

COMMENT

ASTROBIOLOGY A profile of the indomitable woman at the helm of SETI **p.596**



HEALTH Documentary traces the roots and legacy of a pioneering aid agency **p.598**

ENERGY Call for caution following China's gas-hydrate extraction **p.599**

TAXONOMY Rebuttals on bureaucracy, hypotheses, conservation and more **p.600**

REUBEN WU



Decarbonizing the world economy will require renewable energy generation from vast solar farms, such as this one in Nevada.

Three years to safeguard our climate

Christiana Figueres and colleagues set out a six-point plan for turning the tide of the world's carbon dioxide by 2020.

In the past three years, global emissions of carbon dioxide from the burning of fossil fuels have levelled after rising for decades. This is a sign that policies and investments in climate mitigation are starting to pay off. The United States, China and other nations are replacing coal with natural gas and boosting renewable energy sources. There is almost unanimous international agreement that the risks of abandoning the planet to climate change are too great to ignore.

The technology-driven transition to low-carbon energy is well under way, a trend that made the 2015 Paris climate agreement possible. But there is still a long way to go to decarbonize the world economy. The political winds are blustery. President Donald Trump

has announced that the United States will withdraw from the Paris agreement when it is legally able to do so, in November 2020.

The year 2020 is crucially important for another reason, one that has more to do with physics than politics. When it comes to climate, timing is everything. According to an April report¹ (prepared by Carbon Tracker in London, the Climate Action Tracker consortium, the Potsdam Institute for Climate Impact Research in Germany and Yale University in New Haven, Connecticut), should emissions continue to rise beyond 2020, or even remain level, the temperature goals set in Paris become almost unattainable. The UN Sustainable Development Goals that were agreed in 2015 would also be at grave risk.

That's why we launched Mission 2020 — a collaborative campaign to raise ambition and action across key sectors to bend the greenhouse-gas emissions curve downwards by 2020 (www.mission2020.global).

As 20 leaders of the world's largest economies gather on 7–8 July at the G20 summit in Hamburg, Germany, we call on them to highlight the importance of the 2020 climate turning point for greenhouse-gas emissions, and to demonstrate what they and others are doing to meet this challenge. Lowering emissions globally is a monumental task, but research tells us that it is necessary, desirable and achievable.

After roughly 1°C of global warming driven by human activity, ice sheets in Greenland ▶

▶ and Antarctica are already losing mass at an increasing rate. Summer sea ice is disappearing in the Arctic and coral reefs are dying from heat stress — entire ecosystems are starting to collapse. The social impacts of climate change from intensified heatwaves, droughts and sea-level rise are inexorable and affect the poorest and weakest first.

The magnitude of the challenge can be grasped by computing a budget for CO₂ emissions — the maximum amount of the gas that can be released before the temperature limit is breached. After subtracting past emissions, humanity is left with a ‘carbon credit’ of between 150 and 1,050 gigatonnes (Gt; one Gt is 1 × 10⁹ tonnes) of CO₂ to meet the Paris target of 1.5 °C or well below 2 °C (see go.nature.com/2rytztf). The wide range reflects different ways of calculating the budgets using the most recent figures.

At the current emission rate of 41 Gt of CO₂ per year, the lower limit of this range would be crossed in 4 years, and the midpoint of 600 Gt of CO₂ would be passed in 15 years. If the current rate of annual emissions stays at this level, we would have to drop them almost immediately to zero once we exhaust the budget. Such a ‘jump to distress’ is in no one’s interest. A more gradual descent would allow the global economy time to adapt smoothly.

HARNESS MOMENTUM

The good news is that it is still possible to meet the Paris temperature goals if emissions begin to fall by 2020 (see ‘Carbon crunch’).

Greenhouse-gas emissions are already decoupling from production and consumption. For the past three years, worldwide CO₂ emissions from fossil fuels have stayed flat, while the global economy and the gross domestic product (GDP) of major developed and developing nations have grown by at least 3.1% per year (see go.nature.com/2rthjje). This is only the fourth occasion in the past 40 years on which emission levels have stagnated or fallen. The previous three instances — in the early 1980s, 1992 and 2009 — were associated with global economic predicaments, but the current one is not².

