The Science is clear, but we need more of it.

Climate change is happening. Human activity has caused and continues to contribute to towards it; the current and projected severity of its impacts has increased; and it remains an imminently solvable or manageable problem if the required actions are taken (IPCC, 2018). Our ability to understand the interaction between global climate, energy, and earth systems is based on decades of investment in the collection and analysis of scientific data from those very systems. Those investments and our future understanding are now under threat.

The summer of 2018 saw a month-long heatwave, with June being the second warmest month globally on record. In Northern Europe, the World Meteorological Organisation (WMO) recorded temperatures in excess of 30˚C in the arctic circle, Sweden suffered the worst outbreak of forest fires on modern record and agricultural yields were projected to be down 30-50% (WMO, 2018). In the United States, by 9th October there had already been 11 weather and climate disasters in 2018, with losses exceeding $1 billion each across the United States. In California, at least 87 people were killed as wildfires have destroyed more than 400 square miles of land (ABC, 2018), whilst in South Africa, Cape Town became the first major city in the world to plan a shutdown of its water system after an extreme drought caused fears of a 'Day Zero', whereby water reserves would be depleted. Extreme weather events are likely to become more frequent and intense as the impacts of climate change loom ever-more largely.

Extreme weather events are likely to become more frequent and intense as the impacts of climate change loom ever-more largely. The most recent report by the Intergovernmental Panel on Climate Change (IPCC), which reviews and collates the latest research on climate change, is unequivocal in its assessment: at current rates, global temperatures are likely to increase to 1.5˚C between 2030 and 2052 at the latest.

The impacts of a 1.5˚C increase are laid out explicitly:

- Increase in temperatures
- Increase of heat waves
- Increase in floods
- Increase of droughts and water shortages
- Loss of tundra and boreal forests
- Decline of coral reefs by a further 70-90%
- Decrease in global annual fishing catch by around 1.5 million tonnes
- Increase in the geographic range of diseases such as malaria and dengue fever
- Decrease in agricultural yields, particularly between the tropics

Further scientific research is critical to learn how to adapt and mitigate these impacts.

US Role in Climate Science

Despite the vast data and direct experience of climate impacts now and in the future, President Donald Trump and his administration have proposed two budgets that have attempted to dismantle American scientific programs that seek to understand and explain the changing planet. Not only do these programs undergird the United States' scientific and policy-making institutions, they also contribute significantly to international collaborations including the IPCC, the WMO, and the Global Climate Observation System.

The US has contributed enormously to the research and dissemination of climate science - largely through data collection, which is subsequently provided to the scientific community and public at no cost - and the Trump administration's attempts to derail this ongoing contribution could have severe implications on the global gathering of critical data. In fact, if the Trump Administration's budget requests had been approved, they would have resulted in up to a 16.8% cut in funding, around $2.4 billion in absolute terms, in the first two years of his term in office (CAP, 2018).
Other US-funded institutions which provide critical information include the National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of Energy (DoE), and the National Aeronautics and Space Administration (NASA). The NOAA gathers the relevant scientific data to issue forecasts on the weather and climate. One of NOAA's most notable outputs is the Coral Reef Watch, which recently forecast the likely death of the Great Barrier Reef by the end of the Australian summer of this year, citing a 90% chance of mortality (NOAA, 2018).

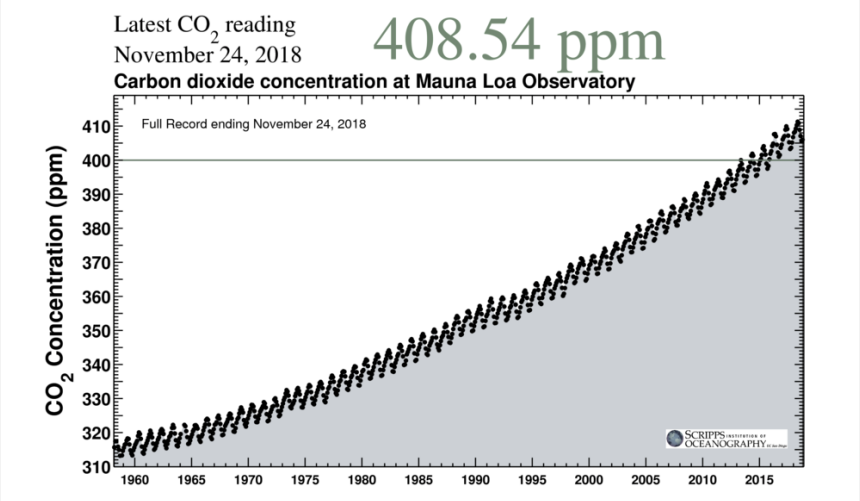
Through the development of supercomputing capabilities at the U.S. National Laboratories, DoE has helped build the analytical infrastructure by which scientists carry out weather, climate, and other Earth system modelling in order to inform decision-makers about what the future might look like (DoE, 2018).
As the main grant-making agency for climate science, energy research, and the application of clean energy solutions to address climate change, the Department of Energy play a vital role in advancing the understanding of the Earth and climate - and the generation of solutions to the climate problem.

