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Collaborative actions to harness technologies during pandemics

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Note by the secretariat

Summary

The present document contains a review of how technology has been deployed by States members of the Economic and Social Commission for Asia and the Pacific in the fight against the coronavirus disease (COVID-19) pandemic. While countries that are leaders in the use of technology are deploying a range of tools at scale, less technologically advanced countries have also been successful in this area during the pandemic. However, the least developed countries often lack the capacity to harness the potential of technology against the pandemic.

Collaboration has been central to the technological response, with Governments harnessing the know-how of the private sector and academic institutions, among others. Additionally, engaging the public and gaining their trust has and will be critical in contact-tracking technology deployments. Governments have also collaborated with each other. These efforts will be critical to the regional and global responses. Going forward, the momentum of these collaborations must be continued to curb COVID-19, recover and better prepare for future pandemics.

Furthermore, the present document shines a spotlight on the importance of digital inclusion and resilient digital networks across the entire region as the foundation for government measures to harness technology to deal with future pandemics. Humanity's collective dependence on digital connectivity – brought to the fore by the pandemic – reinforces the criticality of cooperation.

The Committee on Information and Communications Technology, Science, Technology and Innovation may wish to discuss the issues raised in the present document, share experiences and lessons learned, and identify policy priorities and areas for regional cooperation for a more effective technological response to COVID-19 and future pandemics.

* ESCAP/CICTSTI/2020/L.1.

I. Introduction

1. Governments worldwide have developed and deployed technologies[1] in response to the coronavirus disease (COVID-19) pandemic. The present document contains a review of the technologies deployed for COVID-19 testing and tracking as a key measure, among others, recommended by the World Health Organization (WHO) for fighting COVID-19. Specific attention is given to how measures underpinned by technology that includes innovations in geospatial applications have been developed or deployed and supported with policies and collaborative efforts between Governments and other stakeholders.[2]

2. The present document also contains a review of policy measures that could support a collaborative response to future pandemics. The unprecedented importance of the resilience of core Internet infrastructure networks in the pandemic is reviewed. Proposals are presented for the consideration of the Committee on Information and Communications Technology, Science, Technology and Innovation for its future work on increasing e-resilience and digital inclusion to leave no one behind and to help Governments to be better prepared for future crises and disasters.

II. Deployment of technology in the fight against coronavirus disease

A. Testing technology

3. While countries that are leaders in the use of technology are deploying a range of testing tools at scale, less technologically advanced countries have also been successful in this area during the pandemic. However, many developing countries and the least developed countries in the region lack the capacity to produce such testing kits and challenges remain for importing them.

4. The Republic of Korea has been widely recognized for setting a high benchmark with the development of its testing capacity. Its diagnostic kit was developed within a month by a Korean biotech company using artificial intelligence and big data. While the private sector's strong research capacity was fundamental to the rapid development of such testing kits, government policy also played a key role. For example, in order to fast track the development of testing kits, the Government introduced an emergency use approval system, which enabled swift approval of diagnostic reagents in a simplified process. The Government also provided financial support to selected companies to fund research and development for the kits. Start-ups in the Republic of Korea have also stepped up to provide solutions. For example, a

[1] The term "technology" in the present document refers to both scientific breakthroughs (for example, the identification of the genome of severe acute respiratory syndrome coronavirus 2) as well as the application of scientific knowledge for practical ends, such as developing techniques to produce a product and/or deliver a service (for example, to develop contact-tracing applications).

[2] Tedros Adhanom Ghebreyesus, Director-General of WHO, Opening remarks at the mission briefing on COVID-19, 19 February 2020. Available at www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-mission-briefing-on-covid-19?.

Seoul-based company adopted artificial intelligence-powered automated production to reduce the time to get test results from 24 hours to only 6 hours.[3]

5. In Singapore, the Government's Home Team Science and Technology Agency and Veredus Laboratories worked together early on to develop a swab test diagnosis for the disease. Other locally developed kits include the Fortitude Kit 2.0, developed by the Agency for Science, Technology and Research and Tan Tock Seng Hospital, with ongoing support from the Institute for Health Innovation and Technology researchers, including the development of the Safer-Sample kit that allows virus testing samples to be transported at room temperature. The Health Sciences Authority is ensuring the rapid availability of coronavirus tests by supplying all tests with provisional authorization to health-care institutions, hospitals, medical clinics and laboratories across the city.[4]