Emissions from the United States fell the most: by 3% last year, while its GDP grew by 1.6%. In China, CO₂ emissions fell by 1% in 2016, and its economy expanded by 6.7% (ref. 2). Although it is too early to tell whether this plateau will presage a fall, the signs are encouraging.

In 2016, two-thirds of China’s 5.4% extra demand for electricity was supplied by carbon-free energy resources, mostly hydro-power and wind². In the European Union, wind and solar made up more than three-quarters of new energy capacity installed; coal demand was reduced by 10% (ref. 3). In the United States, almost two-thirds of the electricity-generating capacity installed by

utility companies was based on renewables (see go.nature.com/2skv20g).

The International Energy Agency (IEA) has predicted that, by 2020, renewable sources could deliver 26–27% of the world’s electricity needs, compared with 23.7% of electric power at the end of 2015. But that underestimates the pace of change in energy systems.

Growth in electric vehicles alone could displace 2 million barrels of oil per day by 2025, according to a February report⁴. It suggests that, by 2050, this could reach 25 million barrels of oil per day — a stark contrast to expectations from the fossil-fuel industry that demand for oil will rise. And solar power alone could supply 29% of global electricity generation by 2050. This would remove the need for coal and leave natural gas with only a 1% market share. However, the oil firm ExxonMobil predicts that all renewables will supply just 11% of global power generation by 2040 (ref. 4).

THE FOSSIL-FREE ECONOMY IS ALREADY PROFITABLE.

Investors, meanwhile, are growing wary of carbon risks. BlackRock and Vanguard, the two largest fund managers, voted — along with many others — against ExxonMobil management at its annual general meeting on 31 May and instructed the company to report on the profit impact of global measures to keep climate change below 2 °C. Earlier this month, Norway’s US\$960-billion sovereign-wealth fund declared that it will ask the banks in which it has invested to disclose how their lending contributes to global greenhouse-gas emissions.

Last year, the installed capacity of renewable energy set a new record of 161 gigawatts; in 2015, investment levels reached \$286 billion worldwide, more than 6 times that in 2004. Over half of that investment, \$156 billion, was for projects in developing and emerging economies⁵.

There is a strong headwind against the low-carbon transition in some places, which may impede progress. For example, the Financial CHOICE Act — a bill passed by the US House of Representatives on 8 June — would make it nearly impossible for investors to challenge companies on climate-risk disclosure through shareholder proposal processes, as at ExxonMobil. However, as the UN Secretary General, António Guterres, said in New York last month: “The sustainability train has left the station.” The fossil-free economy is already profitable⁶ and creating

jobs (www.clean200.org). A report this year by the International Renewable Energy Agency and the IEA shows that efforts to stop climate change could boost the global economy by \$19 trillion⁷. The IEA has also said that implementing the Paris agreement will unlock \$13.5 trillion or more before 2050.

Recent geopolitical events, too, have galvanized activity in support of the Paris agreement. For example, the #WeAreStillIn campaign — involving more than 1,000 governors, mayors, businesses, investors and universities from across the United States — has declared that it will ensure the nation remains a leader in reducing carbon emissions.

SIX MILESTONES

To prioritize actions, we’ve identified milestones in six sectors. Developed with knowledge leaders, these were reviewed and refined in collaboration with analysts at Yale University, the Climate Action Tracker consortium, Carbon Tracker, the low-carbon coalition We Mean Business, the Partnership on Sustainable, Low Carbon Transport (SLoCaT), advisory firm SYSTEMIQ, the New Climate Economy project and Conservation International.

These goals may be idealistic at best, unrealistic at worst. However, we are in the age of exponential transformation and think that such a focus will unleash ingenuity. By 2020, here’s where the world needs to be:

Energy. Renewables make up at least 30% of the world’s electricity supply — up from 23.7% in 2015 (ref. 8). No coal-fired power plants are approved beyond 2020, and all existing ones are being retired.

