantial period of his career before ACWA Power was with Black & Veatch, where he served as a Vice President and Corporate officer. He also serves on the board of directors of several companies all operating in the water and power sectors.

ACWA Power (www.acwapower.com) is proud to be a leading developer, owner and operator of renewable energy in emerging markets, with a portfolio of over 1GW in either operation or construction, and with a pipeline of another 1GW to deploy. This contributes to achieving the commitments made by the 200 nations at COP21.

THE ENERGY SECTOR'S GRAND TRANSITION



Younghoon David Kim, Chair of the World Energy Council, looks at the impact of the Paris Agreement on the energy industry as it charts a path to a sustainable future, and shows the need for energy practitioners to collaborate and innovate with other sectors such as water and food.

he Paris Agreement produced by COP21 coincides with a 'grand transition' in the energy sector that reflects broader global trends, ranging from climate change to the so-called Fourth Industrial Revolution, that are fundamentally transforming the economic landscape worldwide.

The implementation of the Paris Agreement will accelerate this transition as it charts a path to a sustainable future. But the challenges ahead should not be underestimated since global economic growth must be aligned with efforts to mitigate environmental damage.

For the energy sector, which will play a vital role in the process, the Paris Agreement is being seen in the context of what the World Energy Council calls the energy 'trilemma' – balancing the sometimes conflicting priorities of energy security, access and sustainability.

A NEW WORLD FOR ENERGY

There is little doubt that we are witnessing a paradigm shift from a carbon-based economy powered by the combustion of fossil fuels to one based on new sources of energy and new modes of power generation. But this shift will take time.

"The challenges ahead should not be underestimated since global economic growth must be aligned with efforts to mitigate environmental damage."

Fossil fuels will continue to play an important role because we cannot meet our pressing energy demands without them.

The Council released at its most recent World Energy Congress, held in Istanbul, Turkey in October 2016, our *World Energy Scenarios for 2060*, which were prepared in cooperation with Accenture Strategy and Switzerland's Paul Scherrer Institute.

The study concluded that while the world has seen rapid growth in energy demand since 1970, mainly satisfied by fossil fuels, the future will be different. "Disruptive trends are emerging that will create a fundamentally new world for the energy industry, characterised by lower population growth, radical new technologies, greater environmental challenges, and a shift in economic and geopolitical power," the report stated.

The report's principal findings were that:

- Global primary energy demand growth will slow and per capita energy demand will peak before 2030 due to unprecedented efficiencies created by new technologies and more stringent energy policies.
- Demand for electricity will double by 2060.
 Meeting this demand will mean cleaner energy sources requiring substantial infrastructure investments and systems integration to deliver benefits to all consumers.
- The rise of solar and wind energy will continue at an unprecedented pace that will create both new opportunities and challenges for energy systems.



- Demand peaks for coal and oil have the potential to alter the world from one of 'stranded assets' to 'stranded resources'.
- The diversification of fuels powering transport presents one of the toughest obstacles on the path to decarbonise future energy systems.
- Limiting global warming to no more than a 2 degree C increase, as called for by the Paris Agreement, will require an exceptional and sustained effort far beyond already pledged commitments, and with very high carbon prices.
- Global cooperation, sustainable economic growth and technology innovation are needed to balance the energy 'trilemma'.

These developments might appear to be encouraging in achieving the goals of the Paris Agreement. But that really depends on what strategies are adopted by the energy sector. The report looked at three divergent paths the world might take.

THREE SCENARIOS

Modern Jazz. The first scenario, called Modern Jazz, represents a 'digitally disrupted', innovative and market-driven world, with an emphasis

"The energy industry must look beyond the confines of its own sector to address the world's rising demand for food and water."

on achieving equitable and affordable access to energy. Under this scenario, global energy consumption by 2060 will grow by 38 per cent, while primary energy demand will grow by 25 per cent. Electricity will account for 28 per cent of global energy consumption based on utility-scale low carbon producers, optimised distribution platforms and energy solution integrators. The intermittent renewable resources of solar and wind will account for 30 per cent of power generation, supported by distributed systems,

digital technologies and battery innovation. The fossil fuel share of primary energy will fall to 63 per cent, with demand for coal peaking before 2020 and oil by 2030, while the use of LNG and natural gas will continue to rise. Oil will account for 67 per cent of transport fuel, with biofuels accounting for 16 per cent.

Unfinished Symphony, the second scenario, is a world in which more 'intelligent' and sustainable economic growth models are adopted to achieve a low carbon future. Under this scenario, energy consumption by 2060 will grow by 22 per cent, while primary energy demand will grow by 10 per cent. Electricity will account for 29 per cent of energy consumption based on highly integrated models and funding mechanisms to allocate the system costs of renewables and avoid cost destruction for energy producers. Solar and wind energy will account for 39 per cent of power generation, with hydro and nuclear capacity serving to balance intermittency. The fossil fuel share will fall to 50 per cent, with a drastic fall in both coal and oil demand, while stringent emissions standards will slow the growth in natural gas use. Oil will

account for 60 per cent of transport fuel, with biofuels accounting for 21 per cent.

Hard Rock, the third scenario, represents a world of weaker and unsustainable economic growth with inward-looking policies to ensure energy security. Under this scenario, global energy consumption will grow by 46 per cent, while primary energy demand will grow by 34 per cent. Electricity will account for 25 per cent of energy consumption based on models that work well in local conditions. Even in this scenario, which sees lower infrastructure investment, solar and wind generation will reach 20 per cent of power generation, while hydro will become particularly important in Africa and nuclear in East Asia. The fossil fuel share will fall to 70 per cent, with coal still seen as providing energy security, particularly in India and China, while transport systems based on fossil fuels will continue to dominate. There will also be a growing dependence on unconventional fossil fuels. Oil will still account for 78 per cent of transport fuel, with biofuels accounting for 10 per cent.

Obviously, Unfinished Symphony represents the best-case scenario to achieve the global climate targets as outlined in the Paris Agreement, with the Hard Rock being the worst-case scenario and Modern Jazz falling between the two. Unfinished Symphony would reduce carbon emissions by 61 per cent from 2014 levels by 2060 and Modern Jazz would result in a 28 per cent decline. In contrast, Hard Rock would result in a 5 per cent rise in carbon emissions.

There are several valuable lessons to be drawn in reviewing these three scenarios. The first is the need to develop clean and more efficient ways to produce and use fossil fuels. The second is the need to search for new technologies for alternative energies. The third is the need for greater global cooperation instead of reverting to policies that put the emphasis on national energy security.

Furthermore, the energy industry must look beyond the confines of its own sector to address the world's rising demand for food and water. The food, energy, and water sectors are becoming more interdependent due to pressures from climate change. Any breakdown in one element of this nexus inevitably impacts negatively on either one or both of the remaining elements. The collapse of the food, energy, water nexus would eventually undermine the very foundations of the global economy.

INNOVATE OR PERISH

The coming decades will help define the winners and losers of the energy transition. The stark

"There is a great need for a grid-scale energy storage system that can once and for all overcome the conundrum of the intermittency of wind and solar power."

fact is that most, if not all, the key players in the energy sector must innovate or eventually perish.

The choices outlined in the three diverging scenarios are becoming even more pressing in light of the threats from climate change. It is why the global energy sector must fully embrace the spirit of the Paris Agreement as well as the United Nations Sustainable Development Goals 2030 to deliver access to affordable, reliable, and modern energy services.

My personal interest is to focus on creating a new generation of sustainable technology and identifying the right technology for the right place at the right price. For example, there is a great need for a grid-scale energy storage system that can once and for all overcome the conundrum of the intermittency of wind and solar power.

The energy industry must accelerate the pace of innovation by financing promising inventors and commercialising disruptive technologies in the same way that the pioneers of the electricity revolution – Michael Faraday, Nikola Tesla and Thomas Edison – were encouraged in their endeavours. Energy companies are realising that the world is on the cusp of a whole new industrial era, driven by technological advances for smart cities, connected homes and big data. It is also supported by remarkable progress in material science, artificial intelligence and molecular machining, to name just a few.

Companies outside the energy sector, such as Tesla, Uber, and Google, are conducting activities that are already affecting energy demand patterns. Energy companies must match them in undertaking innovation. Utilities, for example, must focus on energy storage, automation and digital communications to improve the efficiency and reliability of electricity grids powered by a growing share of renewable energy sources. Innovation should also extend to frontier technologies such as microbial energy research. As a result, there is a

growing need to nurture a whole new generation of energy innovators, inspiring the most brilliant minds to come up with appropriate energy solutions. We must bring them together with forward-looking financiers to help commercialise technological breakthroughs. We must connect the brightest minds with the deepest pockets.

The energy industry has produced a long list of achievements since the invention of the steam engine in the 18th century. It has succeeded so far in providing affordable and widely available energy in many parts of the world. But it must now do more. This new challenge is every bit as ambitious and vital as the commitment made to space exploration since the 1960s, in which the private sector is now assuming a growing role. Energy practitioners must now go beyond their original sector and enhance innovative collaboration among all the relevant stakeholders in the food, energy, and water nexus.

I hope that the Council can play a pivotal role in this process by providing a vision and a roadmap for the sustainability and resilience of the global environment and thus the global economy.

Younghoon David Kim is Chair of the World Energy Council. He is also chairman and CEO of the Daesung Group, a major South Korean gas distributor. Daesung has developed electric power and renewable energy sources, including landfill gas-to-energy, a combined-cycle gas power station, and Korea's first solar power tower system. Mr Kim previously served as Co-chair for the Council and its Vice Chair for Asia Pacific and South Asia. He also sat on the Energy Council of Korea, advising the government on national energy policy and securing energy resources. Mr. Kim received Mongolia's highest decoration for a foreigner in recognition of Daesung's SolaWin project to curb desertification in the Gobi Desert.

The World Energy Council (www.worldenergy.org) is the principal impartial network of leaders and practitioners promoting an affordable, stable and environmentally sensitive energy system for the greatest benefit of all. Formed in 1923, the Council is a UN-accredited global energy body, representing the entire energy spectrum, with more than 3,000 member organisations located in over 90 countries and drawn from governments, private and state corporations, academia, NGOs and energy-related stakeholders. It informs global, regional and national energy strategies by hosting high-level events, publishing authoritative studies, and working through its extensive member network to facilitate the world's energy policy dialogue.

ENERGY LAW AND SUSTAINABLE POLICIES



Elizabeth Maruma Mrema, Director Law Division, UN Environment, shows that legal obstacles to developing sustainable energy policies are still widespread, and introduces the new edition of the *Guide for Energy Efficiency and Renewable Energy Laws*.

he Sustainable Development Goals recognise access to affordable and modern energy as essential to sustainable development. Increased diffusion of cleaner forms of energy is a critical step to implementing the 2015 Paris Agreement under the United Nations Framework on Climate Change. In both instances, the commitments made by the majority of nations will require increased deployment of and reliance on energy efficiency and renewable energy, with concomitant need for large new investments in them.

And large they are. According to the latest data around US\$13 trillion is needed in zero-carbon energy investment between now and 2040 in order to meet global climate targets. The good news is that the shift from coal to renewables is gaining momentum worldwide. Renewable energy sources are set to attract two-thirds of all investment in power-generating plants between now and 2040. However, this still leaves a shortfall of US\$5.8 trillion in zero-carbon energy investment needed to meet global climate targets and prevent a catastrophic 2°C temperature rise.

"Renewable energy sources are set to attract two-thirds of all investment in power-generating plants between now and 2040."

That is why we must look beyond financing mechanisms alone to trigger the required momentum to accelerate the shift from fossil fuels to renewables. While investment is the primary driver of renewable energy developments, it is laws that are the enablers. Take fossil fuel subsidies as an example. Currently worth around US\$452 billion a year to G20 nations, fossil fuel subsidies create an uneven economic playing field for renewables. Laws that help mitigate some of

the substantial up-front costs of renewables can be a key determinant of project feasibility. In addition, there are a number of legislative requirements important for environmental management of the energy sector. While the market place will influence much of the transition required for adoption of efficiency measures and the use of renewable energy resources, government regulations are needed to accelerate this transition.

A NEW LAW GUIDE

Much has been written about sustainable energy policies, but until now there has been no up-to-date and comprehensive treatment of relevant laws. In response to requests for assistance in drafting legislative provisions for promoting and implementing energy efficiency and renewable energy programmes, UN Environment has published a second edition of the *Guide for Energy Efficiency and Renewable Energy Laws*. The Guide describes the latest laws in effect worldwide promoting successful energy efficiency and renewable energy projects. Energy efficiency and renewable energy project initiators,

"Major obstacles to the uptake of renewables in developing and emerging markets include a general lack of awareness of alternative energy options."

government officials and developing country energy law draftsmen are already using it.

From buildings, appliances, industrial and transport efficiency, to energy options, financing and rural applications, the Guide covers an impressive depth and breadth of issues affecting the adoption of renewables worldwide. One of the most important conclusions from the study is the importance of political will in spurring widespread initiation and implementation of renewable energy in developing countries in particular. While there are no hard and fast rules regarding whether law or policy comes first, what is important is the sincerity and determination of government to implement its policies.

In China and India, for example, the central governments take the lead in the initiation of policies on efficiency and renewable energy, but regional and local governments then initiate those policies at the regional and local government levels. On the other hand, in Nigeria and Ghana, there is a dearth of regional, state, and local government initiatives despite the fact that central governments have formulated energy efficiency and renewable energy policies.

SPECIFIC ISSUES

Major obstacles to the uptake of renewables in developing and emerging markets include a general lack of awareness of alternative energy options, as well as a lack of reliable data to undertake specific projects. These considerations, along with limited financial resources, competition from other energy sources, a lack of supportive policies, and inefficient infrastructure and equipment, contribute to the difficulty of accessing the latest renewable energy technology. An adequate regulatory framework must, therefore, specifically address these issues in order to put renewable energy squarely on national agendas.

Renewable energy laws should, among other things, address incentives to harness any form of renewable energy including procedures for facilitating renewable energy technologies through effective implementing institutions. Such laws must provide for the rights and obligations of the host country, its rural communities, and private investors. And they must impose standards. The vagueness of statutory language, weak judiciaries, and poorly trained and ill-equipped workforces in implementing institutions, all combine in varying degrees to deflect regulatory will. Countries with developing and emerging markets must guard against these deficiencies in regulating the renewable energy sector.

Energy efficiency and renewable energy hold great promise for a more secure, safer, cleaner and more economic future for the world. For developing countries, efficiency and renewables present the opportunity for leapfrogging over traditional energy resources and avoiding the myriad of environmental problems that accompany them. Some of the renewable technologies, however, are not yet cost-competitive. There are still many barriers to technology transfer, including financing, pricing, infrastructure and education and training. These must be dealt with before clean resources become universally available. Nevertheless, renewables are the fastest growing of the energy media. It is therefore critical that the countries, states, and cities, and their responsible officials, and implementers, contemplating large clean energy investments and deployment, have the legal tools to do it right.

The Marrakech 'COP of Action' is an opportunity to celebrate the early entry into force of the Paris Agreement and to focus in earnest on implementation mechanisms. Laws for the promotion of renewable energy efficiency have a key role to play in supporting technology transfer, mitigation, adaptation and capacity building. This event is an opportunity to ensure that such laws are recognised as an important resource in the quest for a sustainable clean energy future.

Please visit http://www.unep.org/ publications/ to download 'A Guide to Energy Efficiency and Renewable Energy Laws'.