6. In China, the private sector played an important role in developing testing kits, and more than 100 companies have been producing them.[5] A range of companies made their algorithms publicly available to improve efficiency and to support coronavirus testing and research. For example, Baidu Research made its artificial intelligence algorithm on gene testing open source.[6] The Alibaba Group also developed a cloud-based coronavirus diagnostic tool.[7]

7. China, the Republic of Korea and Singapore are three of the more technologically advanced countries in the region; however, other countries have also demonstrated strong capacity in developing testing technologies. In Viet Nam, the close collaboration between the Government, universities and the private sector enabled the country to rapidly develop its own testing kits.[8] Its success in developing kits can in part be attributed to long-term international collaboration. The country hosts two offices of the Centers for Disease Control and Prevention and its own version of the Center, as well as a branch of the Oxford University Clinical Research Unit, and multiple branches of the Pasteur Institute. The collaboration between these institutions has enabled Viet Nam to build capacity in researching and treating tropical and infectious diseases.[9]

8. In Thailand, the Government's Department of Medical Sciences was directly involved in the development of testing kits. The first kit was delivered in mid-April 2020.[10] In Indonesia, to overcome serious shortages of testing kits during the pandemic, a consortium comprising the Agency for the Assessment and Application of Technology, two universities and state-run medical

[3] Republic of Korea, *Flattening the Curve on COVID-19: How Korea Responded to a Pandemic Using ICT* (Seoul, 2020).

[4] Juliana Loh, "Coronavirus test kits contact tracing app, telemedicine: how Singapore's tech sector stepped up to the plate amid surge in cases", South China Morning Post, 21 April 2020.

[5] Finbarr Bermingham, Sidney Leng and Echo Xie, "Coronavirus: China ramps up COVID-19 test kit exports amid global shortage, as domestic demand dries up", South China Morning Post, 30 March 2020.

[6] Qi Xiaoxia, "How next-generation information technologies tackled COVID-19 in China", World Economic Forum, 8 April 2020.

[7] Helene Fouquet, "Alibaba pitches diagnostic tool to Europe in China outreach move", Bloomberg, 19 March 2020.

[8] VOA News, "Vietnam poised to export COVID-19 test kits", 30 April 2020.

[9] Ibid.

[10] The Nation Thailand, "First Thai-made coronavirus test kits delivered", 20 April 2020.

equipment manufacturers carried out joint research to develop kits. Mass production of these testing kits started in May 2020.[11]

9. However, despite these efforts, many countries in the region still face several challenges in their efforts to achieve widespread testing. First, even though some countries have started producing testing kits domestically, only a few countries have the capacity to ramp up production to meet the demand. Second, many countries – especially the least developed ones – do not have the capacity or resources to produce testing kits domestically. Importing such kits is not always easy given the global shortage of testing kits.[12]

B. Contact tracing technology

10. The goal of contact tracing is to identify and isolate not only those who are known to have COVID-19, but to try to get ahead of the spread of the disease by testing or quarantining those with whom a COVID-19 positive person has been in close contact during the incubation period. If only those with symptoms are identified and isolated, it will not stop the spread of the disease, as it is highly likely that they have already transmitted the illness to others, some of whom will not show symptoms.

11. Traditionally, contact tracing has been laborious work. Trained staff need to interview infected individuals and painstakingly trace each person they have been in touch with. When the number of infected people is small, this approach is particularly effective. However, when transmission takes places at a massive scale, more powerful measures need to be adopted, such as digital technologies, for more efficient tracing.

12. As a result, many countries in the region have adopted contact tracing technologies using smartphones (see table 1). Such technologies can greatly empower tracers to quickly identify the possible groups of people who may have been in contact with an infected individual. For instance, soon after COVIDSafe was released in Australia, the application was used to identify a close contact of an infected person, who had been overlooked during interviews.[13] Furthermore, big data gathered from such technology can enable researchers to better understand the transmission pattern and take appropriate action.

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[11] Ari Supriyanti Rikin and Heru Andriyanto, "Indonesia mass produces COVID-19 testing kits", Jakarta Globe, 4 May 2020.

[12] David D. Kirkpatrick and Jane Bradley, "U.K. paid $20 million for new coronavirus tests. They didn't work", New York Times, 16 April 2020.

[13] ABC News Australia, "Victorian health officials have accessed a coronavirus patient's COVIDSafe app data for first time", 20 May 2020.