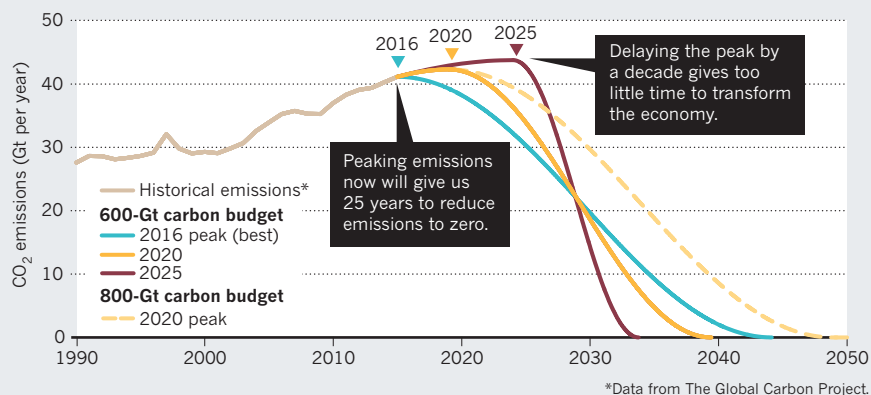
Infrastructure. Cities and states have initiated action plans to fully decarbonize buildings and infrastructures by 2050, with funding of \$300 billion annually. Cities are upgrading at least 3% of their building stock to zero- or near-zero emissions structures each year⁹.

Transport. Electric vehicles make up at least 15% of new car sales globally, a major increase from the almost 1% market share that battery-powered and plug-in hybrid vehicles now claim. Also required are commitments for a doubling of mass-transit utilization in cities, a 20% increase in fuel efficiencies for heavy-duty vehicles and a 20% decrease in greenhouse-gas emissions from aviation per kilometre travelled.

Land. Land-use policies are enacted that reduce forest destruction and shift to reforestation and afforestation efforts. Current net emissions from deforestation and land-use changes form about 12% of the global total. If these can be cut to zero next decade, and afforestation and reforestation can instead be used to create a carbon sink by 2030, it will help to push total net global emissions to zero, while supporting water

CARBON CRUNCH

There is a mean budget of around 600 gigatonnes (Gt) of carbon dioxide left to emit before the planet warms dangerously, by more than 1.5–2°C. Stretching the budget to 800 Gt buys another 10 years, but at a greater risk of exceeding the temperature limit.



supplies and other benefits. Sustainable agricultural practices can reduce emissions and increase CO₂ sequestration in healthy, well-managed soils.

Industry. Heavy industry is developing and publishing plans for increasing efficiencies and cutting emissions, with a goal of halving emissions well before 2050. Carbon-intensive industries — such as iron and steel, cement, chemicals, and oil and gas — currently emit more than one-fifth of the world's CO₂, excluding their electricity and heat demands.

Finance. The financial sector has rethought how it deploys capital and is mobilizing at least \$1 trillion a year for climate action. Most will come from the private sector. Governments, private banks and lenders such as the World Bank need to issue many more 'green bonds' to finance climate-mitigation efforts. This would create an annual market that, by 2020, processes more than 10 times the \$81 billion of bonds issued in 2016.

FURTHER, FASTER, TOGETHER

If we delay, the conditions for human prosperity will be severely curtailed. There are three pressing and practical steps to avoid this.

First, use science to guide decisions and set targets. Policies and actions must be based on robust evidence. Uncensored and transparent communication of peer-reviewed science to global decision-makers is crucial. Academic journal articles are not easily read or digested by non-experts, so we need a new kind of communication in which *Nature* meets *Harvard Business Review*. Science associations should provide more media training to young scientists and hold communication boot camps on how to make climate science relevant to corporate boards and investors.

Those in power must also stand up for science. French President Emmanuel

Macron's Make Our Planet Great Again campaign is a compelling example. He has spoken out to a global audience in support of climate scientists, and invited researchers to move to France to help accelerate action and deliver on the Paris agreement. To encourage others to speak, scientists should forge connections with leaders from policy, business and civil society. The Arctic Basecamp at Davos in January, for instance, brought scientists into high-level discussions on global risk at the World Economic Forum's annual meeting in Switzerland.

Second, existing solutions must be scaled up rapidly. With no time to wait, all countries should adopt plans for achieving 100% renewable electricity production, while ensuring that markets can be designed to enable renewable-energy expansion.

Third, encourage optimism. Recent political events have thrown the future of our world into sharp focus. But as before Paris, we must remember that impossible is not a fact, it's an attitude. It is crucial that success stories are shared. Demonstrating where countries and businesses have over-achieved on their targets will raise the bar for others. More-ambitious targets become easier to set.