Elizabeth Maruma Mrema is the Director of the Law Division of UN Environment (since June 2014). Elizabeth has worked with UN Environment for almost two decades. Until June 2014, she was the Deputy Director and Coordinator, Operations and Programme

HYDRO AND THE LAW

An example of the regulatory need to promote renewable energy may be found in the treatment of small hydro projects. Hydropower for rural electrification can help minimise local, regional and global environmental impacts in the long run, while ensuring people's livelihoods. It is an important pillar of economic development in hilly areas, an important source of a country's fiscal revenues, and an important way for local people to shake off poverty and set out on a road to prosperity. It improves agriculture and rural production conditions and brings about advances in agriculture. And it promotes the comprehensive utilisation of renewable energy resources - wind, water, solar, geothermal and biomass energy.

These benefits, which apply to all renewable energy resources, cannot be realised without a coherent legislative and regulatory framework that sets out the policy, laws and institutional mechanisms that must be in place for the successful application of renewable energy. The problems that permeate efforts to adopt effective laws for promotion of energy efficiency and renewable energy are evident in all countries, but they are particularly prominent in those countries where the need for energy is greatest.

Delivery Branch in the Policy Division. Previously, her work had focused on environmental law both at national, regional and international level. Before joining UN Environment, Elizabeth worked with the Tanzania Ministry of Foreign Affairs and International Cooperation. A lawyer and career diplomat, she has published several articles related to international environmental law, compliance and enforcement of conventions and developed, among others, a number of multilateral environmental agreement negotiation tools, handbooks and guidelines currently used by UN Environment in its capacity building programmes. She is a member of the World Commission on Environmental Law.

UN Environment (www.unep.org) is the leading global environmental authority that sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system and serves as an authoritative advocate for the global environment.

CLEAN TECHNOLOGY INNOVATION



Bertrand Piccard, Initiator, Chairman and Pilot, Solar Impulse, explains how clean technology innovation and renewable energy can be combined to achieve climate goals, using the Solar Impulse solar-powered circumnavigation of the earth as a prime example.

e are constantly hearing that clean water should be free and accessible to all because we cannot live without it. But the same thing can be said about energy. Luckily, more and more people are starting to understand the need for clean energy innovation, as shown by the success of conferences like COP21 or the Sustainable Innovation Forum 2015, which André Borschberg and I both attended, and the current energy trends.

The rapid advance of solar energy demonstrates how innovative research can achieve goals beyond all expectations. The best projections 14 years ago were that the world would be able to install 1GW per year by 2010; we beat that by 17 times over in 2010, and this year we are on track to beat it by 68 times. This has led the cost of solar energy to come down 10 per cent per year for 30 years, and to compete with fossil fuels today.

"Producing more energy, even renewable, is not the ultimate solution. The priority is to increase energy efficiency."



On a broader scale, Germany generated 81 per cent of its electricity from renewable sources on 26 December 2015, and if you look at all the investment in new electricity generation in the USA in 2015, almost three-quarters was from renewable energy, mostly wind and solar.

Rapid progress is also being made in terms of energy storage. Take Tesla: in 2015, they launched Powerwall, a home battery with a 7kWh energy storage capacity, sufficient to power most homes during the evening using electricity generated by



In 2016, the Solar Impulse aeroplane completed the first circumnavigation of the world powered by solar energy.

solar panels or the utility grid during the day.

And to help poorer countries get their share of the pie, recent years have seen initiatives popping up all around the world, such as Akon Lighting Africa – which equips sub-Saharan communities with solar-powered installations like street lamps, microgrids and domestic grids – and projects like ABB's implementation of modern smart grids in India and Hawaii.

TECHNOLOGY BRINGS EFFICIENCY

Producing more energy, even renewable, is not the ultimate solution. The priority is to increase energy efficiency. With the clean technologies that exist today, we could divide by two the world's energy consumption, and thus CO₂ emissions, without having to make any sacrifice.

On the contrary, implementation of innovative technologies would create new jobs and profit for both industry and consumers, as they represent the new market the world needs today. Even climate

"Popular support is one of the ingredients needed to spark true change – and the other is political courage." sceptics, who refuse to be 'ecological,' should understand that this is simply being 'logical.'

But we all know that renewable energy will not improve the quality of life as much as the spate of oil discoveries did in the 1930s. So to get people excited about this energy transition, we, at Solar Impulse, decided to show that combining renewable energy and clean technologies can accomplish the impossible: an airplane of perpetual endurance using nothing but the sun's rays! Indeed Solar Impulse is much more than a plane – it is a symbol spreading the message that clean technologies are the biggest new business opportunity in the history of the world, for developed and developing countries.

THE POLITICAL DIMENSION

Popular support is one of the ingredients needed to spark true change – and the other is political courage. Which is why, over the years, I have been attending international conferences to encourage the leaders of our world to fight for a cleaner future. The technologies, like the ones used on Solar Impulse, already exist today, so what we now need is a legal framework which will allow their massive implementation to replace old polluting systems. Does it seem logical that our communication technologies are always so cutting-edge while most of our energy infrastructure - incandescent light bulbs, combustion engines, housing insulation, heating and cooling systems, electricity distribution networks - is 100 years old?

The challenge now for COP22 is to agree on an international legal framework that will make the change happen. Not only for the quality of life of future generations, but also for all of us right now!

Bertrand Piccard (http://bertrandpiccard. com) is Initiator, Chairman and Pilot, Solar Impulse. Born into a dynasty of explorers and scientists who have conquered the heights and depths of our planet, Bertrand Piccard made the first ever non-stop round-the-world balloon flight. An internationally renowned psychiatrist, aeronaut and lecturer, chairman of the Winds of Hope charitable foundation, and a United Nations goodwill ambassador, he combines science and adventure in order tackle some of the great challenges of our times.

Solar Impulse (www.solarimpulse.com) is a Swiss long-range experimental solar-powered aircraft project. The project is led by Swiss engineer and businessman André Borschberg and Swiss psychiatrist and aeronaut Bertrand Piccard. On 26 July 2016 Solar Impulse finished the first circumnavigation of the Earth by a piloted fixed-wing aircraft using only solar power, to promote the role of clean technologies in developing a global green economy. The flight was achieved in 17 stages, covering about 42,000km, and took in four continents, three seas and two oceans.

ICTS CAN TRANSFORM THE RESPONSE TO CLIMATE CHANGE



Houlin Zhao, Secretary-General of the International Telecommunication Union (ITU), shows how investing in information and communications technologies (ICTs) will be essential in helping all countries implement the Paris Agreement.

n Benin, regional supervisors used to monitor their village's water supply mostly by instinct. But in 2007, a Senegalese software company introduced water supply managers in Benin, and across Africa, to the mWater platform. Now thanks to these information and communications technology (ICT) applications water supply managers can track the entire life cycle of their water supply in an app on the smartphone at his fingertips.

This innovative convergence between utilities and telcos is opening up countless digital opportunities around the world. In Cuba, thanks to a new early warning system, and SMS messages sent to mobile phones country-wide, locals are forewarned when a cyclone's on the way, so they can get themselves and their families to safe shelter from the storm.

"In Cuba, thanks to a new early warning system locals are forewarned when a cyclone's on the way."

In Kigali, Rwanda, young students used to have to stop studying once the sun set because their home had no electricity. In recent years the government and its partners have brought biogas into homes, a small yet significant part of an overall plan to replace charcoal and firewood

with renewables; and which now fulfils 85 per cent of Rwanda's energy needs. Thanks to ICTs monitoring the grid, homes now have light – and school grades have improved.

In these examples, we see some practical and important ways that ICTs are transforming peoples' lives by cleverly altering their environments and adding value to existing services. ICTs can play a transformative role in securing a sustainable and energy efficient future, and will be a front line tool in the fight against climate change. ICTs will play a crucial role in helping the world reach all the Sustainable Development Goals (SDGs), and have an immediate part to play in how every country on earth implements the Paris Agreement.

HEAVY INVESTMENTS REQUIRED

Most countries are already looking at how to implement the Paris Agreement at the national

level, in particular with regard to reaching their National Determined Contributions (NDCs), which reflects the commitment made by each country to significantly reduce their GHG emissions.

Most of them are looking at the role of ICTs as a key infrastructure that can drive the transformation needed to move towards a low carbon or even a carbon-free future. A first example of such ICT-enabled solutions is the use of radio communications, which has always and will continue to serve as a strong tool for climate monitoring. Some areas where technologies are a necessary tool against climate change include continued observations and long-term monitoring of solar activity to improve a country's, a region's, and the world's knowledge and understanding of the influence of the electromagnetic radiation from the sun on earth's environment. The next stage of this includes monitoring changes in the atmosphere, oceans, and land surface, and the use of such information for climate change modeling, and continued observations of changes in the ozone layer and their effects on the environment and human health.

Land cover change assessment and understanding of its dynamics are also recognised as essential requirements for sustainable management of natural resources, environmental protection, food security, climate change and humanitarian programmes. Terrestrial and satellite radiocommunication systems contribute to the monitoring of carbon emissions, the changing of ice in polar caps and glaciers, and temperature changes. Another key aspect is the application of modern radiocommunication systems to increase productivity, optimise energy consumption and reduce transport costs, leading to reduced levels of CO₂ emissions. ITU works hard to ensure that sufficient radio frequencies are available globally for all these critical services.

The second example I would like to highlight is the use of ICTs to advance towards building Smart Sustainable Cities, another area in which we will need to see further investments over the forthcoming decade. With over half the world population now living in cities, ICTs are becoming ever more important as the means of providing efficiency for mass transport and renewable energy. A Smart Sustainable City is an innovative city that uses ICTs and other means to improve the quality of life, efficiency of urban operation and services and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental and cultural aspects.

In today's cities much of the infrastructure is installed by a diverse set of suppliers and

"Land cover change assessment and understanding of its dynamics are recognised as essential requirements for sustainable management of natural resources"

maintained by different agencies that sometimes work in isolation. The interconnection of city systems demands standardised interfaces, and standards bodies such as ITU have an important role to play. For city planners, utilities and service and technology providers, standards are essential enablers in achieving consistent levels of performance and quality, as well as compatibility between technologies and economies of scale. Smart Sustainable Cities will require collaboration and consultation with all key stakeholders including citizens, and will be key to the achievement of all the SDGs, but especially SDG 11 on sustainable cities and communities.

Furthermore, smart investments in ICT keep confirming ICT's power as a positive force for international development for the future. By 2020, more people will probably have mobile phones than electricity at home, bank accounts, or running water. The digital divide between developed and least developed countries (LDCs) will have have to shrink, as much needed

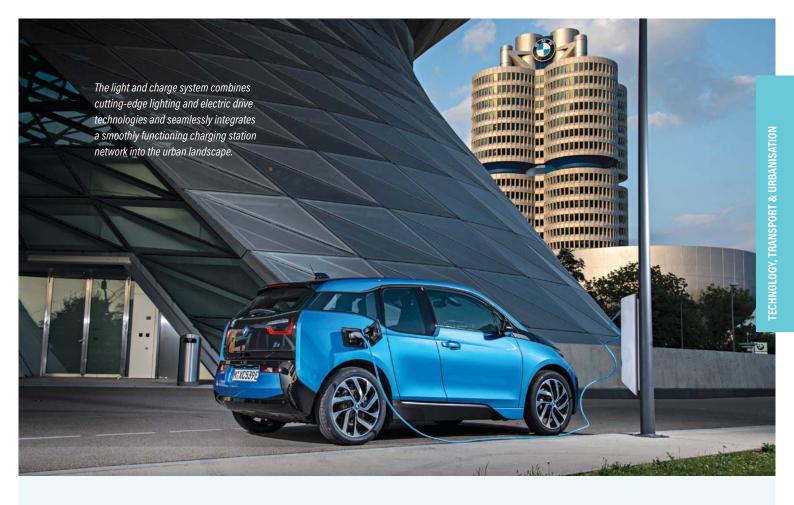
"Smart investments in ICT keep confirming ICT's power as a positive force for international development for the future." investments in broadband grows. The number of countries with National Broadband Plans (NBP) has shown good progress over an eight-year period. Of the 189 countries for which ITU has data, the number with a NBP stands at 151, leaving only 38 without. Average prices for all types of mobile broadband services fell by more than 25 per cent in LDCs in 2016.

These are just a few examples of the incredible potential of ICTs. But fulfilling this potential will require mobilising the right investment. In my role as Secretary-General of ITU I would like to invite all stakeholders from the ICT sector – governments, municipalities, the private sector, academia, entrepreneurs and investors – to work together to mobilise such investments so that the world can start benefiting from the uses of ICTs to address Climate Change. It is a shared responsibility, and it is up to all stakeholders to make it happen.

Houlin Zhao took up his post as ITU Secretary-General in January 2015. Prior to his election, he served two terms of office as ITU Deputy Secretary-General (2007-2014), as well as two terms as elected Director of ITU's Telecommunication Standardization Bureau (1999-2006). Mr Zhao has spent most of his career working in the international arena. His leadership has been characterised by a tireless commitment to further streamlining ITU's efficiency and enhancing strategic partnership between member states and sector members. He has boosted ITU's level of international cooperation with other international organisations, and is dedicated to harnessing technology to bridge the gap between developing and developed countries. As Secretary-General, Mr Zhao is committed to further extending ITU's community to include academia from around the world, as well as promoting the greater involvement of small and medium-sized enterprises in the work of the Union.

The International Telecommunication Union

(ITU, www.itu.int), the United Nations specialised agency for ICTs, has been at the centre of advances in communications since 1865 – from telegraphy through to the modern world of satellites, mobile phones and the internet. The story of ITU is one of international cooperation, among governments, private companies and other stakeholders. The continuing mission is to achieve the best practical solutions for integrating new technologies as they develop, and to spread their benefits to all.



DRIVING THE FUTURE OF MOBILITY

Leading provider of premium products and services for individual mobility, the BMW Group, outlines how the transition to electric is changing the vehicle landscape.

The future of the automobile industry is still taking shape, but some key elements of its transformation are already becoming clear. Electric vehicles are taking to the roads in greater numbers than ever before, with 2015 seeing the global electric vehicle stock surpass 1 million.

Aside from battery and plug-in hybrid vehicles leading the way towards greater engine efficiency, the future of the industry is also being shaped by trends including smart and secure connectivity and sharing-friendly mobility services. The BMW Group has made these priorities and is determined to continue leading the way in sustainable, premium, and innovative personal mobility.

Beyond these product-oriented measures for climate-friendly mobility, the BMW Group is making changes in production, transforming not just how cars perform, but how they are made.

As the transition to electric is changing the vehicle landscape, attention will shift more and more to the production footprint. As there are more electric vehicles on the roads drawing power from renewable sources, emissions over the life cycle of a car will be measured by the environmental impact of factories. Sustainable production will take centre stage.

SUSTAINABILITY IS PREMIUM

A focus on sustainable production starts with reducing energy use. Since 2006, the BMW Group has used 36 per cent less energy per vehicle manufactured. The company's factories around the world have reduced total energy use and many have begun a shift to renewable sources.

In Germany, the Leipzig BMW i3 and i8 production is 100 per cent ${\rm CO_2}$ -free. Meanwhile, in the United States, the Moses Lake carbon fibre plant in the state of Washington uses 100 per cent hydropower. The Spartanburg, South Carolina, factory sources up to 50 per cent of its energy from methane gas brought in from a nearby landfill. This reduces ${\rm CO_2}$ emissions for production by 92,000 tons of ${\rm CO_2}$ and cuts costs by US\$6.7 million a year.

At the MINI plant in Oxford, solar panels covering the equivalent of five football fields provide enough energy to power 850 homes. And at South Africa's Rosslyn factory, up to 30 per cent of the energy is provided through biomass methane sourced from cattle at a neighboring farm.

Innovative solutions for the BMW Group's production have taken many different forms, but the goal is the same: reaching 100 per cent renewably sourced energy.