NASA's contribution to climate science is more salient given the administration's reputation. Its most significant role is to gather data through Earth Observation Satellites, which monitor the Earth's vital signs, amongst the multitude of data it provides. The US's global role in the gathering of this data is demonstrable. Of the 108 satellites which contribute to climate data collection recorded by the Union of Concerned Scientists, 46 of those are operated by an American organisation, while the EU and its member states operate 29 (3 of which are in collaboration with the US) (UCS, 2018).

This implies that almost half of the world's climate data gathering satellites are at risk of federal budget cuts by the Trump administration.

Since the Trump administration entered office, the White House has cancelled NASA's Carbon Monitoring System, which provided information on sources of CO_2 emissions, helpful in assessing whether countries are truly reporting their emissions and how CO_2 in the atmosphere is interacting with oceans and forests. This is an example of a critical area where the EU can help continue the work of American organisations, whose future is at risk amidst budget cuts and a turbulent political environment.

Amongst the many projects funded by the US is the famous 'Keeling Curve', which has been monitoring atmospheric concentrations of Carbon Dioxide in Mauna Loa, Hawaii, since 1958. This observatory boasts the longest continuous measurement of CO_2 and is attributed with bringing attention to the issue of rising emissions by illustrating the year-on-year increase in concentrations, along with the seasonal oscillations which have made it famous.



The Role of Europe

The European Union, in its purported role as climate leader, should step up to the plate and counterbalance the Trump Administration's persistent threats to climate science.

The EU is currently in the critical stage of negotiating its Multiannual Financial Framework, which will set the EU's budget over the next 7 years. The current proposal from the Commission proposes to 'mainstream' 25% of the Budget to contribute towards climate objectives, however, the Parliament has called for this to be increased to 40%.

Whatever the outcome on the total amount of the EU Budget made available to help meet climate objectives, it is essential that due regard is given to the current global outlook for climate and energy data collection and analysis, and, if appropriate, additional funding made available. This could be achieved, for example, through Europe's flagship research programme, Horizon Europe, where the Commission has proposed that almost 16% of the budget is spent on climate, energy and mobility.
In addition, there is a proposal currently being considered for the establishment of a European Union space programme, which emphasises the potential of European collaboration in providing critical information on the Earth's vital signs, and could make a major contribution towards climate data collection.

As part of a new EU space programme, Copernicus - the EU's earth observation programme - can also continue to make a major contribution towards relevant data collection. so as to compensate for the losses incurred from the Trump Administration's cuts. Copernicus currently makes information freely and openly accessible to its users and it is essential that this remains the case.

In addition to direct EU intervention and further European funding, additional opportunities exist to encourage and support multi- and bilateral collaborations, both between EU Member States and more widely. Recent examples include the UK-France agreement, along with NASA and the Canadian Space Agency, to send a component to monitor the oceans, aboard a multinational satellite (UK Government, 2018).

Knowledge Gaps Left to Fill

Despite significant advances in understanding the future of the Earth's climate, we still have much to learn. Important uncertainties in our knowledge of the climate also need to be addressed - such as the non-CO_2 impacts of aviation or the interactions between land, ocean, and atmospheric stores of CO_2 - since ignorance of such impacts could make or break climate mitigation efforts. These uncertainties can be addressed with more computing power, better quality and quantity of climate data, and more general investments in the field of climate science which can provide the people, material, and time to better understand our future.

Furthermore, to guarantee that countries are honestly reporting their greenhouse gas emissions, programmes such as the Carbon Monitoring System can help measure and ascertain the various sources and sinks of CO_2. Not only does this identify non-compliance of climate obligations but also puts evidence-based international pressure on those misreporting their emissions. By way of example, a recent spike in HFC emissions, a refrigerant gas banned by the Montreal Protocol, was traced to an industrial cluster in China thanks to Earth observation satellites.

The Cape Town Droughts

The Countdown to Day Zero, when the city was about to cut off running water: Accelerating climate change will bring more cities to and beyond the edge.

Conclusions

Collection and analysis of climate, energy and Earth systems information is fundamental to our understanding of climate change and the necessity of future investment in mitigation and adaptation programmes.

In response to proposed U.S. budget cuts for climate science, and to avert the worst impacts of deferential budget oversight, the Bellona Foundation and the Center for American Progress are calling on the EU to step-up and provide global leadership in the fight against climate change.

In the context of the new EU Budget, the future of the Horizon Europe programme, and the new EU space programme, the EU should:

1. Increase institutional funding for climate and energy data collection and analysis, particularly targeting the areas in which the US federal budget cuts are proposed. Federal budget spending should be closely monitored and additional EU scientific and research funding for climate change made available as needed.

2. Direct EU Budget spending on climate data collection and analysis, bilateral and multilateral agreements between EU Member States and other nations should be encouraged to promote international cooperation, improve efficiencies and deepen our collective understanding of how the climate is changing.

3. Ensure that climate and energy data remains accessible to the world's scientific bodies, EU leaders should ensure that relevant data gathered by the EU and other applicable bilateral agreements remains open and free of charge.

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