



Key Elements for Success on Climate Change Mitigation at COP21 in Paris

A report by the Leadership Council of the Sustainable Development Solutions Network (SDSN)

March 9, 2015

Working Paper

About the SDSN Leadership Council

Members of the Leadership Council serve in their personal capacities, so the opinions expressed in this Working Paper may not reflect the opinions of their host institutions. The Working Paper has been endorsed by the members of the Leadership Council, though some may not be in full agreement with every detail. Some members of the Leadership Council do not endorse or cannot be otherwise associated with this report. Their names are highlighted with an asterisk below.

Chairs

Laurence Tubiana,* Special Representative of the French Minister of Foreign Affairs for the 2015 Paris Climate Conference (COP-21) and French Ambassador for Climate Negotiations, France

Xue Lan, Cheung Kong Chair Professor and Dean, School of Public Policy and Management, Tsinghua University, China

Members:

Zakri Abdul Hamid, Science Advisor to the Prime Minister, Malaysia; **Irene Agyepong**, Professor, Department of Health Policy, Planning, and Management at the University of Ghana's School of Public Health, Ghana; **Zubaid Ahmad**, Vice Chairman, Citi's Institutional Clients Group and Global Head, Practice with Sovereign Wealth Funds, Citi, USA; **HE Reem Ebrahim Al Hashimy**, Minister of State, United Arab Emirates; **Sultan Al Jaber**,* Minister of State and Chairman, Masdar, United Arab Emirates; **HSH Prince Albert II of Monaco**, Head of State, Monaco; **Shaukat Aziz**, Former Prime Minister, Pakistan; **Peter Bakker**, President, World Business Council for Sustainable Development, Switzerland; **Belay Begashaw**, Director, Columbia Global Centers | Africa, Kenya; **Frances Beinecke**, Former President, NRDC, USA; **Joseph Bell**, Partner, Hogan Lovells, USA; **Mohamed Benaïssa**, Mayor Of Asilah and Secretary-General, Assilah Forum Foundation, Morocco; **David Berry**, Partner, Flagship Ventures, USA; **Micheline Calmy-Rey**, Visiting Professor, University Of Geneva, Switzerland; **Joshua Castellino**, Professor of Law and Dean, School of Law at Middlesex University, UK; **Madhav Chavan**, Co-founder and CEO, Pratham, India; **Süreyya Cilliv**, CEO, Turkcell, Turkey; **Paul Collier**, Professor, University of Oxford, UK; **Mark Cutifani**, Chief Executive, Anglo American, UK; **Robert Dijkgraaf**, Director, Institute of Advanced Study, USA; **Bineta Diop**, Founder and President, Femmes Africa Solidarité, Senegal; **Achim Dobermann**, Director, Rothamsted Research, UK; **Hendrik du Toit**, Chief Executive Officer, Investec Asset Management, South Africa; **Jan Egeland**, Secretary General, Norwegian Refugee Council (NRC), Norway; **Leonel Fernández Reyna**, President, Global Foundation for Democracy and Development (FUNGLODE) and Former President, Dominican Republic; **Christiana Figueres**,* Executive Secretary, UNFCCC, Germany; **José María Figueres**, President, Carbon War Room, USA; **Maria Freire**, President, Foundation for the National Institutes of Health, USA; **Cheikh Tidiane Gadio**, President, Institut Panafricain De Stratégies and Former Foreign Minister, Senegal; **Helene Gayle**, President and CEO, CARE USA, USA; **Tarja Halonen**, Former President, Finland and Fellow, Angelopoulos Global Public Leaders, Harvard Kennedy School, USA; **James Hansen**, Director of Climate Science, Awareness and Solutions program, Earth Institute and Former Director, NASA Goddard Institute for Space Studies, USA; **Thomas Heller**, Executive Director, Climate Policy Initiative, USA; **José Miguel Insulza**, Secretary General, Organization Of American States, USA and Former Minister of Interior, Chile; **Naoko Ishii**, CEO and Chairperson, Global Environment Facility (GEF), USA; **Vuk Jeremić**, President, Center for International Relations and Sustainable Development (CIRSD), Serbia; **Pavel Kabat**, Director General and CEO, International Institute for Applied Systems Analysis (IIASA), Austria; **Geoffrey Kent**, Founder, Chairman and CEO, Abercrombie & Kent Group of Companies, Kenya; **Niclas Kjellström-Matseke**, CEO, Novamedia Swedish Postcode Lottery, Sweden; **Israel Klabin**, Founder and Chairman, Brazilian Foundation for Sustainable Development, Brazil; **Barbara Kux**, Member of Board of Directors of Total and Henkel, Germany; **Markos Kyprianou**, Deputy President, Cyprus Democratic Party, Cyprus; **Felipe Larraín**, Director, Centro Latinoamericano de Políticas Económicas y Sociales (CLAPES-UC) and Professor, Pontificia Universidad Católica de Chile, Chile; **Lord Richard Layard**, Director, Programme on Wellbeing, London School of Economics and Professor Emeritus, London School of Economics, UK; **Frannie Léautier**, Partner and Chief Executive Officer, Mkoba Private Equity, Tanzania; **Yuan T. Lee**, President Emeritus, Academia Sinica, Taiwan