WORKING TOGETHER FOR CLIMATE GOALS

There is no one fix for climate change, no one law that can reduce greenhouse gas emissions, no single alternative power project that can set the world on a path to sustainability. Instead, COP22 is the work of partners the world over to implement the change piece by piece, goal by goal.

Climate impact from the automobile industry comes from production and vehicle use, and the BMW Group is setting the path to reducing environmental strain from beginning to end of a vehicle's life cycle.

www.bmw-i.com www.bmwgroup.com

CREATING BETTER MOBILITY SOLUTIONS



Erik Jonnaert, Secretary General of the European Automobile Manufacturers' Association (ACEA), outlines the automobile industry's commitment to reducing CO_2 emissions and the need to shape a pragmatic policy framework surrounding changing demand and a move towards clean and smart mobility.

OP22 has an important role to play in translating the ambitious Paris Agreement into an agenda for concrete action. Europe's automobile manufacturers are fully committed to further reducing CO₂ emissions. Our industry has already made great strides in improving the CO₂ performance of new vehicles. In 2015 average new car emissions in Europe were 36 per cent lower than in 1995, an impressive decrease in just two decades. By 2021, CO₂ emissions from new cars coming on to the roads will be 42 per cent less than in 2005, and ACEA is committed to doing even more in the future.

CHANGING DEMAND

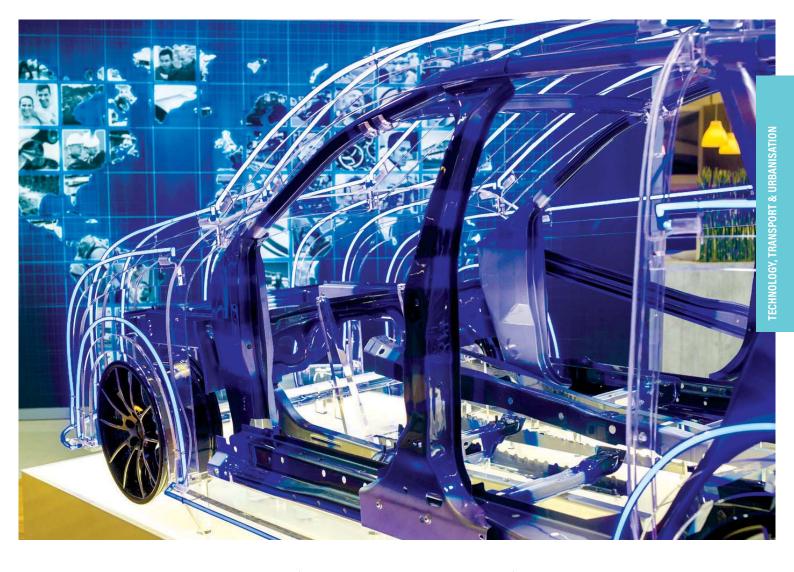
Demand for passenger and freight transport will only continue to grow in decades to come. Forecasts suggest an increase in mobility demand of 2.6 times the current levels by

2050. At the same time, the very nature of our mobility needs is also changing rapidly. Younger generations increasingly demand transport that provides the level of digital utility and capability to which they are accustomed when it comes to other services.

"By 2021, CO₂ emissions from new cars coming on to the roads will be 42 per cent less than in 2005."

In parallel, ideas of ownership are changing as well. With each generation, people seem to become less committed to vehicle ownership. And when looking at society as a whole, changes in consumer demand are transforming the types of goods that are being delivered, as well as their distribution. Think, for example, of all those parcels delivered to people who are shopping online, all of them expecting rapid and direct delivery.

Another phenomenon that is redefining mobility is urbanisation. It is estimated that our planet will count 9.7 billion inhabitants by 2050, with two-thirds of people living in urban settlements. Besides the fact that mobility demand will increasingly need to meet the needs of city dwellers, cities are also among the areas where air quality standards are regularly exceeded. Reducing air pollution therefore remains a priority, even though



reducing ${\rm CO_2}$ and pollutants simultaneously requires conflicting measures.

RETHINKING MOBILITY AS A WHOLE

Clearly, less mobility is not an option, that is just not how our modern lives work. Rethinking mobility as a whole is a much more fruitful pursuit. After all, it is not just a question of meeting targets based on current demand, as we need to be able to meet much greater, and very different, mobility needs in the future. So when we talk about translating global climate change ambitions into concrete actions, we need to overcome the traditional targets-only paradigm.

Instead we need better mobility solutions, and European automobile manufacturers are well under way to create them. Besides developing state-of-the-art vehicles that are fuel-efficient and low-emitting, and investing in a wide range of alternative powertrains, manufacturers are also looking into completely new models of mobility.

CLEAN MOBILITY

In the future, road transport related emissions will be dramatically reduced thanks to a greater uptake of vehicles with the latest technologies and alternative powertrains, as well as intelligent transport systems and improved infrastructure.

"Reliable and uniform charging infrastructure will be widely available across Europe for the whole spectrum of alternative powertrains."

As a result of significant investments in charging infrastructure, the barriers that used to hamper the market uptake of alternative-fuel vehicles for so long will finally be overcome. Reliable and uniform charging infrastructure will be widely available across Europe for the whole spectrum of alternative powertrains. The automobile industry's investments in more efficient, low-emitting vehicles will finally come to full fruition, as fleet renewal brings the latest generation of vehicles to our streets in large numbers.

When looking at freight transport, heavy-duty vehicles will have made great strides as well. Intelligent transport systems in particular will help to make road transport much cleaner in decades to come. Truck platooning for example, which is the linking of two or more trucks in convoy via wireless communications, will become a common sight throughout Europe, saving fuel and reducing CO₂ emissions by up to 10 per cent. For heavy-duty vehicles, we will have to differentiate between what is possible for long-haul transport and regional or urban use. Especially in the case of the latter, we will increasingly see a role for alternative powertrains - with buses among the first vehicles expected to make a shift towards zero-emission transport.

SMART MOBILITY

In order to meet changing demand, manufacturers will become providers of innovative mobility solutions rather than 'just' being producers of vehicles. The future will bring a transport landscape in which private car, freight, bus, rail, pedestrian and bicycle traffic will be woven into a connected network, saving time and resources. The number of vehicles with built-in connectivity will increase from 10 per cent in 2013 to 90 per cent by 2020.

Automated driving will assist those with reduced mobility – for example the elderly and those with visual or other health impairments – to continue or start to drive, either supported by automated systems or within a fully autonomous mode. Vehicles will not only be connected with each other, but also with the infrastructure around them. Traffic lights, for example, will optimise transport flows. The need for parking spots in cities could also be reduced by up to 60 per cent thanks to self-driving vehicles. Increased traffic efficiency means less congestion, with people and goods arriving at their destinations faster and emissions being lowered significantly.

At the same time, tailored mobility and transport solutions will lead to new ownership models, customised intermodal mobility solutions and new logistics concepts. As a result, the auto industry's traditional business model of vehicle sales will be complemented by a range of diverse, on-demand mobility solutions, especially in urban environments. Freight transport will also adapt to new logistics trends and systems, based on a supply chain combining long-haul and last-mile solutions, with logistics platforms on multi-modal corridors – all managed by intelligent transport systems.

Turning to the question of public transport, the next generation of high-service collective transport will be born, including bus corridor concepts based on intermodality, with full integration between cars, bus, rail and non-motorised mobility. However, privately-owned vehicles will remain the main providers of individual mobility, due to their flexibility and the new scope to make valuable and productive use of the time spent in vehicles. In addition, new mobility concepts will offer on-demand mobility whenever desired.

FIVE POLICY RECOMMENDATIONS

The European automotive sector invests over €44.7 billion in innovation each year to ensure new levels of clean and smart mobility. But given the fundamental nature of the challenges we face, these mobility issues simply cannot be addressed by industry alone – there is also clear need for supportive public policies. ACEA expresses the hope that COP22 will play a crucial role in setting this agenda. To that end, I would like to share five policy recommendations with you.

1. Foster innovation. Bearing in mind that innovation is market-driven, the industry needs the flexibility to drive it forward, with policies and regulations that encourage it. The automobile industry calls for support for dedicated automotive initiatives and research that further

"Tailored mobility and transport solutions will lead to new ownership models, customised intermodal mobility solutions and new logistics concepts."

advances vehicle connectivity, environmental performance and safety.

- 2. Adopt a comprehensive approach to reducing emissions. We need to recognise that the current emission limiting system has limited environmental benefits, as it focuses on new vehicle technology alone. A more effective approach will look at the full fleet and how it is used. Such a comprehensive approach can reduce emissions more effectively by drawing on a full spectrum of solutions, whether this relates to intelligent transport systems, improving infrastructure or altering driver behaviour.
- 3. Ensure a better coordination of climate and air quality policies. While significant progress has been made in reducing both ${\rm CO_2}$ and pollutant emissions from vehicles, there is still a technical challenge for car manufacturers, as measures to reduce one often result in the increase of the other. Over past years, EU policy has focused on reducing greenhouse gas emissions, resulting in the most stringent ${\rm CO_2}$ targets for cars in the world. Looking forward,

"ACEA calls for a holistic approach, addressing all modes of transport – including air, maritime and rail – and all industrial sectors." we need a coherent policy framework in which ambitious climate change objectives are better reconciled with tougher air quality standards.

- 4. Encourage a move to the cleanest vehicles. The average age of road vehicles in Europe has been increasing since 2000; for cars it is currently close to 10 years. Fleet renewal offers the most effective way to decrease road transport-related emissions. As older vehicles are replaced with newer models, emissions from road transport will fall. The automobile industry calls on policy-makers to help accelerate fleet renewal and the introduction of the cleanest and smartest vehicles.
- 5. Make sure that policy measures are balanced. Our industry has already reduced CO₂ emissions significantly and is committed to doing more, but the relative costs of reducing emissions must be similar and proportionate across all sectors, in Europe versus the rest of the world. For this reason ACEA calls for a holistic approach, addressing all modes of transport including air, maritime and rail and all industrial sectors. Only a level playing field will allow the EU automobile industry to make the long-term investments that are necessary to tackle future challenges

Erik Jonnaert is Secretary General of the European Automobile Manufacturers' Association (ACEA). Mr Jonnaert began his career with the Linklaters law firm. He subsequently joined Procter & Gamble, where he worked for 25 years in public and regulatory affairs, communications and stakeholder relations. Before joining ACEA, he was Procter & Gamble's Vice President for External Relations in Europe and Asia.

The European Automobile Manufacturers' **Association** (ACEA, www.ACEA.be) represents the 15 European motor vehicle manufacturers providing technical and industrial expertise for the policy-making process. ACEA's members are: BMW Group, DAF Trucks, Daimler, Fiat Chrysler Automobiles, Ford of Europe, Hyundai Motor Europe, Iveco, Jaguar Land Rover, Opel Group, PSA Group, Renault Group, Toyota Motor Europe, Volkswagen Group, Volvo Cars, and Volvo Group. ACEA's Manifesto for Clean, Safe and Smart Mobility can be found at: www.acea. be/publications/article/manifesto-for-cleansafe-and-smart-mobility. For information about reducing CO₂ emissions from road transport more effectively visit: www.reducingC02together.eu.



INTERNATIONAL SHIPPING MOVES TOWARDS A LOW-CARBON FUTURE



Kitack Lim, Secretary-General, International Maritime Organization (IMO), plots a course towards low-carbon performance for shipping, through mandatory energy-efficiency measures for ships and an emphasis on capacity-building projects that support technology transfer.

hipping is indispensable to the world.

Increased globalisation has fuelled rapid growth in international trade, most of which is carried by ship, bringing people the commodities, fuel, foodstuffs, goods and products on which they depend. With this comes a challenge to ensure that international shipping can move towards cleaner energy, reduce its emissions and support the achievement of the Sustainable Development Goals.

This is not an easy task. Like other forms of transport, shipping is currently largely driven by fossil fuel-powered workhorse engines. And shipping is not a country, it is an industry. Finding an effective way to allocate emissions is not straightforward. Ships can move between different flags as easily as they can sail between different countries. Moreover, demand for shipping is dictated not by shipping operators but by world markets, the ever-increasing desire for goods by consumers and the basic need for raw materials and commodities which can only be moved sustainably by ships.

Nonetheless, the International Maritime Organization (IMO), the United Nations agency charged with regulating international shipping, has already ensured that shipping has embarked on a voyage to a greener future. IMO has ensured that shipping has made a solid contribution towards the reduction of greenhouse gas emissions.

Firstly, IMO has adopted binding technical and operational energy-efficiency measures which apply to all ships globally, no matter where they trade or their flag state. Secondly, by focusing on the capacity-building and technology transfer needed to ensure global application, IMO is supporting countries to implement the international measures effectively and is encouraging research and development of green technology.

And thirdly, IMO member states have agreed a three-step approach towards consideration of further measures to enhance the energy efficiency of ships.

BINDING ENERGY-EFFICIENCY RULES

The mandatory energy-efficiency requirements for international shipping adopted by IMO have now been in force for over three years, under the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI. Data show that more than 1,900 ships have now been certified as complying with the new energy-efficiency standards for ships built since 2013. Currently, a review of the status of technological developments is under way, to determine the implementation of phase two of the IMO Energy Efficiency Design Index requirements for new

"More than 1,900 ships have now been certified as complying with the new energy-efficiency standards for ships built since 2013."

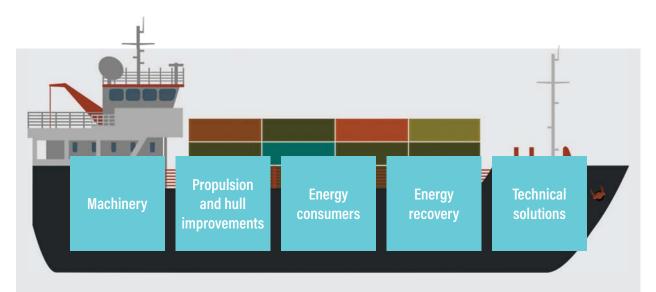
ships from 2020. In other words, requirements for new ships could be strengthened further if the technology is there.

To support this work, the project run by the Global Environment Facility (GEF), the United Nations Development Programme (UNDP) and the IMO Global Maritime Energy Efficiency Partnerships (GIoMEEP), has developed a comprehensive and freely available IMO Energy

Efficiency Technologies Information Portal, which outlines the wide spectrum of ways to potentially reduce ship fuel consumption. These energy-efficiency methods range from engine waste heat recovery and energy-efficient lighting systems - already available - to the use of kites or wind sails, currently at the experimental stage. Raising awareness of mature technologies, such as hull cleaning and propeller polishing to optimise propulsion, and their management, is key to achieving effective implementation of IMO energy-efficiency measures. Many ship operators are already adopting 'Best Available Technology Not Entailing Excessive Cost' (BATNEEC) and we should see technologies move from unproven to maturity over time.

However, while much can be and has been done to improve the energy efficiency of shipping, including alternative fuels and potentially renewable energy, nonetheless a +50MW marine diesel engine remains the prime mover for large seagoing vessels. The reliability and 'power density' of a marine diesel engine means that the space on board





Existing, new and future energy-efficiency measures to support shipping to reduce CO₂ emissions are outlined in the GloMEEP Energy Efficiency Technologies Information Portal. They include:

Machinery. This technology group includes measures that improve the energy efficiency of main and auxiliary engines. These include measures such as auxiliary systems optimisation, optimising heat exchangers, waste heat recovery systems, electronic auto-tuning, batteries and other solutions.

Propulsion and hull improvements. Technologies in this group focus on improving the hydrodynamic performance of the vessel. This includes solutions that reduce the resistance of the vessel and/or also improve the propulsive efficiency of the vessel. Examples include measures such as propeller polishing, hull cleaning, propulsion improving devices (PIDs), air lubrication and more.