The upcoming G20 meeting in Hamburg is the perfect moment for heads of state to integrate the six milestones into their discussions on how to ensure a resilient, prosperous, inclusive and interconnected global economy. This would pave the way for a year of raised ambition in 2018, when nations take stock of progress and revise national commitments under the Paris agreement.

The G20 is due to adopt the recommendations of the Financial Stability Board's Task Force on Climate-related Financial Disclosures, on how the global finance system will manage the risk of climate change. It requires financial institutions to design, disclose and implement a transition strategy with a view to full decarbonization of operations, value

chains and portfolios by 2050. National governments and financial regulators must enact these recommendations swiftly.

Cities and provincial governments must help to drive the ambition of national governments on climate change, particularly through smart infrastructure and transport policy. C40 Cities, a network of megacities committed to addressing climate change, has adopted a strategy called Deadline 2020 that aligns its emissions-reductions plans with the Paris agreement. Other cities now have an opportunity to follow suit, for example through the Global Covenant of Mayors for Climate and Energy.

Our co-signatory list, which includes eminent scientists, business leaders, economists, analysts, influencers and representatives of non-governmental organizations, is an example of the strength of radical collaboration across unusual partners, who all share a mission to seize this opportunity to improve people's lives, the planet and the global economy.

There will always be those who hide their heads in the sand and ignore the global risks of climate change. But there are many more of us committed to overcoming this inertia. Let us stay optimistic and act boldly together. ■

Christiana Figueres is vice-chair of the *Global Covenant of Mayors for Climate and Energy*, and Convener of *Mission 2020*. **Hans Joachim Schellnhuber** is director of the *Potsdam Institute for Climate Impact Research*, Germany. **Gail Whiteman** is director of the *Pentland Centre for Sustainability in Business*, Lancaster University, UK. **Johan Rockström** is executive director of the *Stockholm Resilience Centre*, Stockholm University, Sweden. **Anthony Hobley** is chief executive of *Carbon Tracker*, London, UK. **Stefan Rahmstorf** is head of *Earth system analysis at the Potsdam Institute for Climate Impact Research*, Germany.
 e-mail: cfigueres@mission2020.global

1. Mission 2020. *2020: The Climate Turning Point* (Mission 2020, 2017); available at <http://go.nature.com/2takuw3>
2. International Energy Agency. *World Energy Outlook 2016* (International Energy Agency, 2016).
3. WindEurope. *Wind in Power: 2016 European Statistics* (WindEurope, 2017).
4. Carbon Tracker. *Expect the Unexpected* (Carbon Tracker, 2017).
5. Frankfurt School–UNEP Centre/BNEF. *Global Trends in Renewable Energy Investment 2016* (Frankfurt School, 2016).
6. IRENA. *Renewable Energy and Jobs: Annual Review 2017* (IRENA, 2017).
7. IEA/IRENA. *Perspectives for the Energy Transition* (IEA/IRENA, 2017).
8. REN21. *Renewables 2016: Global Status Report* (REN21, 2016).
9. Climate Action Tracker. *10 Steps* (Climate Action Tracker, 2016); available at <http://go.nature.com/2ryh56j>

A list of co-signatories accompanies this Comment online (see go.nature.com/2sucret).

**Supplementary information to:
Three years to safeguard our climate (Comment in Nature 546, 593–595; 2017)**
doi:10.1038/546593a

Christiana Figueres, Hans Joachim Schellnhuber, Gail Whiteman, Johan Rockström, Anthony Hopley, Stefan Rahmstorf

Full list of co-signatories:

Christiana Figueres Vice-Chair, Global Covenant of Mayors for Climate and Energy; and Convener of Mission 2020; cfigueres@mission2020.global

Hans Joachim Schellnhuber Professor & Director, Potsdam Institute for Climate Impact Research (PIK), P.O. Box 60 12 03, 14412 Potsdam, Germany; john@pik-potsdam.de

Gail Whiteman Professor & Director, Pentland Centre for Sustainability in Business, Lancaster University, Bailrigg, Lancaster, LA1 1YX, UK; g.whiteman@lancaster.ac.uk