and Immediate Past President, ICSU, France; **Klaus Leisinger**, Founder and President, Global Values Alliance Foundation, Switzerland; **Gordon Liu**, Director, China Center for Health Economics Research (CCHER), Peking University, China; **Jane Lubchenco**, Distinguished Professor, Oregon State University, USA; **Arun Majumdar**, Professor, Stanford University and Former Vice President for Energy, Google Inc, USA; **Julia Marton-Lefèvre**, Former Director General, International Union for Conservation of Nature (IUCN), Switzerland; **Vladimir Mau**, Rector, Russian Presidential Academy of National Economy and Public Administration, Russia; **Marcia McNutt**, Editor-In-Chief, Science, USA; **Amina Mohammed (ex officio)**, Special Adviser to UN Secretary-General Ban Ki-moon on Post-2015 Development Planning, USA; **Miguel Ángel Moratinos Cuyaubé**, Senior Member, Global Dry Land Alliance, Qatar; **Romain Murenzi**, Executive Director, The Academy of Sciences for the Developing World (TWAS), Italy; **Shahid Naeem**, Director, Center for Environmental Sustainability, The Earth Institute, Columbia University, USA; **Claude Nahon**, Senior Vice President, Sustainable Development, EDF Group, France; **Sunita Narain**, Director General, Centre for Science and Environment (CSE), India; **Rebecca Nelson**, Professor, Cornell University, USA; **Charity Ngilu**, Cabinet Secretary for Land, Housing and Urban Development, Kenya; **Amadou Niang**, Director, MDG Centre of West and Central Africa, Senegal; **Cherie Nursalim**, Executive Director, GITI Group, Singapore; **Leslie O'Donoghue**, Executive Vice President of Corporate Development & Strategy, Chief Risk Officer, Agrium, Canada; **Ikenna Onyido**, Professor and Director, Centre for Sustainable Development, Nnamdi Azikiwe University, Nigeria; **Rajendra Pachauri**, Director-General, TERI, India; **HE Mari Pangestu**, Former Minister of Tourism and Creative Economy, Republic of Indonesia; **George Papandreou**, Former Prime Minister, Greece; **Antonio Pedro**, Director, United Nations Economic Commission for Africa, Sub-regional Office for Eastern Africa, Rwanda; **Paul Polman**, CEO, Unilever, The Netherlands; **Sabina Ratti**, Executive Director, Fondazione Eni Enrico Mattei (FEEM), Italy; **Srinath Reddy**, President, Public Health Foundation of India, India; **Aromar Revi**, Director, Indian Institute for Human Settlements, India; **Teresa Ribera**, Director, Institute for Sustainable Development and International Relations (IDDRI), France; **Angelo Riccaboni**, Rector, University of Siena, Italy; **Johan Rockström**, Executive Director, Stockholm Resilience Centre, Sweden; **Cynthia Rosenzweig**, Senior Research Scientist, NASA Goddard Institute for Space Studies, USA; **Jeffrey Sachs**, Director, the Earth Institute, Columbia University, USA; **Paolo Scaroni**, Deputy Chairman, Rothschild, Italy; **Josette Sheeran**, President and CEO, Asia Society, USA; **Feike Sijbesma**, CEO and Chairman of the Board, DSM, The Netherlands; **Vania Somavilla**, Executive Director of Human Resources, Health and Safety, Sustainability and Energy, Vale, Brazil; **Monsignor Marcelo Sánchez Sorondo**, Chancellor, Pontifical Academy of Sciences and Pontifical Academy of Social Sciences, Vatican City; **Andrew Steer**, President and CEO, World Resources Institute, USA; **Pavan Sukhdev**, Founder-CEO, GIST Advisory, India; **Carl-Henric Svanberg**, Chairman, BP, UK and Chairman, Volvo AB, Sweden; **John Thwaites**, Chairman, Monash Sustainability Institute, Australia; **Lena Treschow Torell**, President, Royal Swedish Academy of Engineering Sciences, Sweden; **Ted Turner**, Chairman, Turner Foundation and Chairman, United Nations Foundation, USA; **Hans Vestberg**, President and CEO, Ericsson Group, Sweden; **Virgilio Viana**, Director General, Amazonas Sustainable Foundation, Brazil; **Martin Visbeck**, Chair of Physical Oceanography, GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany; **Nur Hassan Wirajuda**, Former Foreign Minister, Indonesia and Member, Council Of Presidential Advisors, Indonesia; **Hirokazu Yoshikawa**, Courtney Sale Ross Professor of Globalization and Education, New York University, USA; **Soogil Young**, Professor, KDI School of Public Policy and Management and Former Chairman, Presidential Committee of Green Growth, Korea; **Zhou Dadi**, Director General (Emeritus), The Energy Research Institute (ERI) of the National Development and Reform Commission, China; **Hania Zlotnik**, Former Director, UN DESA's Population Division, USA.