Table 1
Contact-tracing applications developed by member States

Country	*Application name*	*Initiated by Government or private sector*	*iOS/ Android*	*Bluetooth/ Global Positioning System (GPS)*
Australia	COVIDSafe	Government	Both	Bluetooth
China	Close Contact Detector	Government-Private	Alipay, WeChat and QQ	Scan a Quick Response Code (QR code)
India	SAIYAM - Track & Trace Together	Private	Android	Bluetooth and GPS
India	Aarogya Setu	Government	Both	Bluetooth and GPS
India (Arunachal Pradesh)	COVID CARE	Private	Android	GPS
India (Goa)	Covid-Locator	Private-Government	Android	GPS
India (Karnataka)	Corona Watch	Government	Android	GPS
India (Maharashtra)	Mahakavach	Government	Android	GPS
India (Odisha)	COVID-19 Odisha	Government	Android	Bluetooth and GPS
India (Surat)	SMC COVID-19 Tracker	Government	Android	GPS
India (Tamil Nadu)	COVID-19 Quarantine Monitor	Private-Government	Android	GPS
India (Uttar Pradesh)	UP Self-Quarantine App	Government	Android	GPS
India (Uttarakhand)	Uttarakhand CV 19 Tracking System	Government	Android	GPS
Indonesia	PeduliLindungi (Care and Protect)	Government	Android	Bluetooth and GPS
Kyrgyzstan	Stop COVID-19 KG	Government	Android	GPS
Malaysia	Gerak Malaysia	Government	Both	Unknown
Malaysia	MySejahtera	Government	Both	Unknown
Malaysia	MyTrace	Government	Both	Unknown
Philippines (Cebu)	WeTrace	Government-Private	Both	GPS

Country	*Application name*	*Initiated by Government or private sector*	*iOS/ Android*	*Bluetooth/ Global Positioning System (GPS)*
Singapore	TraceTogether	Government	Both	Bluetooth
Singapore	Contact Tracer	Private	Android	GPS
Republic of Korea	Corona 100m	Private	Android	GPS
Republic of Korea	COVID-19 Epidemiological Investigation Support System	Government-private	Both	GPS
Thailand	Thai Chana	Government	Both	Scan a QR code
Thailand	Mor Chana	Government-Private	Both	Bluetooth and GPS
United States	SafePaths	Private	Both	GPS
United States	Contact Tracer	Private	Android	Bluetooth and GPS
United States	HEALTHLYNKED COVID-19 Tracker	Private	Both	GPS
United States	Contact Tracing	Private	Both	Bluetooth and GPS
United States	Care19	Private	Both	GPS
United Kingdom	NHS COVID -19	Government-Private	Android	Bluetooth

Sources: Malaysian Reserve, "Three major apps to trace COVID-19", 12 May 2020; Republic of Korea, Flattening the Curve on COVID-19: How Korea Responded to a Pandemic Using ICT (Seoul, 2020); Mongkol Bangprapa, "'Thai Chana' fakes phish for user data", Bangkok Post, 26 May 2020; and Samuel Woodhams, "COVID-19 digital rights tracker", TOP10VPN, 10 June 2020.

13. Experiences in several countries in the region show that such applications should be used in conjunction with other tracing measures. For example, in Singapore, to assemble a complete contact map of a person over 14 days, the tracers use several digital footprints. They reviewed business surveillance camera footage as well as the digital signatures of activities at automated teller machines and electronic records of credit card transactions.[14]

14. Similarly, the Republic of Korea developed the COVID-19 Epidemiological Investigation Support System, designed to enable epidemiological surveyors to quickly identify the transmission routes and places that an infected person has visited by using real-time analysis of data sourced from the Global Positioning System, mobile phones and credit-card

[14] Wharton, University of Pennsylvania, "Combating COVID-19: lessons from Singapore, South Korea and Taiwan", *Knowledge@Wharton* (21 April 2020).

transactions to conduct spatial-temporal analysis. The platform helps health officials to confirm information on transmission routes provided by patients. Moreover, the big data analysis gives officials real-time data feeds on patterns and evolving dynamics. The full-fledged digital system was originally developed in the smart city research and development programme which adopted the urban big data platform and cloud technology; it was then customized to combat COVID-19 with multi-ministerial cooperation and public-private partnerships with major telecommunication operators and 22 credit card companies.[15]

15. In Japan, the University of Tokyo developed an open-source software called Mobipack that helps users to analyse and visualize population movements using telecommunications data for contagion control. It is maintained on GitHub[16] by Spatial Data Commons[17] – a joint effort by the University of Tokyo and LocationMind Inc., supported by the Government of Japan and the International Telecommunication Union. Working with information and communications technology (ICT) regulators and mobile network operators, a data pipeline that enables the extraction of actionable information on mobility patterns and human behaviour was established; full support and training is provided remotely. Due to its cost effectiveness, the model is already in use in several low-income African countries.

