



## **APCEL Climate Change Adaptation Platform**

**COP23 Bonn, Germany: The U.S. Stands Alone**

**by**

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## **COP23 Bonn, Germany: The U.S. Stands Alone**

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The United Nations-led COP23 climate change talks in Bonn, Germany concluded on 20 November 2017. Known officially as the 23rd Conference of the Parties to the United Nations Framework Convention on Climate Change, the two-week annual meeting had a very clear objective: to determine how best to implement the goals of the Paris Climate Agreement (PCA) of COP21 held in December 2015. The PCA established specific actions and targets for the world to reduce greenhouse gases emissions, to mitigate and adapt to climate change, and to finance efforts to alleviate impacts in developing countries. As of November 2017, 195 countries have signed the PCA, and 169 have become a party to it (including Singapore). Under the PCA, signatory countries pledge to limit global mean temperature rise to below 2°C, and make strong efforts to keep the rise to no more than 1.5°C. However, it is clear from the latest climate data that the world must work ambitiously to achieve what the United Nations referred to under the 1992 UN Framework Convention on Climate Change i.e. “Limits to climate change or other changes to the climate system that are deemed necessary to prevent dangerous anthropogenic interference with the climate system.”<sup>2</sup>

Arguably, extreme weather events and record-breaking global temperatures could already be deemed as ‘dangerous’. Singapore may experience ‘climate departure’ as soon as 2028 i.e. the year when the coolest annual temperatures are predicted to exceed the warmest annual temperature recorded in a 1960-2005 baseline period.<sup>3</sup> Business as usual carbon emissions will mean more emphasis on adaptation to counter ‘locked-in’ climate impacts for Singapore, such as sea level rise.

COP23 was the first major meeting since U.S. President Donald Trump announced, in June 2017, his plans to remove the United States from the PCA. Under the rules of the agreement, the U.S.

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<sup>2</sup> United Nations Framework Convention on Climate Change. Convention on climate change. <http://www.unfccc.de/resource/conv/index.html> UNFCCC (1992). Accessed on 20 November 2017.

<sup>3</sup> Mora C., Frazier A. G., Longman R. J., Dacks R. S., Walton M.M., Tong E. J., Sanchez J. J.; Kaiser L. R., Stender Y. O., Anderson J. M., Ambrosino C. M., Fernandez-Silva, I.; Giuseffi L. M.; Giambelluca T. W (2013). The projected timing of climate departure from recent variability (2013). *Nature*, Volume 502, Issue 7470, pp. 183-187.

cannot actually leave the PCA until 2020, and so was represented at COP23 by an administration team that mostly promoted fossil fuels. This strange proposition came after the Chief of the U.S. Environmental Protection Agency (EPA), Mr Scott Pruitt, in March 2017, expressed his doubt as to whether carbon dioxide is a primary contributor to global warming. This comment contradicts that of Mr Pruitt's own agency where the EPA website notes that carbon dioxide is the "primary greenhouse gas contributing to recent climate change."<sup>4</sup> Furthermore, two leading scientific agencies in the U.S. i.e. the National Aeronautics and Space Administration (NASA) and the U.S. National Oceanic and Atmospheric Administration (NOAA) have both stated that rising atmospheric temperatures are driven by carbon dioxide emissions. NASA and NOAA have also confirmed that average global temperatures in 2016 were the warmest on the instrumental record. This comes after the IPCC Fifth Assessment report (AR5) of 2013 which said that "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia."<sup>5</sup> The IPCC also added: "Atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years", and that "Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and our current understanding of the climate system. Carbon dioxide concentrations have increased by over 40% since pre-industrial times, primarily from fossil fuel emissions, and from net land-use change emissions."<sup>2</sup>

On the eve of COP23, the U.S. Climate Science Special Report: Fourth National Climate Assessment<sup>6</sup> made the link between fossil fuel combustion and climate change unambiguously clear by stating: "It is extremely likely that human activities, especially emissions of greenhouse gases, are the dominant cause of observed warming since the mid-20th century. For the warming over the last century, there is no convincing alternative explanation supported by the extent of the observational evidence." In the report, U.S. predictions include a global sea level rise of up to 2.4

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<sup>4</sup> Climate Change Science. Causes of Climate Change. The United States Environmental Protection Agency. See: <https://archive.epa.gov/epa/climate-change-science/causes-climate-change.html>. Accessed 20 November 2017.