Energy consumers. Consumers are equipment or devices that use energy when operated. Technologies in this group focus on minimising the energy consumption by improving the device or optimising the utilisation of the device. Examples of measures in this group are frequency controllers, cargo handling systems, low energy lighting and more.

Energy recovery. Technologies in this group focus on capturing energy from the surroundings of the vessel and using or transforming this to useful energy for the vessel. This involves measures such as application of kites, fixed sails or wings, Flettner rotors, or solar panels.

Technical solutions for optimising the operation. Technologies in this group focus on improving the operation of the vessel more than improving the vessel itself. The list of suggested measures includes both technologies and suggestions for best practice (without direct application of a technology). Measures in this group include trim and draft optimisation, speed management, autopilot adjustment and use, combinator optimising, and others.

a ship is currently optimised to carry cargo. The use of alternative and/or renewable energy sources may result in less space being available for cargo which could make a ship less than optimal as a commercial proposition. This is, and will be, a challenge for ship designers.

CAPACITY-BUILDING

The GloMEEP project supports the uptake and implementation of energy-efficiency measures for shipping, thereby reducing greenhouse gas emissions from shipping.

IMO is executing this two-year project, launched at the end of 2015, which involves 10 lead pilot countries (Argentina, China, Georgia, India, Jamaica, Malaysia, Morocco, Panama, Philippines and South Africa). GloMEEP aims to create global, regional and national partnerships to build the capacity to address maritime energy efficiency, and for countries to bring this issue into the mainstream within

"Energy-efficiency methods range from engine waste heat recovery and energy-efficient lighting systems – already available – to the use of kites or wind sails, currently at the experimental stage."

their own development policies, programmes and dialogues.

The project's three key objectives relate to:

- · Legal, policy and institutional reforms
- Awareness raising and capacity-building activities, and
- Establishment of public-private partnerships to encourage technology transfer.

So far, the project has delivered a series of national workshops in some of the lead pilot countries and two global workshops, including 'train-the-trainer' programmes which aim to cascade technical knowledge.

Three important technical guides have been specifically developed under the GloMEEP project, in collaboration with the Institute of Marine Engineering, Science and Technology (IMarEST). The guides are: Rapid Assessment Guide for determining the country's maritime energy efficiency and emissions status (Guide

1); Guide for maritime energy-efficiency strategy development (Guide 2); and Guide for incorporation of MARPOL Annex VI into national law (Guide 3).

A pool of experts, trained by the GloMEEP project in the use of these guides, will contribute significantly to the effective implementation of the energy-efficiency requirements for international shipping in their respective countries. This, in turn, can serve as a model for other countries.

Another exciting project being executed by IMO is the ambitious €10 million IMO-European Union Project on Capacity Building for Climate Change Mitigation in the Maritime Shipping Sector. This four-year project will establish a global network of Maritime Technology Cooperation Centres. The aim is to help beneficiary countries limit and reduce greenhouse gas emissions from their shipping sectors through technical assistance and capacity-building. It will encourage the uptake of innovative energy-efficiency technologies among a large number of users through the widespread dissemination of technical information and know-how. This will heighten the impact of technology transfer.

The four-year project will target five regions – Africa, Asia, the Caribbean, Latin America and the Pacific. These have been targeted for their significant number of Least Developed Countries (LDCs) and Small Island Developing States (SIDS).

To date, 14 potential host institutions have been shortlisted and work is under way to select the five Maritime Technology Cooperation Centres that will be supported financially to carry out specific research and development and analysis projects, including studies on data collection relating to fuel efficiency of ships and emissions in port areas.

NEXT STEPS

The output of the capacity-building projects will undoubtedly help support IMO member states as they move through the agreed three-step process towards consideration of any further global measures for international shipping for climate change mitigation.

Governments at IMO's Marine Environment Protection Committee (MEPC) in April 2016 approved mandatory requirements for ships to record and report their fuel consumption. In simple terms, the system will require ships of 5,000 gross tonnage and above to collect consumption data for each type of fuel they use. The aggregated data will be reported to IMO by the flag state after the end of each calendar year, and IMO will be required

"The reliability and 'power density' of a marine diesel engine means that the space on board a ship is currently optimised to carry cargo."

to produce an annual report to the MEPC, summarising the data collected. Data would be anonymised so individual ship data would not be recognised.

The proposed IMO Ship Fuel Consumption
Database is the first in the agreed three-step
approach, in which analysis of the data collected
would provide the basis for an objective,
transparent and inclusive policy debate at IMO.
This would allow a decision to be made on
whether any further measures are needed to
enhance energy efficiency of ships and whether
identified further measures would effectively and
sufficiently address greenhouse gas emissions
from international shipping. If so, proposed policy
options would then be considered.

The draft mandatory data collection requirements were set to be put forward for formal adoption at the next MEPC session in October 2016, and could enter into force as early as 2018. Crucially, this will be a global regime, applied universally to ships of 5,000 gross tonnage and above.

"Work is under way to select the five Maritime Technology Cooperation Centres that will be supported financially to carry out specific research and development and analysis projects."

IMO will always work on the basis that international shipping needs global regulation. This is set out in the Convention establishing IMO, which makes clear the purpose of the Organization is "to encourage the removal of discriminatory action and unnecessary restrictions by governments affecting shipping engaged in international trade so as to promote the availability of shipping services to the commerce of the world without discrimination".

It is important that IMO works with member states and industry towards instilling a culture that looks towards best practices in achieving lower ship emissions. There is no doubt that the Paris Agreement has placed increased scrutiny on IMO's work to address greenhouse gas emissions from shipping and thereby contribute to the global imperative to tackle climate change. IMO is playing a major role in ensuring that the spirit of the Agreement is translated into appropriate, tangible and lasting improvements in shipping, an industry vital to world trade.

Kitack Lim is the Director-General of the International Maritime Organization (IMO). In 2006, Mr Lim was appointed as Maritime Attaché, minister-counsellor at the Embassy of the Republic of Korea in London and led all IMO work for the Republic of Korea, serving as Deputy Permanent Representative to IMO up to August 2009. He was then appointed as Director General for Maritime Safety Policy Bureau at the Headquarters of the Ministry of Land, Transport and Maritime Affairs (MLTM). He led the delegation of the Republic of Korea to the IMO Assembly in 2009. In March 2011, He was appointed Commissioner of the Korean Maritime Safety Tribunal (KMST). In July 2012, he assumed the position of President of Busan Port Authority.

The International Maritime Organization

(IMO, www.imo.org) is a specialised agency of the United Nations, and the global standard-setting authority for the safety, security and environmental performance of international shipping. Its main role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted and universally implemented. Shipping is a truly international industry, and it can only operate effectively if the regulations and standards are themselves agreed, adopted and implemented on an international basis. IMO is the forum at which this process takes place.



The New Ecoship

Building the most innovative and ecologically friendly cruise vessel ever

What if a cruise model could be developed that not only mitigated environmental damage, but also offered a comprehensively sustainable approach and turned the negative impacts of the industry into a net positive for the planet and its people?

For Peace Boat, this challenge is a huge opportunity to develop the potential of a cruise ship for worldwide advocacy on sustainability. We will build the planet's most environmentally sustainable cruise ship as a flagship for action on climate change; an education and advocacy tool for the UN Sustainable Development Goals (SDGs); and a concrete transitional model for cruising and shipping in a low-carbon economy.

Peace Boat, Japan's largest cruise organization, is a unique social business that combines education, business, advocacy, and travel. Founded in 1983, we are a Nobel Peace Prize nominee and an NGO in Special Consultative Status with the Economic and Social Council for the United Nations. Peace Boat is a committed campaigner for the SDGs.

After a 3-year process developing the concept and choosing the technologies with support

from world-renowned experts, Peace Boat's Ecoship prototype will reduce CO2 emissions by 40%, will produce no SOx or NOx emissions and will recycle 100% of its water and waste. The ship will sail in 2020, in time for the start of the Paris Agreement and to celebrate Peace Boat's 37th anniversary.

We are presently looking for partners that can support us in the construction of the Ecoship. With 80% of the project already secured through development finance institutions, the remaining 20% is being raised through a combination of philanthropic capital, convertible debt and equity.

Our advisers and supporters include:







Amory B. Lovins, Rocky Mountain Institute Wanjira Mathai, The Green Belt Movement David Suzuki, Japan Renewable Energy Foundation



Ecoship Project

FINANCE SYSTEMS FOR SUSTAINABLE CITIES



Eduardo Paes, Mayor of Rio de Janeiro and Chair of the C40 Cities Climate Leadership Group, calls on national governments and international financial institutions to help finance the transition to a low-carbon, resilient and economically sustainable future for millions of urban citizens.



ities played a crucial role at COP21, and are ready to take action to meet the ambitions of the Paris Agreement. City mayors, including the 86 city leaders of the C40 network, are leading the way in tackling climate change, reducing greenhouse (GHG) emissions and building resilient cities. C40 launched at Habitat III in October 2016 a Call for Action on Municipal Infrastructure Finance that outlines what is required to help mayors deliver their ambitious climate action plans to the fullest possible potential. Almost 30 different leading NGOs and city networks from around the world have endorsed the call, including ICLEI, UCLG, the UN Environment Program, WWF, World Resources Institute, Natural Resources Defense Council and the Overseas Development Institute.

The single biggest barrier preventing mayors from delivering on their full climate ambitions is the challenge of accessing finance for sustainable infrastructure projects. A lack of access to finance is a key obstacle to delivering resilient, liveable and climate-safe cities.

C40 research has also shown that the actions taken by mayors over the next four years have the potential to determine whether the world is locked into a high carbon or low carbon growth pathway. These actions range from large-scale transformative infrastructure projects to small-scale investments. Each one will require financing of some kind.

Furthermore, the New Climate Economy reports have demonstrated that as well as being low carbon and climate resilient, cities that are compact, connected and coordinated are more productive, socially inclusive, cleaner, quieter and safer.

Mayors, city leaders and C40 believe that if each of the requirements in this article are addressed on the international, national and project levels, it will unlock billions of dollars of new investment, and help create the low emissions world we all wish to see.

Some overarching themes are present throughout: there is a pressing need for collaboration among all levels of government and among stakeholders; innovations are required in financing as well as technology; and the focus of policy must be on climate change adaptation as well as mitigation.

Finally, all stakeholders have a responsibility to recognise and convey the urgency of action to prevent catastrophic climate change. At every level of government and among financial institutions there needs to be an understanding of this in order to address the barriers that stand in the way of delivering low-carbon growth. The challenge and the opportunity begins in our cities, in the hands of mayors in power right now.

AN INTERNATIONAL ENABLING ENVIRONMENT

Action on the international level is crucial to ensure cities are able to deliver their climate action goals. The current international financial system was developed during the mid-20th century when nation states controlled most government resources. These structures have not yet adjusted to the significant devolution of powers and responsibilities to cities by almost all governments around the world. As a result, the international finance organisations, banks and funds are unwilling or structurally unable to provide cities with the support required to tackle the challenges of climate change. Addressing this is a responsibility both of these organisations' executive teams and the national governments that steer their operations.

Recognising the time required to make significant changes to global structures, C40 cities call on the international community to start the process of addressing these challenges now, to ensure our international financing system meets the needs of cities as quickly as possible.

Development banks must be reformed to respond to city needs. Multilateral and bilateral development banks play a significant role in sustainable development and tackling climate



change. Yet many have been slow to recognise the powerful role of cities in this agenda, and equally, the risks of not addressing climate change in cities. Development banks should prioritise urban low-carbon and adaptation projects that are identified in city climate action plans and aligned with city development plans, and ensure all supported projects are resilient to future climate threats.

Development banks must also create new mechanisms to significantly increase their subnational lending and build a greater understanding of city governance structures. This includes supporting cities in becoming creditworthy; earmarking large proportions of development bank lending to sub-national entities and regional/ municipal banks for green infrastructure; tailoring lending products specifically to meet the needs and capacity limitations of cities; increasing local currency borrowing; developing more flexible loan products; and formally involving the largest cities in the development of country assistance strategies. When supporting institutional and sector reforms, development banks need to pay greater attention to the widespread devolution of powers to cities and the need for capacity development within cities.

If the existing development banks cannot meet this challenge, then they should support the international community to work with city leaders to create new national, regional or municipal development banks (building on positive models such as Findeter). These new institutions should be able to lend directly to urban infrastructure and support cities to implement climate action and sustainable development plans.

Cities must be granted direct access to international climate funds. International climate funds are a vital source of capital, but difficult for cities to access. Existing funds such as the Green Climate Fund, the Adaptation Fund and the Global Environment Facility should identify mechanisms to enable large-scale, direct and simplified entry routes for cities and agree at board level to earmark a proportion of their funding for city projects. This would optimise the impact of these funds, and ensure they deliver on the expectations of the donors that provided capital.

Furthermore, large cities face considerable climate threats, including rising sea levels, storms, heatwaves and landslides. Many of those most at risk are the informal populations and the poorest citizens. Addressing these challenges will require well-planned solutions, many with high capital costs. City-specific mitigation and adaptation funds should be created and other new international climate funds must be structured to allow cities direct and accelerated access, with simplified entry routes through city-designated authorities who can endorse applications directly.

"There needs to be greater sharing of data and expertise and development of joint climate strategies that take into consideration the broader economic and social costs."

A NATIONAL ENABLING ENVIRONMENT

Climate change is the greatest long-term threat to humanity; to succeed, all levels of government – national, regional (states and provinces) and local – must work in partnership to find and implement the most effective solutions. Political challenges must be overcome and constructive partnerships must be developed. There need to be greater sharing of data and expertise and development of joint climate strategies that take into consideration the broader economic and social costs of climate change and move from short-term cost–benefit analyses to long-term life cycle assessments of climate interventions.

National and regional governments must consult with their large cities on the barriers being faced, and act quickly and collectively to create shared solutions. Good practice from across the world must be drawn upon, and ambitions and plans should align across government.

The power to control finance must be devolved to cities. Across the world, national governments have devolved responsibility to city mayors over many policy areas that impact climate change. However, cities often lack the crucial financial autonomy to fund the infrastructure that is needed to deliver on these responsibilities. National governments should work with their cities to understand the gaps in power, and work to address these as a priority.

Cities demonstrating sound financial management and with adequate safeguards in place should have the authority to:

- · Raise and collect own-source revenues
- Borrow, issue bonds and enter into publicprivate partnerships

- Price externalities, such as the creation of carbon prices or trading schemes, congestion charges and climate adaptation levies
- Introduce new mechanisms including tax and investment incentives to allow cities to capture and utilise increasing land values
- Establish green funds, with support from national governments for the necessary seed capital and technical assistance for these to commence operation
- Increase their borrowing limits where debt caps are unnecessarily or artificially low.

Granting these powers to cities will allow them to undertake both large and small-scale investments necessary to tackle climate change. Governments must further support cities by sharing taxpayer and utility ratepayer data and offering the assistance of tax collection agencies in city revenue collection, maximising the receipt of cities' own-source revenues.

National governments must create a stable policy and regulatory environment. One of the most important responsibilities of national governments is to provide a stable policy and regulatory environment that can drive market demand. Government fiscal and regulatory policies should be reviewed to determine their impact on the urban investment environment, including property rates, incentives, effective institutions and stable legal and political frameworks, as well as predictability and timeliness in government fund transfers, to ensure cities can meet their financial obligations.

Creating a stable investment environment requires awareness of the decarbonisation plans being developed at the national and regional level. Cities and other levels of government should all be working towards 1.5°C climate pathways, and planning accordingly. National governments can have a tremendous impact by instituting a national price on carbon and ensuring all proceeds raised are redirected towards the development of low-carbon, climate resilient infrastructure.

