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Landmark Global Review of the Engineering Response to Covid-19 Calls for Action to Ensure Future Pandemic Resilience

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- **Engineering X review of pandemic preparedness identifies key vulnerabilities**
- **Senior leaders endorse the need for comprehensive action by policymakers, business and academic leaders worldwide**

Systemic barriers—including a lack of collaboration mechanisms, insufficient data and skills, and limited understanding and consideration of the role of engineering—reduced the ability of engineers to deliver timely and effective responses to the COVID-19 pandemic, according to a comprehensive review of the global engineering response, published today by Engineering X.

The findings of the global review will today be presented to senior delegates from 30 countries during the annual conference of the International Council of Academies of Engineering and Technological Sciences in Versailles, France.

The *Global review of the engineering response to COVID-19: lessons learned for preparedness and resilience*, produced in partnership with Dalberg Advisors, was conceived by the Engineering X Pandemic Preparedness programme at the height of the COVID-19 pandemic in November 2020 to learn lessons and make recommendations to ensure that a more systemic engineering response is put in place to improve preparedness for future pandemics.

Ensuring that datasets and data systems used for decision-making are up-to-date and bias-free, equipping emergency response task forces with more engineering capability, and encouraging the use of open science and data sharing standards are just three of the actions recommended by the review group.

Informed by data, case studies and comment from more than 40 countries, the review highlights the breadth of contributions made by engineers and engineering globally in responding to key challenges across sectors, disciplines, geographies, and across pandemic prevention, preparedness, response and recovery. It calls on governments, policy makers, public health actors, academia and funders, along with the engineering community, to identify and close structural gaps in resilience against future pandemics, to invest in skills, training and capacity of engineers all around the world, and to develop robust platforms for collaboration within engineering and between engineering and other disciplines.

The review highlights transformational innovations in low resource contexts as well as world-changing advances in medical and communication technologies, the pivotal role of data collection, distribution and management, and the importance of applying a systems lens to complex multifaceted challenges. It identifies six major challenges during COVID-19 where engineers made key contributions:

1. **Providing high-quality and timely data** in near real-time and in appropriate formats, leveraging big data and mobile data for modelling and contact tracing.
2. **Innovating rapidly to provide novel health solutions**, in collaboration with scientists and clinicians, such as in the design of PPE, diagnostics, breathing aids, vaccines and digital health tools.
3. **Designing products and services for diverse environments and user bases** to reduce inequality of access and outcomes, such as customised PPE or wastewater testing and vaccine delivery for low-resource settings.
4. **Pivoting existing industrial capacity and building new capacity** to ramp up production of essential medical and non-medical products such as alcohol manufacturers making hand sanitisers and expanding local vaccine manufacture.
5. **Upgrading and streamlining global supply chains** to help delivery of essential medical and non-medical products, such as cold chains and drones for last mile delivery of vaccines.
6. **Bolstering and ensuring the resilience of societal systems and infrastructure**, such as energy and water supplies, or expanding connectivity and digital solutions for remote education or working.

The report identifies key drivers that made engineers especially useful during the COVID-19 response, such as rallying around a shared sense of purpose, which empowered them to take risks and to innovate in unprecedented timeframes. For example, engineers from University College London (UCL) designed a breathing aid prototype in under 100 hours and partnered with Mercedes AMG, who repurposed their Formula 1 factories to produce 1,000 devices a day. The open-source design has been made available to local manufacturers around the world.

Professor Peter Guthrie OBE FREng, Chair of the Engineering X Pandemic Preparedness board that commissioned the review, said: “As the COVID-19 virus and its impact continues to evolve, there is a need to reflect on the efficacy of our response to it so far and how things might be handled better in the future. Our hope is that we can use the insights provided by this truly global overview of the engineering response to COVID-19 to better integrate engineering skills and habits of mind into resilience policies and structures all around the world, to improve our recovery from the virus, and to help us on the path to a safer, more prepared and resilient future.”

Professor Rebecca Shipley OBE, Director of the UCL Institute of Healthcare Engineering and Co-Lead of the UCL Ventura CPAP breathing device programme, said: "The COVID-19 pandemic has highlighted the pivotal role that engineers play in responding to public health emergencies and resilience planning. There are important lessons that we must learn around understanding the needs of providing healthcare in diverse, global settings and working collaboratively across sectors, listening and building trust. Now is the time for governments and international organisations to act on these lessons."

Sir Richard Feachem KBE FREng, Professor Emeritus of Global Health at the Institute for Global Health Sciences, University of California San Francisco, said**:** "The COVID-19 pandemic has acted as a reminder that a global emergency requires a global response, and that no single country or discipline can tackle a crisis alone. This report reinforces this message and focuses on the role of engineering in this fight. It calls on the global community to learn lessons and act to improve our future pandemic response —creating better mechanisms for global collaboration and coordination, engaging with stakeholders from across disciplines, and developing the skills needed to prevent, prepare for and respond to pandemics."

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NB This press release and the Executive Summary of the global review are both available in French, Spanish and Arabic here: engineeringx.raeng.org.uk/pandemic-preparedness

https://engineeringx.raeng.org.uk/programmes/pandemic-preparedness **Notes for Editors**

1. Dalberg Advisors (2022). *Global review of the engineering response to COVID-19: lessons learned for preparedness and resilience*. Engineering X (founded by the Royal Academy of Engineering and Lloyd's Register Foundation). ISBN: 978-1-909327-56-6
2. CAETS, the International Council of Academies of Engineering and Technological Sciences, annual conference is being held in Versailles near Paris, France, 26–30 September 2022.
3. Engineering X is an international collaboration, founded by the Royal Academy of Engineering and Lloyd's Register Foundation, that brings together some of the world's leading problem-solvers to address the great challenges of our age. Our global network of expert engineers, academics and business leaders is working to share best practice, explore new technologies, educate and train the next generation of engineers, build capacity, improve safety and deliver impact.
4. The Engineering X Pandemic Preparedness Programme, led by the Royal Academy of Engineering, is supporting the UK and global engineering community to learn from the COVID-19 pandemic through global sharing of lessons on disruptive solutions and best practice approaches in the prevention, preparedness, response and recovery from pandemics.
5. The Royal Academy of Engineering is harnessing the power of engineering to build a sustainable society and an inclusive economy that works for everyone. In collaboration with our Fellows and partners, we're growing talent and developing skills for the future, driving innovation and building global partnerships, and influencing policy and engaging the public. Together we're working to tackle the greatest challenges of our age.

The Academy, working with our partners in the National Engineering Policy Centre (NEPC) , provided advice to government on a range of areas during the COVID-19 pandemic.

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