<sup>5</sup> IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. R.K. Pachauri and L.A. Meyer (Eds.)). IPCC, Geneva, Switzerland, 151 pp.

<sup>6</sup> USGCRP, 2017: Climate Science Special Report: Fourth National Climate Assessment, Volume I. Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.). U.S. Global Change Research Program, Washington, DC, USA, 470 pp, doi: 10.7930/J0J964J6.

metres by the end of the century, an increased incidence of drought and flooding, more frequent wildfires, and devastating storms. The report concluded that the current period is "now the warmest in the history of modern civilization." In its Fourth Assessment report in 2007, the IPCC specifically warned of the risk of near-term sea level rise to coastlines and low-lying islands (such as Singapore) due to the disintegration of global ice-sheets, notably Greenland and Western Antarctica<sup>7</sup>.

Despite the clear warning in the official U.S. report, the U.S. White House sought to play down the risks by saying that it was not certain how sensitive the Earth's climate was to greenhouse gas emissions and that climate is "always changing." It is now almost 200 years since the French physicist Joseph Fourier who, in 1824, described the Earth's greenhouse effect, writing: "The temperature of the Earth can be augmented by the interposition of the atmosphere, because heat in the state of light finds less resistance in penetrating the air than in re-passing into the air when converted into non-luminous heat."<sup>8</sup> In other words, the presence of the Earth's atmosphere keeps the planet warmer than if it otherwise would be - about 33°C warmer, as it happens. Later, in 1861, the Irish physicist John Tyndall showed that certain gases in the atmosphere, including carbon dioxide and methane, were responsible for the greenhouse effect. Thirty five years later, in 1896, it was the Swedish chemist Svante Arrhenius who stated that "industrial-age coal burning" would enhance the Earth's natural greenhouse effect, and predicted that a few degrees Celsius of atmospheric warming would occur in response to a doubling of carbon dioxide concentration. This has turned out to be a prophetic finding that has since been largely vindicated by modern climate science. The recent U.S. White House protests against 'fake news' is one matter, but to try and fake physics by casting doubt on whether carbon dioxide is a greenhouse gas and promoting coal as a solution to climate change is, to say the least, off-base. The truth, of course, is that coal is twice as carbon intensive as natural gas as a fossil fuel, and about at 25-50 times more carbon-intensive as a power-source than solar and wind energy when accounting for life-cycle carbon emissions. No doubt, there is merit in squeezing as much energy from coal combustion as possible via energy efficiency savings, but in climate terms there is no such thing as 'climate-friendly coal'

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<sup>7</sup> IPCC Fourth Assessment Report: Climate Change 2007. Climate Change 2007: Synthesis Report. See: [https://www.ipcc.ch/publications\\_and\\_data/ar4/syr/en/main.html](https://www.ipcc.ch/publications_and_data/ar4/syr/en/main.html). Accessed on 20 November 2007.

<sup>8</sup> IPCC Fourth Assessment Report: Climate Change 2007. Climate Change 2007: Working Group I: The Physical Science Basis. [https://www.ipcc.ch/publications\\_and\\_data/ar4/wg1/en/ch1s1-4.html](https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch1s1-4.html). Accessed on 20 November 2017.

without carbon capture and sequestration. In response to the U.S. stance on coal, several countries including Canada, the United Kingdom and Mexico responded at COP23 by forming a new global alliance to move away from unabated coal combustion. Nature and physics cannot be fooled. After Nicaragua's signing of the PCA in October 2017, war-torn Syria's sign-up during COP23. Now the U.S. stands alone as the only country in the world to have rejected the agreement.