As key drivers of economic activity, large cities should always be involved in the development of national and regional climate change mitigation and adaptation plans, and governments should support cities to develop their own action plans. Delivering on a 1.5°C climate pathway at the country level requires an iterative, collaborative and coordinated approach that considers the roles and responsibilities of national, regional and local governments. This vertical alignment will help to ensure resources are deployed in the most efficient way possible.

Cities around the world have already made commitments to report on their greenhouse gas

emissions, mitigation targets and climate risks using a common standard through the Compact of Mayors (now integrated into the new Global Covenant of Mayors for Climate & Energy). However, funding and technical assistance from national governments is needed to support development of mitigation pathways and plans that are aligned with the Paris Agreement, particularly in the global South. Development and disclosure of climate action plans can also send a powerful signal to the finance community that cities are ready for investment.

National, regional and city governments should work together to measure and develop greenhouse gas inventories and ensure that data on emissions and climate threats is as reliable and complete as possible. Collection and sharing of data on co-benefits and avoided costs from sustainable infrastructure across multiple layers of government would help build further political support.

SUPPORTING TRANSFORMATIONAL PROJECTS

Cities have the ambition to deliver transformational projects; however, investors still lack confidence in sustainable infrastructure investments at the city level, and steps should be taken to address this. In times of extremely low interest rates, there is sufficient investor appetite and capital for infrastructure projects. The bottleneck consists in the perceived shortage of bankable projects, often resulting from the capacity of cities to prepare projects for investment, and the way projects are presented and marketed.

Cities need to deliver multiple infrastructure projects successfully to achieve their goals for low carbon growth. The opportunity cost of a city paying too much for current projects means that future projects may become unaffordable, or the city may reach its borrowing limits. It is therefore essential that cities are supported to reduce transaction and capital costs as much as possible.

The recommendations in this section should be taken forward by governments, the private sector, international organisations, community-based organisations and NGOs, working in close collaboration with cities.

Innovation, standardisation, pooling and pipelines must become the new normal.

Overcoming finance barriers requires scale, and awareness of the size of the market, as well as standardised project structures. Such approaches can provide a greater confidence in the financial structuring, enable pooling and reduce project preparation time and transaction costs.

International partnerships that bring together the public, private and NGO sectors will allow cities to pool projects and share risks across jurisdictions and borders. They can also help fund the standardisation of uniform project investment templates and affordable climate measurement and verification mechanisms to structure infrastructure proposals, taking into account cultural and financing differences in different regions of the world. Governments should enable and encourage cities to utilise innovative financing tools such as PACE or on-bill financing, and address any policy or regulatory challenges to their application. Similarly, those working in the finance industry need training to support the delivery of green urban infrastructure projects.

The global pipeline of sustainable infrastructure projects should be collated and published – starting with the largest cities – to reveal the size of the opportunity and encourage more investors to engage in this market.

As the major holders of global capital, private and institutional investors, particularly pension funds and insurance companies, have a specific role and often a strategic interest in the development of sustainable cities. These funds should work harder to understand sustainable infrastructure technologies and project risk profiles, support the development of standardised project structures, and shape the creation of this new asset class in order to deploy large-scale and flexible capital into projects identified in city climate action plans.

Innovation in financing is required, both in the structuring and development of projects, but also in the building of market confidence to use and deploy the new techniques and mechanisms developed. Governments should be fast to respond in understanding and permitting the use of new financing techniques, and city governments should be supported to find the financing structures that maximise the impact they can have.

Innovation, standardisation, pooling and pipelines will help reduce borrowing costs; however, more will be required. Development banks and governments should provide credit enhancements for low-carbon and urban resilience projects at affordable and accessible

"The opportunity cost of a city paying too much for current projects means that future projects may become unaffordable." terms, and made easy to access for city governments. This can make projects more financeable, reduce the costs of capital and leverage significant private investment.

Cities must be supported to develop their capacity to prepare and execute projects.

A major challenge for city governments is the shortage of skills and internal capacity to prepare infrastructure projects for investment and ensure their successful implementation. As cities develop their climate action plans, they require significant capacity development support to prepare finance-ready projects for investment. Governments and philanthropic organisations need to direct funding towards efforts such as the C40 Cities Finance Facility, ICLEI's Transformative Actions Program (TAP), the R20 100 Climate Solutions Project Campaign, the Cities Development Initiative for Asia (CDIA) and others, aiming to increase the pipeline of finance-ready sustainable infrastructure projects.

Investment is also needed to develop the capacity of city experts to prepare these projects, scaling up this support to reach all the cities that need it. National governments should provide cities with legal, technical and financial assistance to support capacity development and implementation of innovative financing mechanisms, including guidance on pricing externalities and conducting life cycle assessments, as well as their implementation.

Eduardo Paes has dedicated his entire career to public service in Rio de Janeiro. Fresh from law school, he became Deputy Mayor of the Jacarépaguá and Barra districts at age 23. Since then he has been Alderman, Federal Chamber Deputy, the city's Environment Secretary and State Secretary for Tourism, Sport and Leisure. In 2008, he was elected Mayor of Rio and led the successful campaign to host the Olympics in 2016. Four years later, he was re-elected for a second term and became Chair of the C40 Cities Climate Leadership Group at the end of 2013.

The C40 Cities Climate Leadership Group

(www.c40.org), now in its 11th year, connects more than 85 of the world's greatest cities, representing over 650 million people and one-quarter of the global economy. Created and led by cities, C40 is focused on tackling climate change and driving urban action that reduces greenhouse gas emissions and climate risks, while increasing the health, well-being and economic opportunities of urban citizens.

BUILDING FOR ZERO EMISSIONS



Terri Wills, CEO of the World Green Building Council (WorldGBC), discusses the role and potential of the building and construction industry in combating climate change.

Then the French Foreign Minister Laurent Fabius brought down the gavel to seal the adoption of the Paris Agreement, rapturous applause sounded from the delegates gathered in the French capital, with some even linking arms and embracing enthusiastically. It was clear the world was witnessing a special moment. "Today we celebrate, tomorrow we have to act," proclaimed Miguel Arias Cañete, the EU's Climate and Energy Commissioner.

In the year since the historic COP21 in Paris and the groundbreaking climate change deal

that was secured there, it has become clear that one of the major impacts was simply the power and influence of world leaders coming together in one place to commit unequivocally to decarbonisation – in particular, through the building and construction sector. Buildings Day, itself a historic occasion as the first day dedicated to the sector at any COP meeting, put the role and potential of buildings in tackling climate change front and centre: the building and construction industry is one of the single biggest contributors of greenhouse gases, accounting

for more than 30 per cent of global emissions. But, by the same token, it also represents a major opportunity to combat climate change, offering one of the most cost-effective ways to do so through measures such as energy efficiency.

It was at Buildings Day that business leaders, policy-makers, city officials and other organisations acknowledged this on the global stage. It led to the creation of the Global Alliance for Buildings and Construction (Global ABC), an alliance of over 20 countries including both France and Morocco, nine major businesses,



and over 50 other national and international organisations including WorldGBC. Although still in its early stages, there are significant future opportunities for the Alliance, such as helping countries to deliver on their own 'Intended Nationally Determined Contributions' (INDC) targets through building efficiency, and ensuring climate finance can flow through to buildings.

Buildings Day also provided the opportunity for the industry to present its own commitments designed to step up action. WorldGBC and its network of over 70 Green Building Councils and 27,000 member companies announced one of the largest buildings-related commitments at COP21, by collectively pledging to dramatically reduce emissions from buildings. Together with the International Energy Agency, we calculated that we must reduce emissions of some 84 gigatonnes of CO₂ by 2050 - the equivalent of not building 22,000 coal powered plants - if we are to keep global warming to within 2°C. This is a bold target, but one that can absolutely be achieved through green building, and specifically net zero new buildings and the energy efficiency refurbishment of our existing ones.

DELIVERING PROGRESS

A year on, we are delivering solid action against that commitment. In March 2016, we launched BUILD UPON – the world's largest collaborative project on building renovation, funded by the European Union's Horizon 2020 fund. BUILD UPON is tackling one of Europe's most daunting climate challenges – its existing buildings, which account for 36 per cent of the EU's total ${\rm CO_2}$ emissions. Thirteen Green Building Councils will hold 80 events and create a policy dialogue with stakeholders from over 1,000 organisations, in order to support their countries to deliver national renovation strategies. We believe this project will spark nothing short of a renovation revolution across Europe – hopefully followed soon by other continents.

Three months later in June, we launched Advancing Net Zero, a groundbreaking project which aims to ensure that all new buildings have net zero emissions by 2030, extending this to all buildings by 2050. This is another vital part of our efforts to stay within 2°C. This project grew out of the growing momentum behind our COP21 commitment. Three Green Building Councils initially announced they would introduce a net zero certification, and this ambition has spread through our network with 10 Green Building Councils from countries as diverse as Brazil, Canada, India and South Africa now committed to introduce net zero building certification schemes. These will challenge those in the industry to strive for buildings that create no emissions, and contribute little or nothing to climate change.



We have also seen another COP21 commitment turn into a major initiative. Many Green Building Councils have committed to working with their governments – city and national – to develop stronger and more ambitious green building policies. The result is a partnership with the World Resources Institute on the UN Sustainable Energy for All's Building Efficiency Accelerator (BEA) programme, designed to help to double the rate of energy efficiency globally by focusing on key cities such as Dubai, Warsaw, Bogota and Tshwane. The partnership has been met with great enthusiasm from mayors and leaders of major cities, with the Secretary General of the Dubai Supreme Council of Energy (DSCE), HE Ahmed Butti Al Muhairbi, stating that the BEA would help to "foster a culture of efficiency in existing and new buildings ... to ensure a sustainable environment for future generations."

FOCUS ON FINANCE

As an international green building movement, we are proud of the progress we have made against our COP21 commitment. But we know we

"Many Green Building Councils have committed to working with their governments – city and national – to develop stronger and more ambitious green building policies." must continue to act, and in particular address challenges not yet overcome. In particular, climate finance is a focus in Marrakech, and has been identified as a main priority for the Moroccan COP22 Presidency, particularly the question of how developing countries can better access finance to adequately address climate change. Many global South countries set ambitious targets as part of their INDCs, yet they specified that these could not be achieved without the ability to unlock climate finance, and thus the ambition of the Paris Agreement would ultimately be much more difficult to reach.

Over the next 15 years, it is estimated that roughly US\$93 trillion of low-emission and climate-resilient infrastructure will need to be built globally. Financing this infrastructure is critical, which is why we at WorldGBC are focusing on a few key areas of climate finance and low emission infrastructure at COP22.

First, we will continue to support innovative climate finance mechanisms. We are beginning to see real progress within the property industry on this. Green bonds, for example - those which are used to fund projects with a positive environmental or climate benefit - are being increasingly used for green building projects. In fact, the non-profit organisation Climate Bonds expects green property bonds to make up to 40 per cent of the green bonds market in the future. In 2015 the Green Building Council of Australia joined Climate Bonds as a partner, allowing Australian property owners to use the Green Star building certification tool to help attract new sources of funds from large institutional investors seeking low-carbon assets.

This example from Australia – and the partnership between WorldGBC, cities, Green Building Councils and the WRI on the Building Efficiency Accelerator – shows how Green Building Councils are uniquely positioned to secure climate finance, and to work with other

organisations in their own countries to do so.

Second, we will make clear the case for investment in green building. We will be creating for the first time a research function which will support major studies to prove beyond doubt the value of green building. Already, data tells us that investment is pouring into green building. A recent report by GRESB, the organisation which assesses the environmental, social and governance performance of property companies and fund managers, paints a positive picture of real estate investments around the world. In its assessment of over 750 real estate companies and funds, representing more than 66,000 assets across 63 countries, with a value of US\$2.8 trillion, property companies are reducing energy and water consumption, cutting greenhouse gas emissions, and placing greater focus on occupant health and well-being.

SUSTAINABLE DEVELOPMENT GOALS

WorldGBC will increasingly be showcasing how green building will contribute towards achieving many of the UN's Sustainable Development Goals (SDGs), demonstrating how climate finance directed towards green building will achieve both climate and global development ambitions.

These goals set forth a challenge for humanity to decouple economic growth from climate change, poverty and inequality – a challenge we firmly believe green building can help to solve. Green buildings are not simply structures that can save energy, water and carbon emissions, but they are also catalysts for social change – and can educate, create jobs, strengthen communities, improve health and well-being, and much more. While the 17 SDGs are wide-ranging, from ending hunger to promoting peaceful and inclusive societies, there are several goals to which green buildings are already contributing to in a significant way.

The goal to 'ensure healthy lives and promote well-being' is supported through our Better Places for People campaign, which focuses on creating green buildings that support healthier and happier lives. According to the World Health Organization, lung and respiratory diseases associated with poor indoor environment quality are three of the top five leading causes of death.

Green buildings are helping to 'promote sustainable economic growth and employment' by creating thousands of jobs and addressing socio-economic issues such as unemployment and lack of skills. South Africa uses a socio-economic framework which guides building owners to certify buildings not just for their environmental impact but also for their social and economic impact, such as job creation.

And green buildings are helping to 'make cities safe, resilient and sustainable,' with energy



efficiency and renewable usage leaving them less reliant on central energy grids, and the creation of neighbourhoods and communities with access to public transport and green spaces. And there are many more – both direct and indirect – such as education through green building training and efforts to break down sexism and promote gender equality in green building workplaces.

SUPPORT FOR GBCS

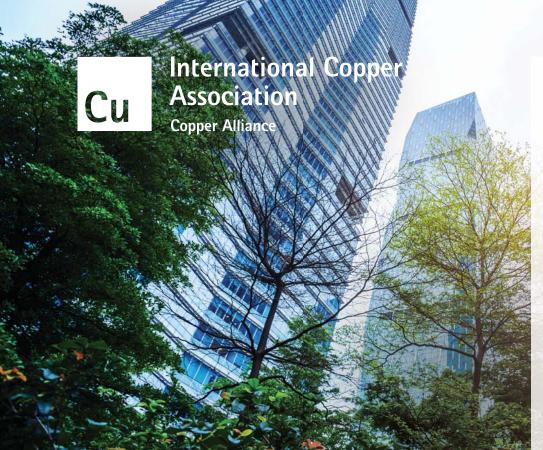
Finally, we will continue to support the development of new and existing Green Building Councils in the global South to become stronger and more impactful, in order to support their countries in achieving their INDCS and SDGs. Earlier this year we were delighted to recognise Morocco Green Building Council as an official member of WorldGBC. This Council was formed when a dynamic group of green building pioneers from Morocco approached France Green Building Council for advice and guidance on joining our movement. With this help, Morocco GBC is now already developing green building training programmes and certifying green building projects with HQE, the French certification scheme, in cities such as Rabat and Casablanca, as well as more rural areas. Given that sustainability within buildings represents such a major challenge

"To enable better direct support for organisations like Morocco GBC, WorldGBC is expanding its regional model to provide better localised support." in the Middle East and North Africa, a region that is currently home to over 350 million people and will see urban populations double by 2050, their work is extremely valuable. To enable better direct support for organisations like Morocco GBC, WorldGBC is expanding its regional model, which already exists in Europe, to provide better localised support that will be critical to post-COP22 action on the ground in the global South.

Morocco GBC's story demonstrates how our global family of Green Building Councils can come together to share knowledge and experiences for mutual benefit – and further shows the strong links established between organisations from COP21 in France to COP22 in Morocco. And our global movement of Green Building Councils and businesses will be out in full force in Marrakech for the second Buildings Day, where we will once again highlight to the world why it's better to build green.

