Virtual workshop hosted by the OECD and Science Europe

11 May 2021, via Zoom, 11:30-15:30 CET (Paris time)

Http://oe.cd/SCIENCEEUworkshop

Research Infrastructures mobilisation in response to COVID-19: lessons learned.

This draft background paper has been prepared for an OECD GSF workshop scheduled on 11 May 2021, which is part of a broader project on Mobilising science in response to COVID-19: lessons learned from COVID-19.

Research Infrastructure adapted their operations during the crisis

Research infrastructures (RIs) are organisational structures dedicated to delivering data or services for basic or applied research. They play a major role in modern research in all scientific domains. The COVID-19 crisis saw an unprecedented and extremely rapid mobilisation of RIs to provide support to the research community. Broadly speaking this mobilisation occurred within two different groups of RIs: 1. those in the life-science/biomedical area for whom supporting research on COVID-19 would normally be expected to be part of their central remit; and 2. a wide range of other RIs for whom COVID-19 was not directly within their remit but, who in many cases adopted their operations to support research addressing the crisis. Both of these groups were also impacted by the crisis and have had to adapt, for example to virtual working, to continue to provide support functions for research that is not related to COVID-19.

Fast track and remote access

To facilitate research on COVID-19, many RIs set up dedicated fast track access to their equipment or services. This provided access to selected instruments and services for research related to COVID-19, without the necessity to undergo regular – often lengthy - evaluation procedures. Many access requests were scheduled within one month from the submission of the proposal. This meant that RIs had to develop quickly new processes to validate the quality of the research proposals, with the additional challenge of many proposals coming from new research areas outside the traditional fields of expertise of the RIs. For example, the Paul Scherrer Institute (PSI) in Switzerland, which operates world-leading large scientific equipment, set up immediately at the start of the crisis a dedicated website for COVID-19 related research (https://www.psi.ch/en/psd/COVID-19). PSI was rapidly able to contribute to various aspects COVID-19 science, ranging from structural biology through pulmonary pathology to epidemiology.

The crisis also meant that physical access to many RIs became difficult, not only for the scientist but also for the engineers and technicians operating the equipment. COVID-19 thus had a substantial impact on the operations of analytical facilities that serve external users. In a European survey conducted during the crisis indicated at the end of April 2020[1], only a third of the surveyed research infrastructures reported that they had maintained physical access for users; however, several had set up specific COVID-19 services and responded to travel limitations with a strong shift towards remote services. RIs had to re-organise their mode of operation quickly to preserve their capacity to offer a service to the community.

A follow on survey carried out in October 2020[2], showed that most of the RIs had resumed their normal operations, including general support to external users. More than two-thirds reported full operations, with almost no change relative to the pre-COVID-19 period with respect to the share of instruments running. Nevertheless, despite the instruments' availability, a large majority of RIs served fewer external

users compared to the pre-pandemic era. In the pre-COVID-19 period, remote access was rather limited, typically comprising up to 20% of all access. This has changed remarkably during the pandemic, with almost a third of RIs estimating that more than 60% of their access is currently remote.

Data sharing

Many RIs provide access to data that are of direct interest for COVID-19 research (biological, environmental, societal data, etc.). Most of these data-RIs have set up dedicated portals and structures to facilitate access and use of COVID-19-relevant data to the research community. Some RIs have developed crowd sourcing initiatives that help to open up and link COVID-19 data. For example, the European research infrastructure ELIXIR co-organised a virtual COVID-19 Biohackathon in April 2020[3] to develop new tools for working with COVID-19 data. In other instances, RIs that have substantial computing and data analysis capacities (e.g. in particle physics) have opened up their capacities and offered their experience to facilitate data-mining on COVID-19. CERN, for example, has mobilised its open source technologies, set up open data repositories and developed a number of cooperative initiatives.[4]