Johan Rockstrom Professor & Executive Director, Stockholm Resilience Institute, Stockholm Resilience Centre, Stockholm University, Kräftriket 2B SE-10691, Sweden; johan.rockstrom@su.se

Anthony Hopley CEO, Carbon Tracker, 40 Bermondsey St, London, UK; ahopley@carbontracker.org

Stefan Rahmstorf Professor & Co-Chair of Research Domain Earth System Analysis, Potsdam Institute for Climate Impact Research, P.O. Box 60 12 03, 14412 Potsdam, Germany; stefan@pik-potsdam.de

Achala C. Abeyesinghe Principal Researcher, Climate Change; Team Leader, Global Climate Change Governance, International Institute for Environment and Development (IIED), 80-86 Gray's Inn Road, London WC1X 8NH, UK; achala.abeyesinghe@iied.org

Anders Levermann Professor, Co-Chair of Research Domain Sustainable Solutions, Potsdam Institute for Climate Impact Research, Telegrafenberg A56; D-14412 Potsdam, Germany; levermann@pik-potsdam.de

Andrew Steer President and CEO, World Resources Institute, 10 G Street, NE, Suite 800, Washington, DC 20002, USA; andrew.steer@wri.org

Angel Hsu Director, Yale Data-Driven Environmental Solutions, Yale School of Forestry & Environmental Studies, 195 Prospect Street, New Haven, CT 06511, USA; angel.hsu@yale.edu

Barbara Buchner Executive Director, Climate Finance Program, Climate Policy Initiative, 235 Montgomery Street, 13th Floor, San Francisco, CA 94104, USA; barbara.buchner@CPICClimateFinance.org

Bill Hare CEO & Managing Director, Climate Analytics, 115 E 23rd St, 3rd Floor, Office #319, New York, NY, 10010, USA; bill.hare@climateanalytics.org

Charlotte Pera President & Chief Executive Officer, ClimateWorks Foundation, 235 Montgomery St Suite 1300, San Francisco, CA 94104, USA; Charlotte.Pera@climateworks.org

Christian Rynning-Tønnesen Chief Executive Officer, Statkraft, P.O. Box 200, Lilleaker, N-0216 Oslo, Norway.

Caio Koch-Weser Chairman, European Climate Foundation, Rivierivismarkt 5, 2513 AM Den Haag, the Netherlands; caio.koch-weser@europeanclimate.org

Daniel M. Kammen Professor of Energy, University of California, Chair, Energy and Resources Group, Science Envoy, U. S. State Department, 310 Barrows Hall, Berkeley, CA 94720-3050, USA; kammen@berkeley.edu

Daniela Saltzman Director, Generation Investment Management, 20 Air Street, London, W1B 5AN, UK; daniela.saltzman@generationim.com

David Blood Senior Partner, Generation Investment Management, 20 Air Street, London, W1B 5AN, UK; david.blood@generationim.com

Diane Regas Executive Director, Environmental Defense Fund, 123 Mission St, 28th Floor San Francisco, CA 9410, USA; dregas@edf.org

Edmund G. Brown Jr Governor of California, State Capitol, Sacramento, California 95814, USA; egb@gov.ca.gov

Eduardo Paes Former Mayor of Rio de Janeiro and former Chair of C40, Willard Avenue 4440Ap 1213 Chevy Chase, MD 20815, USA; paes2016@gmail.com

Fabian Dattner Founding Partner – Dattner Grant Pty Ltd / co-founder Homeward Bound Projects, 64 Brougham St, Eltham, Victoria, 3095, Australia; fabian@homewardboundprojects.com.au
The Rev. Fletcher Harper Executive Director, GreenFaith, 101 South Third Avenue, #12 Highland Park, NJ 08904, USA; revfharper@greenfaith.org

Feike Sijbesma Chief Executive Officer & Chairman of the Managing Board, Royal DSM, Het Overloon 1, 6411 TE Heerlen, the Netherlands; Feike.Sijbesma@dsm.com

Felipe Calderón Former President of Mexico, undación Desarrollo Humano Sustentable, Blvd. Adolfo López Mateos 261 Piso 1, Oficina 101, Col. Los Alpes Delegación Álvaro Obregón C.P. 01010 México, D.F; felipe.calderon@fdhs.org.mx