Another important report that was released just prior to COP23 came from the UN World Meteorological Organization (WMO)<sup>9</sup>. Not only did the WMO confirm that 2016 was the warmest year on the instrumental record, but also that the yearly rise in atmospheric carbon dioxide in 2016, at 3.1 ppm, was 50% higher than the previous 10-year average. Last year was also the first full-year in which concentrations exceeded 400 ppm, at an annual average of 403.3 ppm. The atmospheric carbon dioxide level is now at its highest in at least the last 800,000 years and is rising at about 100 times faster than at the end of the last ice-age 11,600 years ago. The WMO warned that rapidly increasing levels of carbon dioxide, and other greenhouse gases, have the potential to "initiate unpredictable changes in the climate system... leading to severe ecological and economic disruptions." Poignantly, it was also noted that the last time the Earth's atmosphere had 400 ppm of carbon dioxide, three to five million years ago during the mid-Pliocene epoch, equilibrium climate temperature was 2 to 3°C warmer than today, and sea levels were 10-20m higher - largely due to the melting of the Greenland and West Antarctic ice-sheets. Yet another concern highlighted by the WMO is the recent spike in atmospheric methane levels. Methane is a potent greenhouse gas with a global warming potential of 21 times that of carbon dioxide over a 100 year period. Measurement of carbon isotopes in methane shows that its growth is not driven by fossil fuel combustion, but emissions from natural carbon reservoirs including wetlands, peat and tropical farmland in the tropics. If so, this is a sign of an ominous climate tipping point, beyond which a positive feedback cycle kicks-in. This means that further emissions, driven by warmer temperatures, lead to yet more methane being released - prompting what the UN refers to as "abrupt and irreversible climate change."<sup>3</sup> Based on the latest data from the WMO, 2017 is shaping up to be the third warmest year on the instrumental record, meaning that 17 out of the 18 warmest years in the instrumental record will have all occurred in the 21<sup>st</sup> Century.

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<sup>9</sup> World Meteorological Organization Greenhouse Gas Bulletin (October 2017). The state of Greenhouse Gases in the Atmosphere Based on Global Observations through 2016.

Another major report that coincided with COP23 was the annual United Nations Emission Gap Report<sup>10</sup>. In its 2017 review of global carbon emissions, the UN expressed concern over the acceleration of global warming as a result of the increased radiative forcing from the accumulation of atmospheric greenhouse gases. Radiative forcing is up by 40% since 1990 alone. In its report, the UN says the emissions gap between the national pledges under the PCA to cut carbon emissions and the actual reductions needed to keep temperature rise below 2°C of warming is now "alarmingly high". Current pledges cover only one-third of the cuts needed by 2030, and on the current emission trajectory the UN is warning that the world is on track to experience warming of at least 3°C by 2100.

Despite the obvious confusion in the Trump administration over the definition of weather and climate, as well as its limitations on an ability to understand basic atmospheric physics, there are encouraging signs in the climate story - as highlighted at COP23. Carbon emissions from fossil fuels actually stalled for three years from 2014 to 2016 - largely due to a reduction in coal combustion by both China and the U.S., in conjunction with the rapid global deployment of renewable energy technologies (especially solar and wind power). The near-universal endorsement of the 2015 PCA accelerated this welcome trend to the point where investment in renewable energy in 2016 was almost double that of fossil-fuel based power-generation. Unfortunately, newly released carbon emissions data for 2017 by the Global Carbon Project, indicate another 2% increase in carbon emissions this year, mainly as a result of a rise in coal combustion in China<sup>11</sup>. The United Nations is saying that in order to maintain a 66% chance of not exceeding 2°C of warming by 2100 then carbon emissions must peak before 2020. With projected global CO<sub>2</sub> emissions from human activities estimated at 41 billion tonnes for 2017, time is simply running out to keep warming well below 2°C under the PCA - let alone 1.5°C.