New COVID-19 dedicated research

While many RIs are service-oriented facilities geared towards external users, others also conduct internal research with their own staff. In response to the crisis, a large number of service-oriented RIs developed specific tools and programmes aimed at facilitating COVID-19 research for their external users, as well as in some cases, additional services such as project management tools. Many of those RIs that already conducted internal research with some relevance to the pandemic have developed dedicated actions to generate and provide data and information related to the crisis. For example, the European Social Survey[5] has developed a specific set of questions related to COVID-19 for its upcoming survey, including questions on happiness, loneliness, social relationships, health and wellbeing, as well as trust in other people, government and institutions. In Japan, RIKEN began early operation of the new supercomputer 'Fugaku' to support the search for therapeutic drug candidates for COVID-19. Initially, the plan was to start sharing access to the supercomputer in 2021, but it began using some of its functions as a matter of urgency in spring 2020 during the adjustment phase. A team of researchers from RIKEN and Kyoto University announced in July 2020 the discovery of dozens of substances that could be candidates for treatment of COVID-19, performing calculations in about 10 days that would normally take more than a year with conventional supercomputer performance.[6] Fugaku has also been used to model the effectiveness of non-pharmaceutical interventions, such as the wearing of face masks, and this work has had a significant influence on policies in Japan.

Priority setting, steering and coordination of research in crises

While research infrastructures responded quickly to the crisis and demonstrated considerable flexibility in adapting their facilities to meet emergency needs, the scale and complexity of the pandemic also highlighted the need for better preparedness and longer-term support and coordination. This applied across the broad range of RIs, regardless of whether they were directly involved in supporting the scientific response to the pandemic. All RIs have to adapt in emergency situations.

Preparedness

The service-oriented nature of many RIs, their versatility, the flexibility of their management structures, and their scientific and digital capacities have enabled them to respond to a variety of new demands. Nevertheless, the COVID-19 crisis also demonstrated the need for enhanced preparedness to facilitate the transition from "business as usual" to "emergency response". Looking back before the crisis, there was a strong demand for existing resources to be used in the most efficient way possible. This typically involved cross-border, and often multi-sector and multi-disciplinary, research collaboration based on well- established networks. It often resulted in a scale of partnership and coordination that has yet to be achieved during the COVID-19 crisis.

In the domain of biomedical research infrastructures, it is interesting to note the practical recommendations put forward by the three European RIs in a common statement[7] insisting on the need for "the development of cross-border policies that specifically focus on facilitating highly coordinated, standardised research". In this instance it reflected a particular concern about the development of many small-scale underpowered clinical studies that lack the necessary robustness, an issue that arose during the first phases of the pandemic.

The importance of pre-existing networks has certainly been underlined during the crisis, and dialogue and collaboration between relevant organisations and infrastructures before a crisis is key to an effective response. It is interesting to see a number of recent initiatives, such as the the EU-funded Platform for European Preparedness Against (Re-)emerging Epidemics (PREPARE[8]) attracting renewed attention and support. This particular platform was launched in 2014 but unfortunately was not mature in time for the COVID-19 pandemic.

Coordination

The number and diversity of RIs offering services for Covid-19 research created a challenge for the users. Although a number of RIs have created coordinated structures to facilitate research on COVID-19 by providing more centralised access to resources, this inadvertently created new problems in terms of governance and financial support for these networks.

A number of biomedical RIs have created coordinated structures to facilitate research on COVID-19. For example, the German high-performance sequencing centres set up coordinated access to their facilities[9], while in Canada, CGEn (Canada's national platform for genome sequencing and analysis) established a Canadian COVID-19 Genomics Consortium in partnership with national and provincial health labs, hospitals, academia and industry. At the European level, the COVID-19 Fast Response Service was set up as a coordinated and accelerated procedure for researchers to access the academic facilities, services and resources of three medical research infrastructures: the European Research Infrastructure for Translational Medicine,[10] the European Clinical Research Infrastructure Network,[11] and the European research infrastructure for biobanking,[12] working together under the umbrella of the Alliance of Medical Research Infrastructures (AMRI). In the USA, The NHLBI's Collaborating Network of Networks for Evaluating COVID-19 and Therapeutic Strategies (CONNECTS) was set up to coordinate and streamline efforts under one organizational umbrella to respond more quickly and efficiently to health crisis by promoting collaboration and sharing of resources and data.