16. The public's cooperation and collaboration are central to the effective deployment of contact tracing technologies, therefore public trust in the technology and the use of their data are important considerations for Governments when developing policies. Governments need to decide what personal data can be shared with the public and address concerns such as the potential use of personal data collection for mass surveillance. Balancing privacy and openness of data is a common dilemma in the deployment of digital technologies. Nevertheless, it is important to note that the pandemic is often a life-and-death matter, and as such, some Governments have prioritized the public health imperative. Furthermore, some studies show that such technology, if applied properly, does not have to compromise data privacy.[18]

17. In addition to contact-tracing technology, geospatial technology has also been applied in the region. It can inform how countries, cities and communities plan for and mitigate the impacts of the COVID-19 pandemic. The secretariat is working towards integrating geospatial information into a digital platform to find correlations between COVID-19 and socioeconomic trends, as well as to identify the characteristics of risk hotspots, such as high population density, mobility constraints, poor sanitation, and low connectivity and awareness, by conducting geographic information system (GIS) analysis on relevant data, for example, from census and household surveys and on population mobility, sanitation and Internet access. This should help countries to locate, map and target the communities most in need and at risk and to identify how policies impact those communities. Unifying all this information in one platform allows for interoperability and quick information-sharing among different stakeholders.

[15] Government of the Republic of Korea, *Flattening the curve on COVID-19*.

[16] https://github.com/SpatialDataCommons.

[17] https://sdc.csis.u-tokyo.ac.jp/.

[18] Vi Hart and others, "Outpacing the virus: digital response to containing the spread of COVID-19 while mitigating privacy risks", COVID-19 Rapid Response Impact Initiative White Paper, No. 5 (Cambridge, Massachusetts, Edmund J. Safra Center for Ethics, Harvard University, 2020).

18. Governments, institutions and the private sector have developed platforms and published information products, such as web maps of confirmed infections and deaths, maps of critical infrastructure and supplies, and available routes for medical staff, to name just a few. Such initiatives are making use of and integrating GIS, global navigation satellite systems, big data and artificial intelligence.

19. In Thailand, the organization 5Lab launched a website that details the last known location of each infected patient, as well as the places the patient visited prior to testing positive.[19] It also provides information on which places have been sterilized and the hospitals that offer free COVID-19 testing and check-ups under the Government's terms and conditions for testing. All information is backed up by data prepared by the Department of Disease Control. Furthermore, data are validated with information provided by the Anti-Fake News Centre of the Ministry of Digital Economy and Society.[20]

20. In the Philippines, the Department of Health set up the NCoV tracker website which contains information about confirmed cases categorized by age group, as well as geo-location of hospitals that admit patients, and other important information, such as trends.[21] Additionally, the Department of Transportation partnered with Google to make it easier for frontline health workers and hospital staff to find the best routes to take when going to their respective medical facilities through the Department's Hospital Shuttle Route Map.[22]

III. Models for technology collaboration

21. The technology deployments reviewed in the present document have highlighted the importance of government collaboration with different sectors, including the private sector and academia. Additionally, collaboration with the public will be critical to make technological solutions to tracking and tracing work. Below, several models and principles for collaboration with these key stakeholders are reviewed.

22. Additionally, models for enhanced international collaboration between Governments on COVID-19 are outlined in this section. The Asia-Pacific region is home to some of the most technologically advanced economies in the world, as well as to some of the most technologically deprived. This concentration of expertise means that the region relies on a handful of countries to push for technological breakthroughs and advance the frontiers of innovation. Collaboration at the regional level can be a critical force for increasing broad innovation capacity and scaling up effective technologies in the fight against COVID-19.

[19] https://covidtracker.5lab.co/en.

[20] Khemjira Prompan, "5Lab provides verified and up-to-date news and data", Time Out Bangkok, 13 April 2020.

[21] https://ncovtracker.doh.gov.ph/.

[22] www.google.com/maps/d/viewer?fbclid=IwAR3C-6lpQ09rtE6cx60z7J63z-iNnrxJLeEzEj1jV9nwGzpiV44xKLRqZUk&mid=1gryKdZmJDKVD6ueNfs_qjYuJ3c8tJy2A&ll=14.527758399682103%2C121.00459380000004&z=10.