The economic risks of not investing in climate change mitigation were first quantified over a decade ago, in 2006, when Sir Nicholas Stern, Head of the United Kingdom's Government Economic Service, referred to the impact of climate change under a 'business as usual' emission scenario as potentially "the greatest and widest-ranging market failure ever seen". According to

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<sup>10</sup> The Emissions Gap Report 2017: A UN Environment Synthesis Report. United Nations Environment Programme (2017).

<sup>11</sup> Global Carbon Project. Carbon Budget 2017. See: <http://www.globalcarbonproject.org/carbonbudget/index.htm>. Accessed 20 November 2017.

the Stern Review<sup>12</sup>, the cost of unabated climate change on the global economy will equate to a loss of at least 5% of global gross domestic product (GDP) each year, potentially rising to 20%. In contrast, a shift to a low-carbon pathway would benefit the economy by U.S. \$2.5 trillion a year, with markets for low-carbon technologies worth at least U.S. \$500 billion per year by 2050. Avoiding the worst impacts of climate change would require an investment of only 1-2% of global GDP per annum.

Despite the U.S. withdrawal from the PCA, over 1,000 governors, mayors, businesses and financial investors in the U.S have defied the Trump administration and pledged that the country will remain a global leader in reducing carbon emissions. Encouragingly, in its 2017 Energy Technology Perspectives report, the International Energy Agency (IEA) has said the global energy mix is being redefined by rapid, scaled-up deployment of clean-energy (both renewables and nuclear) that now leads new demand for energy growth. For example, in 2016, two-thirds of China's new electricity generation capacity was supplied by renewables (mostly hydro and wind), as well as nuclear. Furthermore, the IEA and the International Renewable Energy Agency (IRENA) in their report 'Perspectives for the Energy Transition - Investment Needs for a Low-Carbon Energy System' in March 2017,<sup>13</sup> stated that the global economy stands to gain U.S. \$19 trillion if it embraces the PCA goals. Although recent trends are positive, 85% of world energy demand is still supplied from fossil fuels, and both the IEA and IRENA stress that current investment rates are still insufficient to achieve the PCA goals, where the CO<sub>2</sub> emission intensity of the global economy must be reduced by more than 80% in the next 35 years. Current investment must double in order to expedite the switch to a low-carbon economy, with renewables rising to at least 65% of the global energy mix by 2050 (compared to 15% today). Notably, both the IEA and IRENA say that a sweeping transformation of the energy sector must also be accompanied by leaving high-carbon fossil fuel reserves, especially coal, in the ground as a stranded (and unburned) asset. Although this would inevitably result in a loss jobs in the fossil fuel industry, investment in both renewables and energy efficiency technologies would more than offset these losses by creating an additional six-million jobs. According to the IEA, "The rapid phase-out of fossil fuel subsidies, together with CO<sub>2</sub> prices rising to unprecedented levels, extensive energy market reforms, and stringent low-

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<sup>12</sup> Stern, N. H. The Economics of Climate Change: The Stern Review. Cambridge, UK: Cambridge University Press, 2007.

<sup>13</sup> 'Perspectives for the Energy Transition - Investment Needs for a Low-Carbon Energy System (2017). International Energy Agency (IEA) and the International Renewable Energy Agency (IRENA).

carbon and energy efficiency mandates will be needed to achieve the transition.” The IEA also added “Such policies would need to be introduced immediately and comprehensively across all countries”.<sup>10</sup> It is certain that COP24 in Katowice, Poland in December 2018 will be the next critical rallying point for the PCA.

Overall, it is mixed news from COP23 - global temperatures are still rising, and carbon emissions have resumed their inexorable upward trend. On the other hand, a global transformation to low-carbon technologies has now become embedded as an economic imperative – as well as an environmental one. Hopefully then COP23, despite the U.S. withdrawal from the PCA, will pave the way forward to a cooler, safer world that avoids what the United Nations prophetically warned of - now a quarter-century ago.