Outside the biomedical area, many research infrastructure networks also addressed the need for better coordination to offer potential users a range of tools than can be used in such crisis. The Analytical Research Infrastructures of Europe (ARIE) are one example. ARIE regroups RIs in many different fields, to produce a combined resource that offers a range of complementary analytical techniques which can be used for to address a diversity of challenges.

Funding and long-term support

Although RIs have had to review their operating procedures during the crisis, in particular to enable remote experiments, and remote analysis of data resources, little additional funding appears to have been granted to the facilities to support these activities, which were often resourced by reallocating internal funds.

To accompany the efforts of the RIs in their response to the demand of the research community, RI funders and host institutions will have to work together to provide the necessary support for these new RI activities, in the light of the considerable pressure from governments to deliver results.

In addition, the crisis has clearly highlighted that the role of RIs is not just producing knowledge in narrow research domains but is also to provide a capacity for the whole research community that can be adapted to meet multiple needs in times of emergency. This raises questions not only regarding long-term support and strategic choices, but also about how these RIs are evaluated.

Policy initiatives

Tbd. this should focus on examples of what countries and funding agencies are doing as opposed to the specific projects/

See annex for examples

Outstanding challenges

Tbd Emerging from workshop

Lessons learned for future crises

Tbd Emerging from workshop

Research Infrastructures mobilisation in response to COVID-19: lessons learned.

Outline workshop agenda

Workshop to be held on 11 May, 2021, via Zoom, 11:30-15:30 CET (Paris time)

Co-organised between OECD Global Science Forum and Science Europe

Summary Description

The workshop will include case studies that illustrate good practices and challenges and consider what policies can be implemented before, during and after a crisis to optimise the scientific response to crises, using the COVID-19 pandemic as the reference. What are the main challenges that need to be addressed in developing and implementing effective research to respond to crises and what policy actions are required to facilitate this?

Case studies can be a mix of interesting project level initiatives and national and international initiatives. They should also include presentations from research agencies, funders and international organisations

Aim: to explore key challenges and good practices from the science response to the COVID-19 pandemic and identify policy actions that can enhance the preparedness of research systems for future crises.

Meeting organisation

Due to the current outbreak of COVID-19 virus and to facilitate a broad participation, the meeting will be organised virtually using the Zoom video-conferencing system.

Participants

All ICRI participants, delegates to GSF, members of the GSF Expert Group on "Mobilising science in times of crises" and members of Science Europe are invited to attend the workshop and will need to register beforehand (link to be sent separately).

Draft Agenda

11:30	**Introduction** by OECD GSF secretariat (Carthage Smith), Science Europe secretariat (Lidia Borrell-Damián) and the meeting chair (Petr Bartunek)
11:45	***Session 1: Adapting RI processes in emergency situations*** *The objective of this session is to explore, based on case studies, how research infrastructures from different domains can adapt their management and operation to contribute to emergency research during crisis.* *How to develop 'in house' projects and fast track user access for high priority research?*

	How to adapt operations in a context of restricted physical access to RIs *How to accelerate the diffusion of data and research results?* *What policy actions are required to enable research infrastructures to mobilise effectively?* • Case studies (3x15min presentations) o Christos Arvaniditis, CEO, Lifewatch-ERIC o Philip Gribbon, Coordinator, EU-Openscreen o Makoto Tsubokura, RIKEN Center for Computational Science • Questions/Panel Discussion (15 min) (moderator: James Morris)
12:45	***Session 2: Preparedness and response of life science and health RIs*** *The objective of this session is to explore, based on case studies, how life science and health research infrastructures prepare for and respond to a global health crisis.* *What level of preparedness is required for an emergency response, how could this be improved?* *How to develop synergies and complementarities with other national and international efforts during a crisis?* *How to share resources and data worldwide?* *How to address conflicting national priorities and develop international governance?* • Case studies (3x15min presentations): o Michaela Mayrhofer, Head of ELSI Services & Research, BBMRI-ERIC o Volker Gerdts, CEO, Vaccine and Infectious Disease Organization (VIDO) (Canada) o Bryan Charleston, Director of The Pirbright Institute (UK) • Questions/ Panel Discussion (15 min) (moderator: Heidi Bandulet)