A. Collaboration with technology developers

1. Top-down and bottom-up approaches

23. The top-down form of cooperation takes place when Governments initiate collaboration. For instance, a ministry of health in a country may identify national laboratories, research institutions and private firms to carry out research. The advantage of such an approach is that a country can quickly mobilize national resources. During a pandemic, speed is of the essence. However, this approach is only applicable when the purpose is very clear (for example, to develop testing kits) and Governments have a good assessment of which partners are the most suitable for the job. Such approaches have been adopted by the Governments of Viet Nam[23] and Indonesia,[24] among others, in developing testing kits.

24. The bottom-up approach means businesses and research institutions voluntarily take the initiative to identify technology solutions to fight COVID-19, either for reasons of social responsibility or business interest, or both. For example, in Thailand, Chulalongkorn University launched a line of robots to assist medical staff in providing tele-health to COVID-19 patients as the number of local infections were on the rise.[25] In Hong Kong, China, the Hong Kong University of Science and Technology innovations include autonomous robots to help deliver care and services and a sterilizer that removes up to 99.99 per cent of different infectious viruses.[26]

25. In the current context of the COVID-19 pandemic, social innovators and entrepreneurs are stepping up in the regional response, from providing educational technology and e-health services for the most vulnerable to developing community tracing initiatives. In this regard, government policies that incentivize businesses to look beyond profit maximization and put social responsibility at their core could support more effective bottom-up innovation for future pandemics. Indeed, several Governments in the region have put in place enabling policies to support social enterprises and inclusive businesses. They can be defined as business models and practices that aim to generate social and environmental impact, alongside economic return.

2. Financing innovation and innovative financing

26. Governments may also implement innovation funding initiatives and innovative financing mechanisms to engage the private sector in the COVID-19 response. As an example, in the United Kingdom of Great Britain and Northern Ireland, Innovate UK – a part of UK Research and Innovation – announced it would provide up to 20 million pounds sterling for businesses that applied with proposals for innovation projects. The aim of this competition is to support businesses in the United Kingdom to focus on emerging or

[23] Robyn Klingler-Vidra, Ba Linh Tran and Ida Uusikyla, "State capacity and COVID-19 testing", King's College London, 21 April 2020.

[24] Ari Supriyanti Rikin and Heru Andriyanto, "Indonesia mass produces COVID-19 testing kits", Jakarta Globe, 4 May 2020.

[25] Alita Sharon, "Thai hospitals roll out ninja robots to help combat COVID-19", Open Gov Asia, 19 March 2020.

[26] Wei Shyy, "From virus-slaying air purifiers to delivery robots, how university inventions are fighting COVID-19", World Economic Forum, 16 March 2020.

increasing needs of society and industries during and following the COVID-19 pandemic.[27]

27. In addition, innovative financing mechanisms can provide the private sector with the incentives and assurances they need to recoup research and development investments. One such mechanism is an advanced market commitment which has been implemented for past vaccine developments. To incentivize investment, assurances of vaccine uptake are provided to manufacturers in advance. Countries benefit both from having vaccines available at a much faster rate and from more predictable vaccine pricing. Advanced market commitments for pneumococcal vaccines were established in 2009 by a group of donors together with the Gavi Alliance, the United Nations Children's Fund and the World Bank. The pneumococcal advanced market commitment received $1.5 billion in long-term commitments from donors to incentivize the market to manufacture and supply vaccines for biological strains of pneumococcus in poorer countries.[28]

B. Collaboration between Governments and the public

28. During the pandemic, collaboration between Governments and the public in implementing measures arising or backed by technology does not necessarily lead to new technology solutions. Equally important is the outcome of collaboration. Effective communication between Governments and the public is essential for Governments to maintain or gain the trust of the public. In this respect, alternative communication technology is essential. In Singapore, Prime Minister Lee Hsien Loong used Facebook to reach out to citizens. The Ministry of Health also provided regular and consistent WhatsApp group updates of what was happening in the country and the extent to which the virus had spread.

29. Transparency can also be key to maintain or gain public trust in the deployment of technology solutions. For instance, the use of tracing applications has raised concerns about data privacy. In such cases, Governments can clearly explain to the public the details of the technology and relevant policy and laws for protection of data privacy. The Government of Australia made its tracing application very transparent. It explained how the application works and the privacy policy, and the benefits of using it as well as other issues.[29] A recent survey shows that more than 40 per cent of the population has downloaded the application.[30]

C. Collaboration between Governments

30. Disease knows no geographical boundaries. Enhanced international collaboration on COVID-19 should be a policy priority for Governments to ensure that the region moves forward together in the fight against COVID-19. The concept of open innovation should be a core principle in the technological response to the pandemic. Additionally, many countries in the region do not have the financial resources to develop meaningful research and development

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[27] https://apply-for-innovation-funding.service.gov.uk/competition/583/overview.