Terri Wills is the CEO of the World Green
Building Council. Previously, Terri was with the
C40 Cities Climate Leadership Group where she
spearheaded C40's networks that have had a
direct impact on policy in over half of C40 cities.
Terri also served as the London City Director for
the Clinton Climate Initiative and has worked with
the Government of Ontario on clean technology
and creative industry development; and for the
British Broadcasting Corporation as a Head of
Strategy. Terri is Canadian, based in London, UK.

The World Green Building Council (WorldGBC) is a global member network of Green Building Councils enabling green building and sustainable communities through leadership and market transformation. WorldGBC aims to make all building and communities sustainable, enabling us to thrive on our planet today and in the future.







































COPPER: CRITICAL TO SUSTAINABLE DEVELOPMENT

In September 2015, world leaders adopted the 2030 Agenda for Sustainable Development, which includes a set of 17 Sustainable Development Goals (SDGs). These SDGs provide a framework for addressing mankind's most critical issues over the next 15 years.

Many of the global trends driving the sustainable-development agenda rely on copper and its unique properties: climate-change mitigation and adaptation, energy efficiency and energy security, water quality, renewable energy, energy access, public health, and others.

At its highest level, sustainable development is at the core of the work of the International Copper Association (ICA). Our mission is to "bring together the global copper industry to develop and defend markets for copper and to make a positive contribution to society's sustainable-development goals."

No other metal or material connects so broadly and critically with global sustainable-development objectives. Copper is infinitely recyclable; it can be recycled over and over again without loss of any of its inherent properties. Copper is critical to the circular economy and contributes to stronger life-cycle analyses of end-use products containing it. Other materials are consumed or downcycled at end of life.

To learn more about how the International Copper Association, its members and the copper industry support the UN's SDGs, visit sustainablecopper.org

AIR QUALITY AND URBANISATION -

DRIVERS OF CLIMATE CHANGE



Dr Fatih Birol, Executive Director, International Energy Agency (IEA), makes an urgent case for stepping up energy efficiency and fuel pollution measures in emerging megacities.

ities are at the heart of the energy landscape, currently accounting for two-thirds of primary energy demand and 70 per cent of energy-related carbon dioxide emissions. By 2050, the urban population will grow from half to two-thirds of the global population. Under current trends this would result in urban energy demand rising by 70 per cent, with the vast majority of this growth coming from cities in emerging economies and developing countries.

In the megacities that are rapidly expanding across the developing world, decision-makers are struggling to reconcile the imperatives of urbanisation and energy access, economic growth and social development. Yet at the same time, there is an urgent need to improve urban air quality and reduce greenhouse gas emissions, the twin challenges of

"There is an urgent need to improve urban air quality and reduce greenhouse gas emissions, the twin challenges of urbanisation."

urbanisation. With energy production and usage the most important sources of air

pollutant emissions – contributing 85 per cent of particulate matter and almost all of the sulphur oxides and nitrogen oxides – rising demand for energy services may seem at odds with these objectives.

This is not an abstract problem. In those smog-choked cities, close to 18,000 people die every day from the effects of air pollution – 6.5 million premature deaths per year, or more than one in nine deaths worldwide. While these devastating impacts of air pollution are felt in both the wealthiest and poorest nations on earth, it is in the world's emerging economies, where the urbanisation process is still far from complete, that we find the greatest opportunities for finding a healthier path.

Policy-makers in these countries face a clear choice: they can lock in highly polluting infrastructure that damages the climate and

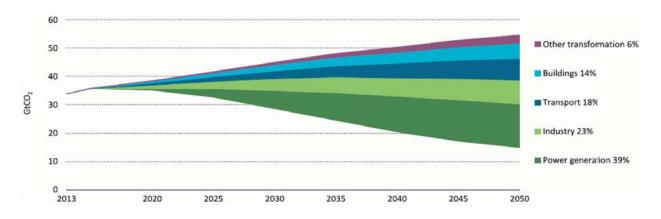


Figure 1. CO, reductions in the 2DS by sector

human health, or chart a different course – one that delivers low-carbon growth, cleaner air and a sharp improvement in health, averting millions of preventable deaths each year while at the same time taking significant steps towards meeting targets under the Paris Agreement.

PRACTICAL STEPS FORWARD

In recognition of the importance of the interlinked issues of urbanisation, air pollution and climate change, the IEA has dedicated two major research efforts to this area over the past year. Energy Technology Perspectives 2016 (ETP2016) focused on technology and policy opportunities to accelerate the transition to sustainable urban energy systems, while the World Energy Outlook Special Report: Energy and Air Pollution analysed the global outlook for energy and air pollution and proposed a pragmatic scenario to deliver both climate and air pollution improvements.

"Cities can take a leading role in adopting, monitoring and enforcing building energy codes for new construction."

The analysis in ETP2016 lays out an ideal potential future in its 2°C Scenario (2DS). In this scenario, the rising demand for energy driven by urbanisation is still met, but smart and sustainable policy and technology choices mean that economic growth

and booming populations do not lead to skyrocketing energy demand and emissions growth (Figure 1).

This outcome can only come about through a set of actions that collectively avoid the lock-in of high-emissions urbanisation. Policy at the national level must encourage the deployment of clean energy technologies, and include greenhouse gas emission reduction targets, carbon pricing mechanisms, and investment in energy research, development and demonstration.

But these targets must then be complemented by action at the local level. To meet their renewable energy targets, cities can provide detailed solar maps giving valuable information on expected energy yields and installation costs for buildings and houses in various neighbourhoods, for example. On transport and fossil fuel emissions, cities can also invest in the long-

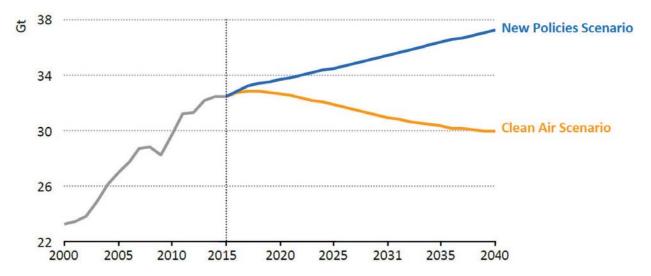


Figure 2. Global energy-related CO_2 emissions by scenario

Note: details of each scenario are given in World Energy Outlook Special Report: Energy and Air Pollution.

term development of walking and cycling infrastructure. For energy efficiency, cities can take a leading role in adopting, monitoring and enforcing building energy codes for new construction.

Urban density offers a significant opportunity for emissions reductions as less energy is needed to fulfil the same needs for things like heating and cooling. Equally, urban infrastructure design can curb transportrelated carbon emissions by reducing trips and trip distances, shifting activity to public transport, and promoting adoption of more efficient, low-carbon vehicles. Local and national policy decisions are key to shaping this future, through regulations on landuse planning, building codes and vehicle standards, pricing policies, and support for uptake of non-motorised and electric mobility. If this full transformation of urban energy systems could be realised, it would mean that CO₂ emissions from urban energy use could be reduced by 75 per cent in 2050 compared with the track we are on today.

This long-term shift ultimately moves the energy system away from fossil fuel combustion, while also making significant progress on combating air pollution. This is because the root causes of air pollution can be found in the energy sector. Coal is responsible for sulphur dioxide emissions - a cause of respiratory illnesses and a precursor of acid rain - while transport fuels, such as diesel, generate nitrogen oxides and particulate matter that can contribute to serious health issues such as asthma, lung cancer and heart disease. Cities can easily become pollution hotspots. The impact of vehicle emissions is heightened by the fact that they are discharged at street level, where pedestrians walk and breathe. This is a problem that will not go away tomorrow, despite strong efforts.

This makes the urgent case for taking action today. In the near term, the World Energy Outlook Special Report: Energy and Air Pollution proposes a set of policies to avoid pollutant emissions while at the same time taking steps towards fulfilling Paris Agreement obligations. These policies include, among others, stronger efficiency policies for appliances and buildings, higher vehicle emission standards, reduced sulphur content in fuels, and a phase-out of fossil fuel consumption subsidies. This 'Clean Air Scenario' requires a small increase of 7 per cent in investment. But the benefits are massive: saving over 3 million lives in 2040 while providing energy access for all and

"Confronting the twin challenge of CO₂ emissions and air pollution means dispensing with short-term thinking and stopgap solutions."

contributing to a peak in global ${\rm CO_2}$ emissions by 2020 (Figure 2).

ENERGY ACCESS

In 2013, an estimated 1.2 billion people - 17 per cent of the global population - lacked any access to electricity, and an estimated 2.7 billion relied on burning wood, charcoal, and agricultural waste to meet their cooking and heating needs, typically using inefficient stoves in poorly ventilated spaces. Solving both these problems together, expanding energy access and improving air quality can be mutually supportive. Overall, the extra impetus to the energy transition from the Clean Air Scenario means that global energy demand would be 13 per cent lower in 2040 than otherwise expected and, of the energy that is combusted, three-quarters would be subject to advanced pollution controls. These measures would have a dramatic impact on key pollutants, reversing the current trend towards worsening air pollution in many countries, particularly fastgrowing Asia and Africa.

On top of these benefits, the Clean Air Scenario provides a pragmatic first step toward achieving the climate goal agreed in

"the global fight against climate change and air pollution will be won or lost in the megacities of the world's emerging economies."

the Paris Agreement. For developing countries embarking for the first time on CO_2 emission reduction goals, the associated benefits for air quality could be a powerful driver of action.

Confronting the twin challenge of CO₂ emissions and air pollution means dispensing with short-term thinking and stop-gap solutions. IEA analysis shows that proven energy policies and technologies can chart a new sustainable path for urbanisation that delivers major cuts in air pollution around the world and bring health benefits, broader access to energy and improve sustainability. In the spirit of the Paris Agreement, this is a time for bold, ambitious and strategic decision-making.

It is no exaggeration to say that the global fight against climate change and air pollution will be won or lost in the megacities of the world's emerging economies. Cities are naturally positioned to make these kinds of changes. In my role as Executive Director of the IEA I have been fortunate to travel to many of the world's great cities, and I have seen first-hand their great potential. The density of human, economic and intellectual capital in these cities can and should be a driving force for the acceleration of clean energy development and deployment for the decades to come.

Dr Fatih Birol is Executive Director of the IEA. Prior to assuming his current duties, he held the positions of Chief Economist and Director of Global Energy Economics, with responsibilities that included directing the flagship World Energy Outlook publication (www.worldenergyoutlook.org). Prior to joining the IEA in 1995, Dr Birol worked for a number of years as an oil market analyst at the Organisation of the Petroleum Exporting Countries (OPEC) in Vienna. He has been named by Forbes magazine among the most powerful people in terms of influence on the world's energy scene. He is the Chairman of the World Economic Forum's (Davos) Energy Advisory Board and serves as a member of the UN Secretary-General's Advisory Board on Sustainable Energy for All.

The International Energy Agency (IEA, www.iea.org) is an autonomous 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.



STIMULATING GLOBAL COLLABORATION

The Aid & International Development Forum (AIDF) is an independent platform uniting humanitarian and development thought leaders, governments, NGOs, UN agencies, donors, investors, research institutes and the private sector to establish partnerships, gain expertise and exchange best practice around infrastructure resilience, disaster response, food and water security.



AID & DEVELOPMENT AFRICA SUMMIT

February 2017 | Kenya

africa.aidforum.org



CLIMATE-SMART AGRICULTURE SUMMIT
May 2017 | South Africa
food-security-africa.aidforum.org



AID & DEVELOPMENT ASIA SUMMIT

June 2017 | Myanmar

asia.aidforum.org



GLOBAL DISASTER RELIEF SUMMIT
September 2017 | USA
disaster-relief.aidforum.org

If you have a compelling story or research to share, one that will inspire and inform other development leaders, one that goes to the heart of how the world is or should be changing, then we have an exclusive audience eager to hear from you.











WATER INFRASTRUCTURE CHALLENGES AND OPPORTUNITIES



Benedito Braga, President of the World Water Council (WWC), describes how climate change is affecting the natural water cycle and points out the necessity for water infrastructure adaptation and finance.

ith everybody talking about climate change in the hottest year on record, it is easy to get the impression that the sky is falling. And it is easy to forget that it is only rain that falls on our heads. This rain gives humanity the water we depend on: to drink, but also to grow food and produce energy, to stay clean and healthy, and much more. As climate change scientists predict, the gift of gentle rain will not be something we can depend on. The sky will not fall, but the rain might come down harder – or not at all.

Understanding the problem of climate change requires an understanding of how water is distributed on the planet, and how it impacts all aspects of our lives. Only 2 per cent of the world's water is fresh, not salty. Of that, less than 0.05 per cent is in the atmosphere at any given time as vapour, clouds, rain or

snow. Yet this tiny portion is critical, as it drives the water cycle and brings fresh water to the world. The overall effect of climate change is an intensification of the water cycle, causing more extreme floods and droughts, and hampering many people's resilience – mostly in the less developed countries. This global shift is affecting the distribution of water across the planet, threatening to fundamentally disrupt our water security.

The impacts of this disruption cannot be predicted with confidence by current models, because it is not just about how precipitation will change – it is also about how we will react. Therefore, a recent research programme conducted by the World Water Council in collaboration with the Government of Mexico set out to collect case studies from different parts of the world on the roles that infrastructure and

governance play in adapting and increasing resilience to climate change. This project, which resulted in the book *Increasing Resilience to Climate Variability and Change*, has shown that countries can enhance their water security in a sustainable manner through strong investment in water infrastructure. The studies also demonstrate that decision-making has changed over time, and will have to keep on changing, as authorities address knowledge and data gaps, unresolved water management concerns and many other open issues.

Residents of Australia's Murray–Darling
Basin are among those whose livelihoods have
been gravely threatened by ongoing droughts.
Happily, policy reforms have enabled adaptation
measures to better manage climatic variability.
By developing strategies such as water capping
extraction, conjunctive management of surface



and ground water, water markets and improved water storage facilities for distribution and irrigation, the basin authority has increased resilience to climate change, building adaptive capacities and means for greater water security. These measures have significantly reduced the socio-economic impacts of climatic variability in the past two decades, and have decoupled growth and benefits from water consumption. Among other places that have never experienced severe drought, the Metropolitan Region of São Paulo, Brazil, had reductions to the inflows to its water supply reservoirs to 25 per cent of average in 2014. This has required implementation of infrastructure and demand management initiatives sooner than was envisaged in the water resources plan of the Tiete river basin.

These cases show how complex decision-making has become. As climate conditions change, knowledge and understanding of the social, economic and environmental impacts, as well as the political ones, have been seen to improve, but still need to progress globally to be more comprehensive.

REDISTRIBUTION AND SAVING

In discussing the complexity of climate change, it is necessary to keep in mind that even this thorny issue is, in some ways, a tree hiding a larger forest from view. There is a need to view

concerns about climate change alongside water security. Crucially, the most common solution to meeting increased demand is also a way of insuring ourselves against climate change impacts: the engineered redistribution of water over space and time. This includes reservoirs to store water, pipelines to transfer it and desalination to recover fresh water from the oceans. At the same time, efforts must also be made to increase water saving, reuse and recycling through major investments by governments and the water industry.

Following the adoption of the post-2015 agenda and the Paris Agreement, it is important to recognise just how much water permeates both. In the arena of climate negotiations, COP21 created some spaces for water, with dedicated events organised by the French and Peruvian Presidencies and partners from civil society. The

"There is a need to view concerns about climate change alongside water security."

World Water Council joined forces with multiple organisations worldwide in the #ClimatelsWater initiative, rallying the climate community around efforts to ensure that climate discussions continue to consider water issues. We need to continue creating this dialogue.