In December 2015, the Government of France will host the 21st Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC) in Paris. The stakes could not be higher. Twenty-three years after the signing of the Framework Convention, greenhouse gas (GHG) emissions are still rising fast, dangerously disrupting the climate system, and posing a grave threat to sustainable development in all countries.

Avoiding highly dangerous climate change will require sustained efforts and profound changes in the world's energy systems, land-use patterns, and socio-economic development trajectories. The global agreement reached at COP21 in Paris must be a decisive turning point for the world's efforts to fight climate change. COP21 will be the last chance to adopt a global agreement that makes it possible to secure a safe climate.

This working paper highlights eight key criteria for ensuring that an agreement at the COP21 in Paris avoids highly dangerous climate change. We focus here on mitigation and climate finance required in order to respect the 2°C upper limit. We do underscore, however, that a Paris agreement will need to cover a broader agenda, including adaptation to climate change, technology transfer, accountability, transparency, differentiation, and the appropriate legal form of an agreement.

Criterion 1: A clear commitment to the 2°C upper limit on global warming.

Scientists have long warned about the extreme risks of global warming by 2°C or more above the pre-industrial mean temperature. Governments adopted this upper temperature limit, including keeping the possibility of adjusting this to 1.5°C due to severe risks, back in 2009. The limit has been reaffirmed every year since then. Despite this, the world remains dangerously off track, on a path to a 4-6°C increase in mean surface temperature by the end of the 21st century. Note that 2°C is not a target but an upper limit, or a global “guardrail” to prevent disastrous climate change.

Criterion 2: A clear commitment by all governments to achieve net-zero GHG emissions no later than 2070 as required to stay below the 2°C upper limit.