[28] Shirmila Ramasamy, "COVID-19 (coronavirus): ensuring equal access to vaccines through advanced market commitments", World Bank Blogs, 20 May 2020.

[29] Australia, Department of Health, *COVIDSafe App*, 3 June 2020. Available at www.health.gov.au/resources/apps-and-tools/covidsafe-app.

[30] Simon J. Dennis and others, "70% of people surveyed said they'd download a coronavirus app. Only 44% did. Why the gap?", The Conversation, 15 May 2020.

and technology investment initiatives. Therefore, pooled research and development funds can be used to ensure that no one is left behind.

1. Open innovation

31. Open innovation is the process of harnessing the distributed and collective intelligence of large groups of people.[31] It has taken on a wider meaning and application thanks to the Internet, which has enabled large numbers of people to interact and contribute at a relatively low cost.[32] The concept of open science has emerged from the open innovation movement. Open science moves beyond open-access research articles, towards encompassing all elements underpinning research activity. In general, open source refers to any program whose source code is made available for use or modification as users or other developers see fit. Open source software is usually developed as a public collaboration and made freely available.[33]

32. The COVID-19 pandemic has greatly stimulated open science. For example, the genome of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes COVID-19, was published by Chinese scientists on a public genome-data repository just days after the virus was isolated. This permitted the rapid creation of tests to detect infections.[34] By comparison, there was a five-month delay in the case of the severe acute respiratory syndrome outbreak in 2002–2003, due in large part to an information blackout during the first few months of that epidemic. Lessons from previous outbreaks have underscored the importance of sharing data and publications in order to combat the disease.[35]

33. The Government of Singapore shared the source code of TraceTogether, its contact tracing mobile application, to enable other organizations and countries to build similar solutions suited to their local contexts.[36] The application was useful to the Government of Australia in its efforts to develop its application.[37] The Government of Fiji has also been working with Singapore and other developers to test a contact tracing application.[38]

2. Pooled research and development funds

34. The international community has shown solidarity in pooling resources for research and development. More than 30 countries, together with the United Nations, philanthropic bodies and research institutes, have pledged

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[31] Henry W. Chesbrough, *Open Innovation: The New Imperative for Creating and Profiting from Technology* (Boston, Massachusetts, Harvard Business School Press, 2003).

[32] Don Tapscott and Anthony Williams, *Wikinomics: How Mass Collaboration Changes Everything* (London, Atlantic Books, 2007).

[33] Margaret Rouse, “Open *s*ource”, TechTarget (May, 2009).

[34] The Economist, “Scientific research on the coronavirus is being released in a torrent”, 7 May 2020.

[35] Organization for Economic Cooperation and Development, “Why open science is critical to combatting COVID-19”, 12 May 2020.

[36] Singapore, Government Technology Agency, *6 things about OpenTrace, the open-source code published by the TraceTogether team*, 9 April 2020.

[37] Macquarie University, “Privacy of the COVID-19 tracing app: everything you need to know!” (2020).

[38] Naveel Krishant, “Govt works with Singapore and USP to test a contact tracing app for COVID-19”, Fijivillage, 11 May 2020.

more than $8 billion to help develop a coronavirus vaccine and fund research into its diagnosis and treatment.

35. The Association of Southeast Asian Nations (ASEAN) and the Government of China have jointly set up a COVID-19 fund, part of which has been allocated for medicines and vaccine research to enable the ASEAN community to be self-reliant in the long run.[39]

36. The Government of New Zealand recently announced a COVID-19 vaccine strategy, which will enable New Zealand scientists to contribute to global research efforts and explore the potential of vaccine manufacturing capability in New Zealand. Up to $15 million is earmarked for international research collaboration, including research managed by the Coalition for Epidemic Preparedness Innovations. A further $7 million in official development assistance will go to the vaccine alliance, the Gavi Alliance, which distributes vaccines to developing countries. The Government will also advocate internationally for the equitable distribution of a COVID-19 vaccine, with a particular focus on ensuring the Commission's Pacific island partners can access it when needed.[40]

IV. Collaboration to strengthen digital inclusion and e-resilience

37. Digital technologies have been widely recognized as indispensable contributors and accelerators in the achievement of the Sustainable Development Goals. The importance of digital connectivity and inclusion became even clearer during the pandemic. Broadband-enabled applications brought medical services from overstretched health systems to the home, they brought digital textbooks to pupils, electronic stock market exchanges continued to function, and on-line shopping for goods kept supply chains moving, to mention but a few. Digital connectivity became a lifeline and it showed how technology can be harnessed to transform economies, societies and governments simultaneously across the entire globe. The current moment is a once-in-a-century chance to disrupt development trajectories and open up new opportunities for people and planetary prosperity.