13:45- 14:00 short break

14:00	***Session 3: Policy lessons learned from COVID-19, and the potential role of research infrastructures in future crises*** *The objective of this session is to explore how the lessons learned from the Covid-19 crisis can help strenthen the role of research infrastructures in addressing future crises and societal challenges.* *Can emergency operation processes be used to broaden the contribution of RIs to science and society?* *Can new RI networks and collaboration be maintained and optimised for global challenges?* *What policy actions are required to enable research infrastructures to mobilise effectively for future challenges?* • Panel Discussion (45 min) o Martin Taylor, Executive Director, Canadian Research Data Centre Network o Yasdan Yasdanpanah, Head of the French agency for emerging infectious diseases o Antonio Zoccoli, President of INFN, Italy

	○ Lukas Levak, Director of Department of Research and Development at the Ministry of Education, Czech Republic • Questions/Discussion (30 min) (moderator: Petr Bartunek)
15:15	**Concluding remarks and key points for next steps**
15.30	End

Potential good practices for research infrastructures responses to COVID-19:

The following example have been extracted from the OECD STIP Compass and were collected in response to the COVID-watch survey in late 2020

Diagnostics, therapies and vaccines

H2020 grants access to research infrastructures for COVID-19 (EU)

Beyond the European Virus Archive and TRANSVAC for vaccine research, this includes other EU supported pan-European RIs: SoBigData-Plus (big data analytics); ERINHA (high-risk pathogen safety labs); ELIXIR (coordinating the storage of and access to biological data); ECRIN (clinical trials). CALIPSO-PLUS and CERIC-ERIC have set up a dedicated Fast Track Access to a selected number of analytical facilities.

High Performance Computing Infrastructure (HPCI) call for proposals on the novel coronavirus diseases (COVID-19) (Japan)

The supercomputer "Fugaku", the fastest supercomputer worldwide, which was planned to start its operation in FY2021, was partly deployed a year in advance to be used for COVID-19 research. HPCI supercomputers at national universities and institutes have also being collectively utilized for COVID-19 research.

Epidemiology

The Flemish Supercomputer Centre: Support for COVID-19 research (Belgium)

Computing capacity on the Tier-1 system (BrENIAC) will be reserved for a period of 8 weeks. Capacity at the Tier-2 infrastructure at university level can also be made available. Applications will be validated by by the Flanders Research Foundation. Resources will be granted on a First Come First Served basis. Companies will be awarded exploratory access.

Non-financial support

COVID-19 Response R&D Support Council (Korea)

A Council consisting of major government-funded research institutes and universities was set up to provide technical and infrastructural support to companies and research groups developing COVID-19 vaccine and therapeutics. While many companies and research groups are engaged in R&D efforts to develop COVID-19 diagnostics, vaccines, and therapeutics, parts of these research are highly specialized requiring expert knowledge and experience as well as essential equipment such as BSL3 (Biosafety Level 3) facilities which are difficult for small and medium-sized businesses or labs to acquire.

[1] ERF's Review of Working Practices of Analytical Facilities During the Pandemic | Zenodo

[2] Effect of the COVID-19 Pandemic on the Working Practices of Analytical Facilities II | Zenodo

[3] https://elixir-europe.org/news/hacking-pandemic

[4] https://againstcovid19.cern/articles/cern-and-lhc-experiments-computing-resources-global-research-effort-against-covid-19

[5] http://www.europeansocialsurvey.org/

[6] https://www.japantimes.co.jp/news/2020/07/04/national/science-health/japan-fugaku-supercomputer-coronavirus-drugs/

[7] EATRIS-BBMRI-ECRIN-Joint-statement-COVID-19-May2020.pdf

[8] https://www.prepare-europe.eu/

[9] https://ngs-kn.de/?page_id=70

[10] https://eatris.eu/

[11] https://www.ecrin.org/

[12] https://www.bbmri-eric.eu/