In order to remain below the 2°C limit, the world must limit GHG emissions to within a scientific GHG “budget.” Given the best evidence currently available, the IPCC estimates that cumulative emissions of GHGs this century must remain below 1,000 billion tons of CO₂ equivalent. Current annual emissions are around 54 billion tons. Therefore, emissions must decline dramatically by mid-century to roughly one-third of current levels and to near zero by 2070 to stay within the 2°C carbon budget.¹ Note that a substantial fraction of proven reserves of coal, oil, and gas will have to remain underground and unburned in order to stay within 2°C. These unused reserves are now known as “stranded assets.”

¹ The executive summary of the [UNEP 2014 Emissions Gap report](#) describes the global carbon budget associated with the 2°C limit.

Criterion 3: Each national government should agree to prepare and submit an illustrative and aspirational National Deep Decarbonization Pathway (NDDP) to demonstrate how it intends to shift to a low-carbon energy system by 2050 and achieve near-zero net GHG emissions no later than 2070.

Negotiations under the UNFCCC have focused on emission reduction commitments over a relatively short horizon, typically 10-15 years. Yet short-term commitments need to be anchored within a long-term pathway towards deep decarbonization. Without a long-term pathway, short-term emission reductions may be undertaken through measures that are not consistent with long-term deep decarbonization. For example, natural gas can play a useful role in reducing emissions over the medium term, in particular by replacing coal-fired power plants. Yet, it cannot be compatible with long-term deep decarbonization required to respect the 2°C upper limit, unless CCS is deployed on gas-fired power plants.

Governments should therefore commit to prepare long-term NDDPs as part of the agreement adopted at COP21 and to nest shorter-term emission reduction strategies within such pathways. These NDDPs would then be submitted to the UNFCCC before the entry into force of the agreement in 2017 or 2018. Developing countries should receive the technical assistance and financial support they need to prepare these NDDPs whenever is appropriate.

These long-term NDDPs would not need to have the same legal status as short-term emissions reduction commitments. They would be illustrative, aspirational, and therefore not binding. But NDDPs would become the basis for a ratchet-up mechanism to be established to progressively raise the level of ambition of the global agreement: NDDPs would become the reference to assess the adequacy of future short-term emissions reduction targets, and identify the need for additional international cooperation and support.

Importantly, every NDDP should take into account different national circumstances, resource endowments, and preferences. Above all, they must be consistent with countries' long-term socio-economic development objectives.² As a result, no two NDDPs will be the same.

Prospects for the large-scale deployment of net-negative emissions technologies, such as bioenergy with carbon capture and sequestration, are very uncertain. Available technologies could conflict with other sustainable development objectives, such as food security, or the protection of biodiversity. As underscored in Criterion 8 below, we are optimistic about the potential for improved technologies to reduce greenhouse gas emissions, but the deployment of net-negative emissions technologies will most likely be limited, even under optimistic assumptions.

In the absence of realistic prospects for the large-scale deployment of net-negative emission technologies and given the need for global net GHG emissions to converge towards net zero, it becomes a matter of simple arithmetic that all NDDPs will need to converge towards net-zero

² The [Deep Decarbonization Pathways Project](#) launched by the SDSN and IDDRI demonstrates that NDDPs can be consistent with countries' socio-economic development objectives. Similarly, the [New Climate Economy Report](#) shows that low-carbon development strategies are affordable and generate substantial co-benefits.

emissions over the long-term. If no country can reach a level of emissions far below zero then no other country can stay far above zero GHG emissions over the long term.

Yet, the overall convergence towards net-zero emissions needs to take into account countries' common but differentiated responsibilities as well as their different capacities to reduce emissions. Developed countries must take the lead and must converge faster towards net-zero emissions. And developing countries should also, depending on their needs, receive support to transition towards net-zero emissions.

Criterion 4: All countries should commit to strong actions by 2025-30 through Nationally-Determined Mitigation Contributions (NDMCs), and demonstrate that the NDMCs are consistent with and indeed part of their long-term NDDPs.