It was with this same purpose that the World Water Council, in conjunction with the COP22 Presidency, the Moroccan Government, co-organised the International Conference on Water Security for Climate Justice that took place in Rabat in July 2016. The outcome of this was the 'Water for Africa' call, which appeals to the international community to pay as much attention to measures to adapt to climate change as to mitigate it. The plea called specifically for developing ways to finance water security across Africa in the face of climate change. I am very confident that these initiatives will catalyse action to bring water and adaptation to the forefront of the climate negotiations at COP22 in Marrakech.

DEVELOPING PLANNING AWARENESS

For too long, water has been a neglected and marginalised sector in discussions of public policies for growth and sustainable development. In comparison with sectors like energy and transport, water has not received its share of political support. This lack of attention becomes



most visible, and dangerous, in the form of insufficient water infrastructure. We see this in countries at all stages of development, where not enough is being done to maintain and replace existing systems and structures, nor to prepare the infrastructure for growing future requirements. Water infrastructure – especially large and multipurpose infrastructure – is costly, and its funding needs to receive the attention of the international financing systems.

This inattention will change in the years ahead. Whatever the concerns may be, water security is also a genuine economic opportunity, and so is investment in sustainable and resilient water infrastructure. While long-term finance has been more difficult to find since 2008, at the same time, now is the best moment to raise funding for infrastructure at historically low borrowing costs.

In taking on a new generation of infrastructure, I recognise that we have a lot to learn. Infrastructure planning needs to evolve to fit new requirements and constraints, pressed by climate change, scarcity, conflict over resources and other factors. This implies a more inclusive and eclectic approach to the planning of such projects.

FUNDING CONCERNS

Funding infrastructure will also require the same inclusiveness. An important reason why water infrastructure is so underfunded is that it rarely satisfies the criteria of financial viability required by commercial funding sources. While more could be done to make effective use of existing traditional sources of infrastructure finance, there is both a need and an opportunity to engage

with newer sources, such as climate funding, green bonds, pension funds, insurance funds and sovereign wealth funds.

In the face of present and future challenges, water, finance and growth are inevitably connected. Research led by the World Bank shows that water scarcity could cost some regions up to 6 per cent of their GDP. New infrastructure will minimise water scarcity and will reduce the economic impacts of floods, droughts, inadequate water access and poor sanitation. These are the substantial costs that are forcing governments to pay greater attention to water, and hopefully to look at water not simply as a problem but as a solution and a navigable route to sustainable development.

POLITICAL COMMITMENT

The Sustainable Development Goals call for universal and equitable access to water, sanitation and hygiene by 2030. Achieving SDG Targets 6.1 and 6.2 alone will require about three times the current level of investment, a total capital cost of US\$114 billion per year. Implementing a more comprehensive agenda, one that would also ensure water for food and energy production for sustainable development and economic growth, would cost at least US\$840 billion a year over the next 20 years. However, that level of investment would deliver more than US\$3 trillion annually in economic, environmental and social benefits. The technical solutions already exist for these massive water resources development projects; it is only the right economic incentives and innovative financing models that are needed to make them a reality.

Nothing comes easy when the clouds run dry. Yet I hope we can recognise the scale of the challenge as an equally large opportunity. It is an opportunity to solve the world's most pressing threat, and to address sources of suffering and inequity that have persisted for far too long. Achieving water security, sustainability and resilience means a shared commitment to adapting water management in the face of a changing world and changing social needs. Many complex processes are involved, but one fact is universal: long-term, consistent commitment at the highest political level is needed in order to succeed.

Professor Benedito Braga is the President of the World Water Council, responsible for the organisation of the World Water Forums since 2012 and Secretary of State for Sanitation and Water Resources of the State of São Paulo, Brazil. He was the President of the Intergovernmental Council of International Hydrologic Programme of UNESCO (2004/05) and member of the Board of Directors of the Brazilian National Water Agency (2000/09).

The World Water Council (WWC.

www.worldwatercouncil.org) is an international organisation that aims to promote awareness, build political commitment and trigger action on critical water issues by bringing people together, through active hydro-politics, and serving as linkage between stakeholders and decision-makers. Headquartered in Marseille, France, the Council celebrates its 20th anniversary in 2016.

WILD LIFE CRIME



INVESTMENT, CORRUPTION, STATUS, PSEUDO MEDICINAL USE OR CULTURAL BELIEFS.

> NONE OF THESE SHOULD RESULT IN THREATS TO SPECIES, GREAT OR SMALL.



TRANSFORMING AGRICULTURE TO ADDRESS CLIMATE CHANGE



José Graziano da Silva, Director-General, Food and Agriculture Organization of the United Nations, asserts that the path to sustainable food and agriculture depends on turning climate commitments into action now.

limate change is already having an impact on agriculture, and the implications for food security are alarming. They highlight the urgent need to support smallholders in adapting to the challenges the whole world faces. Farmers, pastoralists, fisherfolk and community foresters all depend on activities that are intimately and inextricably linked to climate. Their livelihoods are thus the most vulnerable to climate change. They will require far greater access to technologies, markets, information and credit for investment to adjust their production systems and practices to climate change.

Action must be taken now to make agriculture more sustainable, productive and resilient.

Otherwise, the impacts of climate change will seriously compromise food production in countries and regions that are already highly food-insecure – and jeopardise progress towards the key

"Hunger, poverty and climate change need to be tackled together."

Sustainable Development Goals of ending hunger and poverty by 2030. We cannot let that happen, especially as the negative impacts on agriculture will be even more widespread after 2030.

FOOD SECURITY IS UNDER THREAT

Through its effects on agriculture, livelihoods and infrastructure, climate change threatens all dimensions of food security. It will expose both urban and rural poor to higher and

more volatile food prices. It will also affect food availability by reducing the productivity of crops, livestock and fisheries, and hinder access to food by disrupting the livelihoods of millions of rural people who depend on agriculture for their incomes.

Hunger, poverty and climate change need to be tackled together. This is, not least, a moral imperative as those who are now suffering most have contributed least to the changing climate.

ADAPTATION STRATEGIES

FAO's new State of Food and Agriculture 2016 report describes ways of adapting smallholder production to climate change and making the livelihoods of rural populations more resilient. Diversification and better integration of food production systems into complex ecological processes create synergies with the natural



habitat instead of depleting natural resources. Agroecology and sustainable intensification are examples of approaches that improve yields and build resilience through practices such as green manuring, nitrogen-fixing cover crops and sustainable soil management, and integration with agroforestry and animal production.

More resilient agriculture sectors and intelligent investments in smallholder farmers can deliver transformative change, enhancing the prospects and incomes of the world's poorest while buffering them against the impacts of climate change.

We know things that can be done now. And we know that the benefits of adaptation outweigh the costs of inaction by very wide margins. The transformational path to this sustainable and more equitable agriculture requires assuring better access to adequate extension advice and markets. Barriers such as insecurity of tenure, high transaction costs, and lower resource endowments – all of which are especially acute among rural women – must be overcome.

Livelihood diversification can also help rural households manage climate risks by allowing for on-farm activities to be cushioned by seasonal work, in agriculture and in other sectors. In all cases, social protection programmes will need to play an important role – they help smallholders manage risk better, reduce vulnerability to food price volatility, and enhance the employment prospects of rural people who leave the land.

In order to keep the increase in global temperature below the crucial ceiling of 2°C, overall global emissions will have to be reduced by as much as 70 per cent by 2050.

IMPLEMENTATION OF THE PARIS AGREEMENT

The agriculture sectors, which themselves account for at least one-fifth of total emissions, mainly from the conversion of forests to farmland as well as from livestock and crop production, must contribute to this global imperative – while at the same time rising to the challenge of meeting the expected 60 per cent increase in need for food.

This can be done. There are known ways for the agriculture sectors to contribute substantially to balancing the global carbon cycle. Similarly, avoiding deforestation, increasing the area under forest, and adopting sustained-yield management in timber production can bind large amounts of atmospheric CO₂.

Soils are pivotal in regulating emissions of CO₂ and other greenhouse gases. Appropriate land use and soil management techniques lead

"Barriers such as insecurity of tenure, high transaction costs, and lower resource endowments – all of which are especially acute among rural women – must be overcome,"

to improved soil quality and fertility, enhancing sustainable crop yields and mitigating the rise of atmospheric CO₂.

It is essential that national commitments – the country pledges that form the basis of the 2015 Paris Agreement on climate change – are translated into action. The November Conference of the Parties in Morocco will have a clear focus on implementation in the agriculture sectors.

FAO'S FOCUS ON CLIMATE CHANGE

FAO has identified strategies, financing opportunities and data and information needs, and articulated transformative policies and institutions that can overcome barriers to implementation. As countries revise and hopefully ramp up their national plans, successfully implementing those commitments will be vital to creating a virtuous cycle of even higher ambition. Owing to their complex and varied conditions around the world, the agriculture sectors require particular and immediate attention. Soil must be prepared and seeds sown before we can harvest and glean.

To assist its members, FAO has invested in areas that promote food security hand in hand with climate change adaptation and mitigation. FAO is helping to reorient food and agricultural systems in countries most exposed to climate risks, and has a clear focus on supporting smallholder farmers.

FAO applies all of its areas of expertise to the pursuit of new models of sustainable, inclusive agriculture. Through the Global Soil Partnership, FAO promotes investment to minimise soil degradation and restore productivity, thus stabilising global stores

of soil organic matter. We participate in the Global Agenda for Sustainable Livestock, and have launched a programme to reduce enteric emissions of methane from ruminants using measures suited to local farming systems. In the fisheries sector, the Blue Growth Initiative is integrating fisheries and sustainable environmental management, while a joint programme with the European Union aims at protecting carbon-rich forests. Guidance is provided on how to include genetic diversity in national climate change adaptation planning, and we have joined forces with the United Nations Development Programme to support countries as they integrate agriculture in adaptation plans and budgeting processes. FAO also helps link developing countries to sources of climate financing.

Whether humanity succeeds in eradicating hunger and poverty by 2030, as promised, depends on all members of the international community enabling agriculture, forestry and fisheries to adopt climate-friendly practices – starting today. 'Business as usual' is not an option.

Agriculture has always been the interface between natural resources and human activity, and now it holds the key to humanity's two greatest challenges: eradicating poverty, and maintaining the stable climatic corridor in which civilisation can thrive.

José Graziano da Silva has worked on issues of food security, rural development and agriculture for over 30 years. Since his appointment as FAO Director-General in 2012, he has spearheaded major transformational changes within the Organization. These reforms have entailed refocusing FAO's work, reinforcing its institutional capacities, strengthening partnerships with civil society, the private sector and academia and boosting FAO's support for South-South cooperation. His efforts have resulted in best value for money for the Organization and its partners.

The United Nations Food and Agriculture Organization (FAO, www.fao.org) is a specialised agency of the United Nations with a unique mandate covering all aspects of food and agriculture. Its mission is the attainment of global food security. FAO's vision, shared with its members and development stakeholders, is that of a world free from hunger and malnutrition, where food security and agriculture contribute to improving living standards, especially for the rural poor, in an economically, socially and environmentally sustainable way.

THE ROLE OF FORESTRY AND AGRICULTURE IN MITIGATING CLIMATE CHANGE



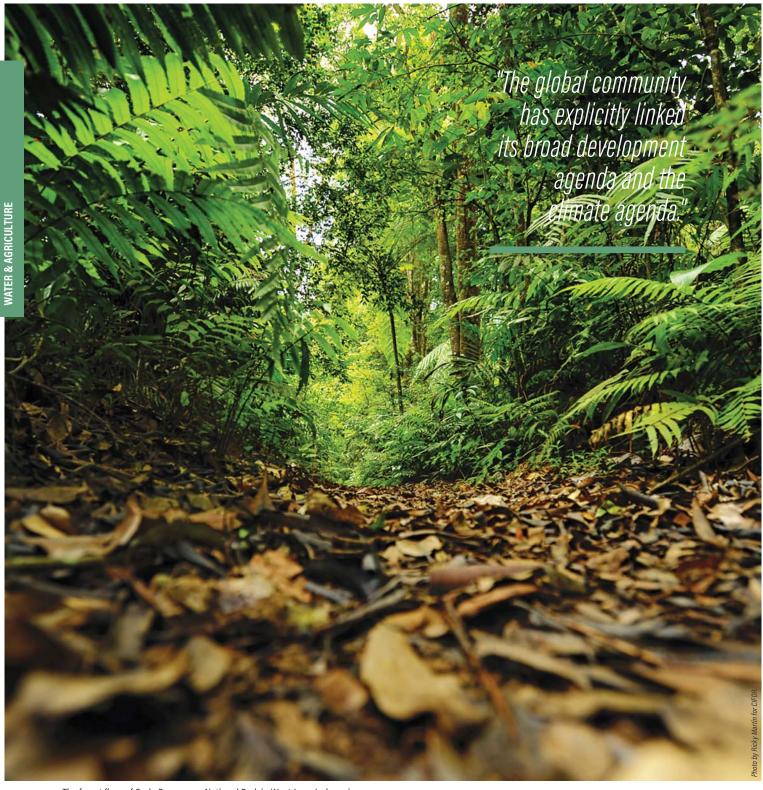
Peter Holmgren, Director General of the Center for International Forestry Research (CIFOR), explores the fundamental role of forestry, agriculture and landscapes in mitigating climate change.

he Paris Agreement and The Sustainable Development Goals (SDGs) set out a raft of new and challenging global targets for people, the environment, business and development. SDG 13 directly embeds the climate change challenge in the framework. In other words, the global community has explicitly linked its broad development agenda and the climate agenda, clarifying that climate benefits must be part of our investments in the future of humanity.

For forestry, some linkages are explicit, such as SDG 15 concerning the sustainable management of forests, which relates to Reducing Emissions from Deforestation and Forest Degradation (REDD+); and SDG 12, covering corporate responsibility, sustainable consumption and production. At CIFOR, we have concluded in our new strategy that forestry links to all 17 SDGs. This way, we emphasise the essential contributions that forests and trees make to all aspects of sustainable development, including the climate change challenge.

THE PATH TO IMPLEMENTATION

Countries set out their plans for post-Paris Agreement action in their Intended Nationally Determined Contributions (INDCs). Analysis of the 158 INDCs submitted to the UNFCCC prior to COP21 shows that there is a significant gap between the contributions proposed and the emission reductions needed (http://climateactiontracker.org). Even if countries fully implement their INDCs, the world may experience warming of 2.7-3.0°C, therefore countries need to notably elevate the



The forest floor of Gede Pangrango National Park in West Java, Indonesia.

ambitions set out in their INDCs if we are to avoid disastrous climate change.

Forestry, agriculture and landscapes may offer significant additional mitigation or removal opportunities beyond the options elaborated in the negotiations and INDCs.

More importantly, it is clear that improving resilience and reducing vulnerability – the third pillar of the Paris Agreement – by and large means safeguarding the natural production systems on which we depend for food, ecosystem services and economic

development. This clearly reflects the sustainable development aspiration of the Paris Agreement and illustrates the important context of the climate change challenge.

Approximately 20-24 per cent of global greenhouse gas emissions are attributed to forestry, agriculture and landscapes.
Clearly, better management of the world's landscapes has a key role to play in reducing greenhouse gas emissions. Yet, most INDCs do not comprehensively include agriculture and forestry in their mitigation targets. A recent

study of INDCs in seven countries in Asia, to which CIFOR contributed, found that only two countries include both agriculture and forestry mitigation targets and measures in their INDCs.

Looking beyond the mitigation of emissions, the world's landscapes have great potential to act as carbon sinks by increasing stocks held in vegetation and soils. INDCs are generally not exploring these potentials at the moment, and more research into the biological and socioeconomic potential is needed.

Even where forestry and agriculture are included in INDCs and national plans, it is unclear how contributions from these sectors will be achieved. Insufficient international support in the form of finance, technology transfer and capacity building hinder many countries' abilities to implement the adaptation and mitigation measures outlined in their INDCs in agriculture, forestry and other land-use sectors.

