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GUEST EDITORIAL

Climate change and pandemics: New challenges for science and technology

Global warming is one of the major challenges that needs to be dealt with in the coming decades. In particular, the Intergovernmental Panel on Climate Change (IPCC) published a special report in 2018,[1] establishing the need for a limit to the global ambient temperature at the end of the present century (2100) of 2 °C and, if possible, even 1.5 °C, above the pre-industrial level. To attain these temperature values, the United Nations asked all countries to present Nationally Determined Contributions (NDC), describing the way how they would act to attain the upper limit of 2 °C; these include how to reduce greenhouse gases (GHG) and also to identify possible financial support for mitigation and adaptation actions. However, scientific analysis of the sum of the NDCs revealed less reduction than needed, with final temperatures at 2100 in the range of 2.7–3.6 °C.[2] Significant negative impacts, e.g., flooding in some regions and drought in others, glacier melting, food security concerns, disease vector propagation to high latitude and altitude, ocean acidification, coral destruction, among others,[3] would occur on the whole planet if the limits suggested by IPCC are not attained.

To attain the proposed IPCC limit to global warming,[1] it is suggested to arrive at a peak global emission level of GHG in 2020 and to reduce significantly this emission up to 2030, at a rate of 2.7 $GTnCO_2$/year if 1.5 °C is to be achieved at the end of the present century and 1.3 $GTnCO_2$/year if the global ambient temperature would arrive at 2.0 °C at the same time. Figueres and Rivett-Carnac[4] indeed considered that the 2020 decade would be critical and "will determine the quality of life for hundreds of years to come, if not more."

We would like to point out that, in relation to global extreme environmental events (as climate change-induced flooding, heat waves, wildfires, etc.) and health events (as COVID-19 pandemic), the industry is not currently well prepared to modify its line of action and to change the production (partially or totally) to develop products that could solve human problems in a short period of time. Examples are the shortage of medical ventilators and masks in some countries, in relation to COVID-19 pandemic. The most powerful countries are well prepared for defending their nations against invasions, but this was not enough for preventing them from the coronavirus pandemic invasion. To be prepared, we propose for industry: (a) to implement nested networks of collaborative R&D teams including both academia and industry; (b) to remain in the state of preparedness at all times to reconfigure and switch products, production capacity and supply chains and to repurpose existing production streams; (c) to use big data analytics to determine needs around the globe and optimize logistics; (d) to apply artificial intelligence, 3 D and 4 D printing technologies along with other advanced technologies to speed up the production of the needed products and systems without delay; (e) to apply criteria in all industrial processes, making products that take into account the environment[5] via the rational use of resources and avoiding atmospheric pollution, so as to not only affecting the climate[1] but also the human health, even in relation to the COVID-19 pandemic.[6]

It is important to have advance agreements regarding intellectual property, as private profit-making firms would need to work immediately with governments, not-for-profit organizations and agencies from around the world. Cooperation at all government levels (international, national and regional) with industry associations needs to be very proactive to develop the required agreements for emergency preparedness and to organize their activities to have the possibility to switch rapidly from one line of production to another one.

Clearly, there is a need for global-scale cooperation and collaboration to tackle the massive global problems caused by climate change and potential pandemics. Existing technologies need to be repurposed at short notice while new innovations emerge.

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