38. In this environment, the resilience of core Internet infrastructure networks takes on unprecedented importance as it affects the capacity of technology to absorb and process real-time big data and deliver bandwidth-intensive high-value added services instantaneously.

39. E-resilience is defined as the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management. E-resilience forms one of the four pillars of the Asia-Pacific Information Superhighway initiative and the Master Plan for the Asia-Pacific Information Superhighway, 2019–2022. The Asia-Pacific Information Superhighway initiative aims to increase the availability and affordability of broadband across the region by strengthening the underlying infrastructure through regional cooperation.

[39] Bangkok Post Thailand, "Thailand and other ASEAN countries join China in the fight against the COVID-19", 18 May 2020.

[40] New Zealand, Beehive.govt.nz, *New Zealand Joins Global Search for COVID-19 Vaccine*, press release, 26 May 2020.

40. Prior to the pandemic, ESCAP developed an e-resilience toolkit which helps users to gain insight into how to build redundancies into network systems to ensure that the Internet functions, despite surges in traffic and other adverse events such as cybercrime. The toolkit is now being adapted to the current situation.

41. The pandemic has also made obvious the need to harness such technologies in the service of the public good through collaborative public-private actions. This need is expected to continue for a rather lengthy post-pandemic recovery period of many months, in which physical distancing will be the norm. Table 2 sets out a possible structure for such a collaborative framework, built around the concept of the resilience of ICT infrastructure networks and of ICT for societal resilience, for each phase of the disaster or crisis cycle, namely risk prevention, risk reduction, preparedness and response, and recovery.

Table 2
E-resilience from a pandemic management perspective

Pandemic phase and ICT role	*Risk prevention*	*Risk reduction*	*Preparedness, adaptation and response*	*Recovery*
Key task	Improving pandemic-informed investments, strategies, operations in ICT connectivity, risk analytics for early warning and enhanced preparedness	Mitigating the chance of virus-induced disruption, damage, socioeconomic losses, through development of analytical tools, applications, lessons learned	Risk indexing, lessening the impacts by preparing and being able to respond to new pandemics. Developing an e-resilience index to assess readiness	Restoring functions with graded lockdowns and operations, recovering to build back better
Resilience of ICT infrastructure networks	• Avoiding creation of new risks • Avoiding exacerbation of existing risks • Avoiding transfer of risks	• Addressing the underlying risk factors • Reducing vulnerability to pandemics • Increasing network capacity and protection through alternatives such as co-deployment of infrastructure • Reducing exposure • Investing in early warning	• Ensuring continuity plans on connectivity • Ensuring redundancy and backups • Ensuring response readiness • Ensuring training and drills • Ensuring contingency planning • Ensuring emergency mechanism • Ensuring early recovery	• Enabling rapid multidimension al assessment • Enabling estimation of needs • Ensuring recovery strategy • Investing to reduce future risks • Adaptive and innovative ICT networks

Pandemic phase and ICT role	*Risk prevention*	*Risk reduction*	*Preparedness, adaptation and response*	*Recovery*
ICT for societal resilience	• Utilizing ICT to improve risk assessments • Utilizing ICT for better analysis • Utilizing ICT for development planning through real-time data management, scenario planning techniques	• Establishing and utilizing risk databases • Utilizing GIS, remote sensing, science and technology for disaster risk reduction • Fostering knowledge and innovation • Enhancing risk monitoring and warning	• Utilizing ICT for preparedness • Utilizing ICT for assessment and emergency decision-making • Enhancing communication and coordination at all levels • Enhancing technologies for real data management and scenario planning	• Enabling rapid assessments and detailed post-disaster needs assessment • Acceptance of uncertainty and unpredictability • Public-private cooperation framework for diversity and redundancy

Abbreviations: GIS, geographic information system; ICT, information and communications technology.