FORESTRY RESEARCH FINDINGS

Forestry and landscapes offer a number of recognised mitigation measures, and research by organisations like CIFOR helps to refine and target these measures to best effect. Four examples highlight the diversity of forestry research that informs the land sector's contribution in implementing the Paris Agreement.

In doing so, we must consider the future horizons in forestry and landscape management, and incorporate a long-term transition toward sustainable systems. History tells us that active, long-term forest management can increase both productivity and carbon stocks while improving resilience and reducing the risk of wildfires. It is important therefore not to be short-sighted when it comes to forestry, landscapes and climate change.

ECOSYSTEM RESTORATION

Ecosystem restoration is increasingly seen as part of national mitigation efforts and represents the only land sector activity with considerable potential as a carbon sink. Large-scale restoration offers both opportunities and challenges for poverty reduction and equitable outcomes.

Ecosystem restoration efforts are under way through a number of large-scale initiatives. The Bonn Challenge is a global commitment to restore 150 million ha of the world's deforested and degraded land by 2020, and 350 million by 2030. Supporting this, Initiative 20x20 in Latin America and AFR100 in Africa aim to restore 20 million and 100 million ha of land in the respective regions by 2020 and 2030. And ecosystem restoration is not just about forests: in Indonesia, for example, the Peatland Restoration Agency aims to restore two million ha of degraded peatland over five years, directly addressing the large carbon emissions from peatland degradation.

Ecosystem restoration offers immediate mitigation and adaptation benefits from the land sector. Achieving restoration at scale, however, requires countries to address the drivers behind current land degradation, as well as enabling or hindering policies, in an integrated way. Forestry research underpins ecosystem restoration efforts, and informs the most effective and equitable approaches.

"Ecosystem restoration offers immediate mitigation and adaptation benefits from the land sector."

THE PRIVATE SECTOR

The private sector's role in implementing the Paris Agreement is a fast developing area with rapidly increasing expectations. Many non-state actors - companies, financial institutions and non-governmental organisations - have made bold commitments to reduce deforestation and improve management of forests and agricultural commodity production. The New York Declaration on Forests, which endorsed and extended the Bonn Challenge 2020 target, set out a commitment to cut deforestation in half by 2020 and eliminate it entirely by 2030. The declaration was signed at the United Nations Climate Summit in New York by 30 national governments, 50 private companies and many non-governmental organisations – but it did not specify a plan for how to achieve the targets.

Actions taken by the private sector – for example the elimination of commodity-driven deforestation from agricultural supply chains – will contribute to the achievement of national-level mitigation and adaptation measures and NDCs. Questions remain, however, as to how such actions will be monitored, verified and reported. Private sector commitments do not currently form part of the information requirements related to NDCs or the UNFCCC reporting or transparency frameworks. Research to identify and track the private sector's potential and actual contributions will help determine how it can best be incorporated into national plans and contribute to Paris Agreement implementation.

BIOENERGY

Bioenergy is widely discussed as a major opportunity by which the land sector can contribute to climate change mitigation in many countries. Indeed, bioenergy constitutes nearly 10 per cent of the world's energy supply, and there is potential both to increase supply and improve conversion rates. Bioenergy is typically a side-product in land-use systems and should be addressed as an integrated component of these systems. However, current analyses of bioenergy as a climate action often treat bioenergy as a stand-alone action, which has led to a polarised debate.

When seen as a large-scale production system dedicated to mitigating climate change – for example, using crops to generate power to achieve so-called Bioenergy with Carbon Capture and Storage (BECCS) – researchers caution that life-cycle emissions need to be comprehensively assessed. Under current accounting rules, the carbon neutrality of bioenergy and how it is incorporated into carbon accounting methodologies are sometimes questioned.

There is considerable risk in isolating policies for climate impact from bioenergy from wider land use benefits and value chains. Bioenergy is often a valuable and necessary co-benefit in production systems for food or forest products, especially for smallholders. Benefits from bioenergy could be increased through technology development towards better conversion rates, which could also enhance the climate change mitigation potential.

At the same time, it is clear that large-scale bioenergy production has become a highly politicised topic in parts of the global North, with doubts on environmental integrity and the effectiveness of subsidies. Bioenergy is also often portrayed as potentially reducing countries' abilities to produce food. Clearly, more nuanced and solution-oriented research on bioenergy systems is desirable.

REDD+

REDD+ is an international policy framework to provide financial incentives to reduce emissions from deforestation and forest degradation and to conserve and enhance forest carbon sinks.

Completed in 2015, the framework is a key element of the Paris Agreement (Article 5), together with other approaches that include joint mitigation and adaptation. Many countries are studying ways to implement REDD+, and clear signals are needed, for example from the Green Climate Fund, on the level of REDD+ financing available and how it will be operationalised (CIFOR Infobrief 138).

Research on the governance challenges of REDD+ has shown that the collaboration and alignment of central and subnational government levels still has large gaps, including communication and sharing of resources. Lessons can be drawn from the REDD+ experience for implementing NDCs at subnational levels.

THE WAY AHEAD

The NDC process will provide a framework to move countries' climate agendas forward and periodically increase their ambition through the five-yearly revision process. Over time, implementing the Paris Agreement means that countries need to move away from isolated



Women in Jambi, Indonesia, ready to harvest in an area where villagers have the legal right to manage state forest.

solutions in individual sectors and towards more integrated approaches involving landscape-level interventions and life-cycle emission accounting.

The evolving agricultural sector is key to this cross-sectoral thinking. Where expanding agriculture is a key driver of deforestation, integrated landscape interventions are needed to negotiate the trade-offs between the sectors. The expansion of intensive, industrial agriculture and contraction of traditional agricultural practices as populations migrate and become increasingly urbanised will have profound impacts on the landscapes

of the future and their carbon outcomes. Research supports this by identifying the different carbon trajectories of different forestagriculture scenarios.

This multi-sectoral, multi-level harmonisation must be underpinned by research that clarifies the trade-offs and synergies between actions. CIFOR's research on REDD+ already highlights the frequent gaps between central and subnational government levels, which are also likely to occur with the implementation of NDCs. Research on INDCs in Asia reveals that none of the INDCs reviewed explicitly mention the role



A man marks a tree in Central Kalimantan, Indonesia, as part of a REDD project in the area.

of private sector deforestation and sustainability commitments or the role of financial services in reducing emissions. Forestry research such as this offers essential insights and lessons for the implementation of the Paris Agreement.

A FINAL THOUGHT

It is abundantly clear that forests and landscapes offer an important part of the solutions for the climate and development agendas. But these solutions are almost always local, small-scale and highly diverse. The climate change debate is often held at a global, intergovernmental level, far from implementation on the ground. A very real challenge is to create a movement among hundreds of millions of small-scale entrepreneurs to include climate actions in their landscape businesses. Mega-scale policy instruments may not always be the most effective method for achieving the changes we need.

Dr Peter Holmgren was appointed in 2012 as the Director General of the Center for International Forestry Research (CIFOR), where he leads a team of more than 200 scientists and staff operating together with partner institutions in over 40 countries. Under his leadership, CIFOR updated its strategy in 2016, emphasising the role of forestry in achieving each of the 17 Sustainable Development Goals. Dr Holmgren has a PhD in Forestry and 26 years of experience in international forestry and agriculture. Prior to CIFOR, Dr. Holmgren worked at the Food and Agriculture Organization (FAO), where he led FAO's work on climate change and its contributions to the UNFCCC process. While at FAO he also coordinated the Global Forest Resources Assessment, played a leading role in establishing the UN-REDD programme, and led the development of the Climate Smart Agriculture concept. An early champion of the landscape approach, he launched the Global Landscapes Forum, which is today the world's largest conference on integrated land use.

The Center for International Forestry Research (CIFOR, www.cifor.org) is a non-profit, scientific facility that conducts research on the most pressing challenges of forest and landscape management around the world. Using a global, multidisciplinary approach, we aim to improve human well-being, protect the environment, and increase equity. To do so, we help policy-makers, practitioners and communities make decisions based on solid science about how they use and manage their forests and landscapes.

FACES OF CHANGE







It's easy to get bogged down in the debate and forget the human face of climate change. Climate change is not just an abstract debate over statistics – it's about people and the impacts they're facing but it's also about people taking action. Yet, the stories are often untold. UN Environment has teamed up with renowned photo-journalists to put a face on some of the good initiatives underway. For the first time, this series of images will reveal these extraordinary 'Faces of Change' to the rest of the world.





Date: From 07 to 18 November 2016

Location: COP 22 - Green Zone Civil Society area



INTERVIEW WITH ERIK SOLHEIM, EXECUTIVE DIRECTOR OF UN ENVIRONMENT

Following an extensive career focusing on environment and development in government and international organisations, Erik Solheim was elected to become head of UN Environment Programme (UNEP) on May 13, 2016. He took the reins of the world's leading global environmental authority in June, and Climate Action is delighted to feature an exclusive interview with the inspirational 'Green Politician'.

Q: Leading UN Environment into the future at this critical juncture in history carries with it great expectations. What is your vision for the organization?

A: At UN Environment, we have a unique position and opportunity to bring together governments, businesses, scientists, civil society and the public. We can inspire, influence behaviour and policy, and help shape the way forward with good science and knowledgeable experts. But while we have great science, we need to translate that science into a language that everybody can relate to. For example, pollution is one of the main causes of death in the modern world – and by helping improve air quality we can also have a big impact on climate change. In other words, we have to better connect with people so that they can act, and encourage their governments to act.

Q: What is it about UN Environment that inspired you to want to become its leader?

A: Every single one of the UN's Global Goals is linked to the environment – from ending hunger to achieving gender equality and building peace. We have an enormous responsibility and a huge potential for impact. We are an organisation that is not only calling out the problems, but also putting forward solutions to air pollution or the overwhelming amount of plastic in the oceans. We will drive green finance and build upon the love we all feel for beautiful Mother Earth. We aim to be a can-do organization!

Q: Do you have any reservations about taking on the role? What do you feel will be your greatest challenge as Executive Director?

A: The chief concern is that we're on a tight schedule. Contrary to belief the world is rapidly progressing in nearly all regards. But we need to speed up. UN Environment is a small organisation when you think that we are working for the entire planet. So everything we want to achieve will require partnerships - with governments, business or citizens. We need to push forward on a whole host of initiatives – like using the Montreal Protocol on the Ozone layer to help tackle climate change by phasing out climate gases from

refrigerators and air conditioning systems. The Kigali agreement was a great victory in that regard.

Q: What do you believe is Achim Steiner's greatest legacy from his 10-year tenure?

A: Achim's legacy is really a body of work that has made UN Environment more focused and trusted by donors and governments. UN Environment was upgraded to universal membership during his tenure, and our work has been placed at the heart of the Global Goals. He has helped us pioneer work on the green economy and sustainable finance. Working with the Nigerian government on the oil clean-up of Ogoniland is an example of how to affect the lives of many people. The soon to be in force Minamata Convention on mercury is another. We can see the results of his work in the Paris Agreement and the Kigali Protocol, and from the financial markets to the mountains of Afghanistan.

Q: You previously held the position of Norway's Minister of the Environment and International Development. How can the rest of the world learn from Norway's commitment to climate change and the environment?

A: My country Norway has advanced some great green initiatives and ambitions. The global initiative to reduce emissions caused by the destruction of rainforests is probably the most well-known. Here Norway partnered with Brazil and many other Lawton American nations, with Indonesia and beyond. Norway also has the highest per capita number of electric vehicles, thanks to tax holidays and preferential treatment in traffic. My hometown of Oslo is now aiming to halve greenhouse gas emissions in the next four years. But still Norway can do a lot more. And for sure - there are inspiring examples and a lot to learn from all continents.

Q: You have stated that two urgent areas we need to address are creating jobs and markets with clean and green technologies, and transforming the sustainable finance landscape. Why is this, and how can UN Environment help in these critical areas?



A: One of the main reasons for resistance to change is fear of how it will impact existing economic models. There's a perception that doing the right thing is too expensive, or that preserving our planet is not compatible with development. This is wrong – and we all instinctively know that it's wrong – so we have to create the conditions in which change can happen by fixing the parameters. We need to demonstrate the low-carbon economy makes sound economic sense, and that sustainability is good business.

UN Environment has been working for decades with financial institutions, banks and investors. Most recently, our Inquiry project has worked with finance ministries and central banks to promote green finance, and take environmental considerations into risk assessments and investment decisions. Taking care of the planet is not an obstacle to development, it's a business opportunity. It creates interesting, good green jobs.

Q: You have a strong focus on business. Do you plan to strengthen UN Environments collaboration with the private sector? And will you consider only working with companies who have endorsed the UN Global Compact Principals?

A: The United Nations should work with all companies and all governments, and this doesn't mean that we agree with all governments or companies. I want to speak positively of companies that are doing well because other companies can learn from them. Let us name and fame. If they do less well, then we should be prepared to name and shame. Working with the private sector is simply common sense and recognizing that the private sector is where many of the technologies and solutions of tomorrow will come from, and that we need to be present in that space. We need to be there to help with our expertise, but also to listen and learn. You will see us partnering a lot more with business.

Q: COP22 in Morocco will mark a turning point for climate change as the landmark Paris Climate Change Agreement will enter into force. What are your expectations for the Conference and its immediate aftermath?

A: Our Moroccan hosts are framing this as an action meeting that will build on negotiations in Paris. I share that optimism. In a broader sense, we have to build on the momentum from Paris and accelerate the change. Things are moving in the right direction, but not nearly as quickly as they need to. More specifically, we have to work on addressing two big holes in the process: the emissions gap and the finance gap. We need to cut emissions more than we have agreed up to now, and we need to turn the big investments green.

Erik Solheim was elected as Executive Director of UNEP on May 13, 2016. Prior to joining UNEP, he was the chair of the Development Assistance Committee (DAC) of the Organization for Economic Co-operation and Development (OECD). From 2007 to 2012, Erik Solheim held the combined portfolio of Norway's Minister of the Environment and International Development, and from 2005 to 2007 served as Minister of International Development. He has served as UNEP's Special Envoy for Environment, Conflict and Disaster since 2013 and a Patron of Nature for the International Union for the Conservation of Nature (IUCN) since 2012.

The United Nations Environment Programme (UNEP), or UN Environment, is the voice for the environment in the United Nations system. It is an advocate, educator, catalyst and facilitator, promoting the wise use of the planet's natural assets for sustainable development. UNEP's mission is "to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations".

Responsibly managing the planet's resources is a main ingredient of our sustainability goals.

As a global business that operates locally, our sustainability is intricately linked to the communities we serve. So we think about tomorrow with the actions we take today.

We're working to improve our business and reduce our environmental impact by 2020:



Reduce CO2 emissions of 'the drink in your hand' by 25% through our entire value chain



Improve water efficiency in our plants by 25%



Replenish 100% of the water we use back to communities and nature



Sustainably source key agricultural ingredients used to make our beverages



Reach a 75% recovery rate in developed markets of the equivalent amount of bottles and cans we introduce into the marketplace



Help ensure healthy, resilient freshwater systems through conservation efforts with World Wildlife Fund



EVELVA OVELVA We give one back.

Working with our bottling partners and organizations across government, civil society and the private sector, Coca-Cola exceeded our goal of giving back to communities and nature the equivalent of all the water we use in our beverages and their production. We achieved this milestone by supporting projects in safe water access, watershed restoration and water for productive use, in addition to treating wastewater from our operations. Third-party assessors confirm we achieved this milestone early, but this is not the end of our journey. In the coming years, we plan to grow our conservation efforts and dedication to communities.

To learn more and see the partners who made this possible, visit coca-colacompany.com/water.