Fiona Reynolds Managing Director, Principles for Responsible Investment, PRI Association, 5th Floor, 25 Camperdown Street, London, E1 8DZ, UK; fiona.reynolds@unpri.org

Gavin E. Patterson Chief Executive Officer, BT Group, BT Centre, 81 Newgate Street, London EC1A 7AJ, UK; Gavin.E.Patterson@bt.com

Gebru Jember Endalew Chair of the LDC Group in the UNFCCC, International Institute for Environment and Development, 80-86 Gray's Inn Road, London, WC1X 8NH, UK; gebbru_j@yahoo.com

Heidi Cullen Chief Scientist, Climate Central, One Palmer Square, Suite 330, Princeton, NJ 08542, USA; hcullen@climatecentral.org

Helen Mountford Programme Director, New Climate Economy, 10 G St NE Washington, DC 20002, USA; hmountford@wri.org

Helena Morrissey Head of Personal Investing, Legal & General Investment Management, One Coleman Street, London, EC2R 5AA, UK; Helena.morrissey@lgim.com

Jeremy Oppenheim Partner, SystemIQ, 1 Fore Street, London, EC2Y 5EJ, UK; Jeremy.oppenheim@systemiq.earth

Jim Leape William and Eva Price Senior Fellow - Stanford Woods Institute for the Environment and Co-Director, Center for Ocean Solutions, 473 Via Ortega, Stanford, CA 94305, USA; jleape@stanford.edu

Joanna Haigh Co-Director, Grantham Institute for Climate Change & Environment, Imperial College London, South Kensington Campus, London SW7 2AZ, UK; j.haigh@imperial.ac.uk

John Chryssavgis Archdeacon of the Ecumenical Patriarchate, Environmental Advisor to Ecumenical Patriarch Bartholomew, PO Box 392, Bath, ME 04530, USA; chryssavgis@gmail.com

John Sterman Director, MIT System Dynamics Group, Director, MIT Sloan Sustainability Initiative, MIT Sloan School of Management, 100 Main Street Cambridge MA 02142, USA; jsterman@mit.edu

Jonathan Bamber President, European Geosciences Union, and Professor, University of Bristol, University Road, Clifton, Bristol BS8 1SS, UK; j.bamber@bristol.ac.uk

Justine D. Shaw Research Fellow, Centre for Biodiversity & Conservation Science, The University of Queensland, St Lucia, 4072, Queensland, Australia; justine.shaw@aad.gov.au

Katherine Richardson Professor & Director of the Sustainability Science Centre, University of Copenhagen, Denmark;

Supplementary information; continued:

kari@science.ku.dk

Keith Tuffley Managing Partner & CEO, B Team, 115 Fifth Ave 6th floor New York NY 10003, USA; kt@bteam.org

Konrad Steffen Professor & Director, Swiss Federal Research Institute WSL, Zürcherstrasse 1118903 Birmensdorf, Switzerland; Konrad.Steffen@wsl.ch

Kornelis Blok Professor of Energy Systems Analysis, Delft University of Technology, Netherlands, PO Box 5015, 2600 GA, Delft, the Netherlands; K.Blok@ecofys.com

Laurence Tubiana CEO, European Climate Foundation (ECF), Institut du développement durable et des relations internationales, 41, rue du Four, 75006 Paris, France; laurence.tubiana@europeanclimate.org

Lord Mark Malloch-Brown Chair of the Business and Sustainable Development Commission, 6th Floor, 105 Piccadilly London W1J 7NJ, UK; mark.malloch-brown@sgo.com

Mark Watts Executive Director, C40 Cities Climate Leadership Group, North West Entrance, City-Gate House, 39-45 Finsbury Square, Level 7, London EC2A 1PX, UK; MWatts@C40.org

Mary Robinson President and Chair of the Board of Trustees, the Mary Robinson Foundation; Former President of Ireland; Former UN High Commissioner Human Rights; Mary Robinson Foundation - Climate Justice, Trinity College, 6 South Leinster Street, Dublin 2, Ireland; mary.robinson@mrfcj.org

Mary-Anne Lea Associate Professor, Marine Predator Ecology, Institute for Marine and Antarctic Studies (IMAS), University of Tasmania, IMAS Waterfront Building, 20 Castray Esplanade, Battery Point, TAS 7004, Australia; maryanne.lea@utas.edu.au

Mattlan Zackhras Minister-in-Assistance to the President of the Republic of the Marshall Islands & Convenor of the High Ambition Coalition.