42. Moving forward, under pillar 4 of the Asia-Pacific Information Superhighway initiative, broadband for all, the secretariat proposes the development of an action plan for digital transformation of the Asia-Pacific region. With the impetus provided by the pandemic, and anchored to the Secretary-General's road map for digital cooperation, the action plan would be based on an ambitious vision that seeks to connect the unconnected in an accelerated, scaled up and regionally coordinated way. In line with global connectivity targets, notably those of the Sustainable Development Goals, with a target date of 2030, and those of the Broadband Commission for Sustainable Development, with a target date of 2025, the action plan could set a target to increase connectivity twofold by 2025, for example, and to achieve universal access to broadband by 2030. The action plan would put Governments in the lead. Drawing from the Commission's research and lessons learned by countries that are closing the digital divide, the action plan would necessarily have to identify and quantify the investment needs for deployment of next generation networks and financing partnerships that have proven successful. The action plan would also identify policy and regulatory reform actions that need to be accelerated, and it would call for a coalition of partners.

43. Additionally, the secretariat proposes the development of an e-resilience index by country. The composite index would serve as a monitoring tool for Governments to assess the resilience (or vulnerability) of their digital infrastructure to inform and ensure that digital systems have the capacity to handle the crises of the future. Similar to the e-government development index developed by the Department of Economic and Social Affairs of the Secretariat, which consists of three equally weighted indices (namely, an online services index, a telecommunication infrastructure index and a human capital index), an e-resilience index could include indices related to speed, latency, bandwidth and redundancy and other factors that are relevant to digital and societal readiness. To develop this index, the secretariat proposes setting up a working group of experts under the overall guidance of the Asia-Pacific Information Superhighway Steering Committee. As a first step, the secretariat plans to include this in the work programme of the newly constituted thematic working group on innovation and technology for sustainable development of the United Nations Special Programme for the Economies of Central Asia. Its next meeting, jointly organized by ESCAP and the Economic Commission for Europe, will be held in July 2020.

V. Issues for consideration by the Committee

44. In dealing with COVID-19, Governments have engaged in unprecedented collaboration – at the national, regional and global levels – in the development and deployment of technology solutions. Moving forward, such momentum must be continued. Policies that harness the innovation capability within a country – especially the private sector and academia – and build public trust in technology will be key to the development and scaling up of effective solutions.

45. Equally, international technology collaboration between Governments will be critical to tackle a disease that knows no boundaries and to ensure that no country is left behind. In this regard, open innovation principles and pooled research and development funds are policy directions that Governments could pursue.

46. As the response to the COVID-19 pandemic increases reliance on digital connectivity, maintaining the momentum in infrastructure investment is not enough. Notwithstanding the progress many developing countries have made in rolling out mobile networks, accelerated investment momentum in gigabit networks is needed because investment in such next generation networks has lagged in many countries. There is a need to invest in much denser infrastructure networks with fibre-optic cables traversing the last mile to reach homes and buildings. While it is more expensive than previous generation networks, the secretariat’s research shows that co-deployment of fibre-optic cables along other passive infrastructure networks such as highways, railways and power networks is not only cost-effective but that it accelerates transformation to smart or intelligent systems with everything connected to the Internet (the Internet of things).

47. There will also be a need to improve the quality of the Internet. The secretariat’s research shows that building more carrier-neutral Internet exchange points – and for small countries on a shared basis – improves data traffic management. This results in more intraregional rather than extraregional content exchange, improved latency, speeds and costs.

48. The Committee on Information and Communications Technology, Science, Technology and Innovation may wish to discuss the following questions:

(a) What are the experiences and lessons learned of leveraging technologies in the fight against COVID-19?

(b) Going forward, what measures related to the use of technology should be implemented to ensure that countries can be better prepared to deal with pandemics?

(c) How can the region advance technology together in the fight against COVID-19 so that no one is left behind?

(d) How can the secretariat better support countries in the region to leverage technologies in the fight against pandemics now and in the future?

(e) How can countries prevent the digital divide from becoming the new face of inequality during the COVID-19 pandemic?

(f) How can the region double connectivity by 2025 and achieve universal connectivity by 2030?

49. Recognizing that humanity’s collective dependence on digital connectivity – brought to the fore by the pandemic – reinforces the criticality of cooperation, the Committee may wish to take the following actions:

(a) Discuss e-resilience, digital inclusion and the pandemic and make recommendations that will guide the next phase of the Master Plan for the Asia-Pacific Information Superhighway and the Asia-Pacific Information Superhighway Regional Cooperation Framework for the period 2023–2026;

(b) Anchored to the Secretary-General’s road map for digital cooperation, support the development of an action plan for the digital transformation of the Asia-Pacific region and an associated e-resilience index for better crisis preparedness in future.

50. The Committee may wish to discuss other issues contained in the present document.