Parties to the UNFCCC have agreed to submit their Intended Nationally-Determined Contributions (INDCs) well in advance of COP21, and no later than September. In Lima at COP20 they agreed that INDCs could include mitigation, adaptation, finance, technology, and capacity building components. Once the agreement is adopted in Paris, these INDCs will become firm Nationally-Determined Contributions, or NDCs. We focus here on the mitigation component of NDCs, which for clarity we call Nationally-Determined Mitigation Contributions, or NDMCs.

Some countries and regions have already announced their intended mitigation pledges for 2025-30. The EU has committed to reduce its domestic emissions by at least 40% by 2030 compared to 1990. The US has pledged to cut emissions by 26 to 28% in 2025 compared to 2005. China has committed to peaking its emissions by 2030 or earlier. Most countries have still not declared their intentions for 2025-30, and so far only the EU has shown how the 2030 commitment fits within a long-term deep decarbonization pathway.

Taken together, the NDMCs included in the agreement adopted at COP21 will most likely be insufficient for the world to stay below the 2°C limit. The Paris agreement should therefore make clear that these NDMCs represent “minimum” (“baseline” or “floor”) commitments. It should encourage Parties to strengthen their NDMCs in the period between their initial submission and the entry into force of the agreement. Furthermore, it should establish a ratchet-up mechanism to increase future commitments based on countries' NDDPs and the emissions reductions needed to stay within 2°C.

Criterion 5: All countries should describe in as much detail as feasible how they intend to implement the NDMCs for 2025-2030 and the NDDPs for 2050.

Detailed planning is vital for governments and the private sector to identify the most efficient investments needed to implement the NDMCs for 2025-30 and NDDPs through to 2050. Mere promises of emissions reductions without presenting in detail how they will be achieved – for example through market mechanisms, carbon taxation, or the regulation of power plant

emissions – will not be credible and cannot be implemented. They will give rise to confusion and cynicism, rather than the clarity needed to guide public and private investments.

Providing full operational details on how each NDMC and NDDP will be implemented is also vital for building the trust needed among Parties: each Party needs to see evidence that others are serious about implementing their commitments. This becomes even more important since there is a growing sense that the NDMC will not be legally binding, as opposed to the rules of the UNFCCC agreement itself.

Criterion 6: Developed countries should make clear how they plan to fulfill the pledge of mobilizing at least \$100 billion per year of climate finance as of the year 2020.

Developing countries – particularly the poorest ones – require increased climate finance to pursue climate change mitigation (e.g. convert to low-carbon energy systems) and adaptation. Developed countries have repeatedly promised that they will provide a minimum of \$100 billion per year of climate finance as of the year 2020. Yet so far developed countries have not spelled out how they intend to honor this commitment or which financial flows ought to be counted towards “climate finance.”

The \$100 billion should include climate-related Official Development Assistance (ODA); multilateral and bilateral official loans, trade finance, and other non-concessional international public finance (collectively known as “Other Official Flows,” or OOF); and Private Flows Mobilized by public guarantees and other official risk-reduction mechanisms (PFM). Purely commercial private capital flows that are independent of donor-country actions should not be counted as part of the \$100 billion.³ Developed countries must also demonstrate that the \$100 billion is additional to the long-standing (but unmet) pledge of 0.7% of gross national income in ODA. Indeed, they should demonstrate a credible trajectory for scaling-up climate and development finance.

The separate accounting of climate finance is needed to track the additionality of financing commitments and to respect the fact that development will require additional investments because of the need for climate change mitigation and adaptation. Yet, development and climate finance are operationally linked and must be integrated. Both support the overall objective of low-carbon, climate resilient sustainable development. Care must therefore be taken to avoid any false separation of climate and development finance.