Michael Mann Distinguished Professor of Atmospheric Science, Penn State; Director, Earth System Science Center, The Pennsylvania State University, Department of Meteorology, University Park, PA 16802, USA; mann@psu.edu

Michael Oppenheimer Albert G. Milbank Professor of Geosciences and International Affairs, Woodrow Wilson School, Princeton University, Princeton, NJ 08544-1013, USA; omichael@princeton.edu

Michiel Schaeffer Director and Senior Scientist, Climate Analytics, Ritterstraße 3, 10969 Berlin, Germany; michiel.schaeffer@climateanalytics.org

Mindy Lubber President, CERES, Headquarters, 99 Chauncy Street, 6th Floor, Boston, MA 02111, USA; lubber@ceres.org

Nigel Topping CEO, We Mean Business; nigel@wemeanbusinesscoalition.org

Niklas Höhne Professor, Wageningen University the Netherlands

and Partner NewClimate Institute, Am Hof 20-26, 50667 Cologne, Germany; n.hoehne@newclimate.org

Paul Polman Chief Executive Officer, Unilever, Unilever House, 100 Victoria Embankment, London EC4Y 0DY, UK; Paul_Polman_CEO@unilever.com

Paul Simpson Chief Executive Officer, Carbon Disclosure Project, CDP headquarters Level 3, 71 Queen Victoria Street, London EC4V 4AY, UK; paul.simpson@cdp.net

Peter Bakker President and Chief Executive Officer, World Business Council for Sustainable Development, Maison de la Paix, Chemin Eugène-Rigot, 2B, Case Postale 2075, CH-1211, Geneva 1, Switzerland; bakker@wbcsd.org

Peter Seligmann Chairman, Chief Executive Officer & Co-Founder, Conservation International, 2011 Crystal Drive, Suite 500, Arlington, VA 22202, USA; pseligmann@conservation.org

Rachel Kyte CEO, Sustainable Energy for All, 750 Pennsylvania Avenue NW, Suite 300, Washington, DC 20006, USA; r.kyte@se4all.org

Rev. Canon Sally G. Bingham President, The Regeneration Project, Interfaith Power & Light, 369 Pine Street, suite 700, San Francisco, CA 94104, USA; sally@thegenerationproject.org

Sharan Burrow International Trade Union Confederation General Secretary, Boulevard Roi Albert II 5, 1210 Bruxelles, Belgium; Sharan.Burrow@ituc-csi.org

Steve Waygood Chief Responsible Investment Officer, Aviva Investors, St Helens, 1 Undershaft, London, EC3P 3DQ, UK; Steve.Waygood@avivainvestors.com

Thomas Stocker Co-Chair IPCC Working Group I, 2008-2015, Professor of Climate and Environmental Physics, University of Bern, Sidlerstrasse 5, 3012, Bern, Switzerland; stocker@climate.unibe.ch

Tom Brookes Executive Director, Strategic Communications, European Climate Foundation, Rue de la Science, 23, 1040 Brussels, Belgium; Tom.Brookes@europeanclimate.org

Tomas Insua Executive Director, Global Catholic Climate Movement, 116 Holden Green, Cambridge, MA 02138, USA; tomas@catholicclimatemovement.global

Wael Hmaidan International Director, Climate Action Network (CAN), Rmayl, Nahr Street, Jaara Building, 4th floor P.O.Box: 14-5472, Beirut, Lebanon; whmaidan@climatenetwork.org

Yacob Mulugetta Professor of Energy and Development Policy, Department of Science, Technology, Engineering & Public Policy (STePP), University College London, Boston House, 36-38 Fitzroy Square, London W1T 6EY, UK; yacob.mulugetta@ucl.ac.uk

Yvonne Deng Managing Consultant, Ecofys - A Navigant Company, Woolgate Exchange, 25 Basinghall Street, London EC2V 5HA, UK; y.deng@ecofys.com