At least three new sources of financing can make a significant contribution towards the additional \$100 billion in climate finance: (i) contributions by countries based on their carbon emissions levied through domestic carbon taxes and the sale of carbon emissions permits; (ii) domestic revenues collected through new Financial Transaction Taxes; and (iii) levies on fossil fuel emissions resulting from international aviation and maritime transport. Other sources for mobilizing dedicated climate finance should be explored.

³ The distinction between purely commercial flows, such as foreign direct investment (FDI), and PFM is important since public finance should be directed towards leveraging a maximum volume of private resources. We support efforts currently underway by the OECD DAC and other multilateral institutions to propose rigorous technical criteria and standards for estimating PFM.

Criterion 7: The Lima-Paris Action Agenda should include plans of action by sub-national and key non-state actors.

Sub-national and non-state actors can make a critical contribution towards progressively closing the emissions gap. These actors include cities and sub-national regions, businesses and financial investors, and civil society groups. Encouraging and showcasing actions from all levels of society can help craft a positive and pragmatic narrative around climate action and help ratchet up emissions reductions set out in the NDMCs.

Critical sub-national and non-governmental actors should therefore launch initiatives at COP21 in Paris that facilitate the implementation of NDMCs and NDDPs consistent with the 2°C upper limit. Many industry groups, such as cement, steel, electric utilities, automotive, aviation, chemicals, and food, should propose or deepen sector-wide approaches. An important example is the recent multi-stakeholder commitment to halve deforestation by 2020 and to end it by 2030. Groups of major cities, such as the C40, should also propose major decarbonization initiatives.

A mechanism to review the implementation of commitments made by these sub-national and non-state actors will be critical for the credibility of the Lima-Paris Action Agenda. Such a review mechanism should also demonstrate that the actions not only achieve emissions reductions, but also fit within the broader objective of achieving the Sustainable Development Goals (SDGs).

Criterion 8: The Lima-Paris Action Agenda should launch several Global Public-Private Partnerships on Low-Carbon Technologies.

Staying within the 2°C upper limit will *inter alia* require a profound transformation of energy systems.⁴ Three transformations are of particular importance: (i) energy efficiency in all sectors; (ii) zero-carbon and low-carbon electricity, such as through wind, solar, hydro, biomass, geothermal, nuclear, and carbon capture and sequestration technologies; and (iii) fuel switching to electricity (e.g. in vehicles and space heating) and advanced sustainable biofuels.

Several core technologies are required to underpin these transformations. They include but are not limited to: (i) improvements in solar photovoltaics; (ii) improvements in electricity generation and distribution systems to manage high shares of electricity from intermittent renewable sources, such as wind and solar power; (iii) improved storage of intermittent energy; (iv) improved performance of electric vehicles; (v) smart energy grids using advanced information systems; (vi) carbon capture and storage at power plants and industrial sites that continue to use fossil fuels; (vii) sustainable biomass, biofuels and synthetic fuels; (viii) climate-smart land-use technologies for agriculture and forestry; and (ix) other energy efficiency measures, including through information and communication technologies (ICT).

Current technologies and business-as-usual technological advances are not adequate to deliver these transformations at the scale and pace required to stay within the 2°C target. All

⁴ Other key decarbonization priorities include halting deforestation and climate-smart agriculture.

technologies will require significantly faster increases in performance standards, as well as reductions in capital and operating costs. Delivering these improvements will require leadership and improved international collaboration from business, governments, and science to scale up research, development, demonstration and diffusion (RDD&D) of low-carbon technologies. Well-designed Global Public-Private Partnerships (PPPs) should be deployed to scale up RDD&D for each technology.

These Global PPPs should be partnerships involving governments, businesses, and research institutions. They should be designed to identify and promote specific, operational, and quantifiable advances in technology performance. Where possible they should build on existing initiatives. Global PPPs for low-carbon technologies should operate on the time-scale of one decade, with the possibility of extension for a second decade if the PPP is successful. The costs for RDD&D must be shared appropriately between governments and businesses, with private philanthropy playing a potentially very significant role.