Sandboxing and experimenting digital technologies for sustainable development

FROM INNOVATION HUBS AND POLICY EXPERIMENTS TO REGULATORY SANDBOXES

Digital technologies carry a promise to fast track sustainable development by supporting innovative, forwarding-looking policies and digital government solutions. There are, however, numerous risks and complexities of frontier technologies that come along with those opportunities, as well as policy and regulatory challenges such as those related to inclusion, competition, privacy and security.

Innovation hubs, incubators, accelerators or testbeds have since emerged as springboards for new technologies and are now common in many developed and developing countries. In some scenarios, however, the perceived risks and costs of failure in public sector innovation mean that policymakers and regulators may still prefer to stick to the status quo.

In more recent years, the relatively new approaches of sandboxes and experiments have emerged among some countries and have proven to be effective in creating a more conducive and contained space where Governments, in partnerships with the private sector and other relevant stakeholders, are able to test technologies in a controlled space with a small sample group before launching them at scale, allowing one to dramatically reduce costs and limit the chances of failure and negative impacts. Figure 1 illustrates various institutional approaches in innovation, experimenting and sandboxing.

Some countries have since implemented an institutional, policy or regulatory framework for the use of sandboxes, through public-private partnerships (PPP) or multistakeholder partnerships (MSP). For example, the United Kingdom's Financial Conduct Authority (FCA) has established a regulatory sandbox for enabling more efficient small medium enterprises (SME) lending and supporting the development of digital ID in the financial sector, specifically aiming at consumers and SMEs[1]. In Singapore, the Energy Market Authority (EMA) implemented a regulatory sandbox for the energy sector, with the primary focus on innovation in the sectors of electricity and gas, aiming to find innovative solutions for future renewable energy sources[2]. In Kazakhstan, the

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[1] Financial Conduct Authority (FCA), United Kingdom, 2021. Available at: https://www.fca.org.uk/insight/unleashing-potential-digital-identity-sandbox-observation
[2] Energy Market Authority (EMA), Singapore, 2021. Available at: https://www.ema.gov.sg/cmsmedia/Consultations/Electricity/2019/PD/Regulatory%20Sandbox%20Framework%20-%20Version%202.0.pdf
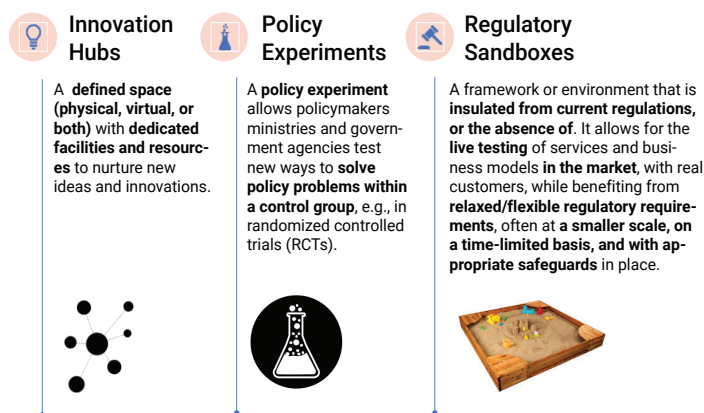
Key messages

» The speed, complexity and new risks of technological development often present policy and regulatory challenges. It is a common notion that governments have limited resources, expertise and capacity to understand, assess, and keep up with the fast-changing pace of ICT-enabled innovations. Very often this leads to scenarios of policy gaps or under-regulation, or both, that result in missed opportunities, policy failures, inherent risks to end-users, or regulatory overreactions that stifle innovation and exacerbate digital exclusion.

» The promise of sandboxes and experiments allows evidence-based decision-making and adaptive deployment of digital technologies in the pursuit of e-government aims. It allows institutions and regulators to experiment and trial with digital technologies and innovations at the edge or even outside of the existing policy space and regulatory framework.

» Sandboxes have gained popularity in FinTech in the past few years but could go beyond the financial sector to others, including health, education, transport, energy, connectivity and the digital economy, in fast-tracking smart, risk-aware implementation of digital technologies and in accelerating the implementation of the Sustainable Development Goals.

» Sandboxes and experiments have proven to be an effective catalyst in mitigating challenges brought about by the COVID-19 pandemic. The pandemic has had devastating impacts on society, but it has also accelerated digital government and digital transformation in e-health and other e-services, with successful outcomes through sandboxes and experiments, such as in contact tracing and quarantine measures.

» Institutions and regulators could consider investing in requisite resources and building capacities in deploying sandboxes and experiments, with the medium- and long-term aims to advance agile, responsive and resilient approaches in adopting new technologies and in preparing for the future of digital government and sustainable development.

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Figure 1
Various institutional approaches in sandboxing and experimenting[a]

Innovation Hubs

A **defined space (physical, virtual, or both)** with **dedicated facilities and resources** to nurture new ideas and innovations.

Policy Experiments

A **policy experiment** allows policymakers ministries and government agencies test new ways to **solve policy problems within a control group**, e.g., in randomized controlled trials (RCTs).

Regulatory Sandboxes

A framework or environment that is **insulated from current regulations, or the absence of**. It allows for the **live testing** of services and business models **in the market**, with real customers, while benefiting from **relaxed/flexible regulatory requirements**, often at **a smaller scale, on a time-limited basis, and with appropriate safeguards** in place.

a   UN DESA, 2021. Sensitization Workshop on "Frontier Technology Policy Experimentation and Regulatory Sandboxes", 3 June 2021. Presentation by Wai Min Kwok

Box 1
Countries with initiatives in experimentation and sandboxes

Out of the 149 responses to UN DESA's Member State Questionnaire in preparation of the 2022 UN E-Government Survey[a], 73 countries (over 48 per cent of responses) indicated there is some measure or initiative in policy experimentation and/or regulatory sandboxes in the use of digital technologies in the public sector. The majority of initiatives are related to FinTech while there are some initiatives in other sectors such as in health, energy and transport sectors.

a   UN DESA (2020). UN E-Governemnt Survey 2020. Available online at: https://publicadministration.un.org/en/Research/UN-e-Government-Surveys

Government is in the process of introducing a legislative framework through a draft bill for the use of experiments and sandboxes, referred to as an "experimental regime", to further promote innovation and digitalization, under the joint collaboration between the Artificial Intelligence Fund (AI Fund) and the Ministry of Digital Development, Innovation and Aerospace Industry.

This policy brief benefits from a study of over 60 cases of policy experiments and regulatory sandboxes from different countries across different regions ––– from both developed and developing countries, with the aim to seek analytical findings on the benefits as well as challenges and risks in experimenting and sandboxing for sustainable development.

WHAT IS A SANDBOX?

A sandbox is a framework or environment that allows for the live testing of technologies, services and business models in the market with real consumers, while benefiting from relaxed or flexible regulatory requirements, often at a smaller scale and on a time-limited basis, and with appropriate supervision and safeguards in place. Because of the availability of a conducive and contained space through a more lenient or flexible regulatory environment, a sandbox can facilitate the pertinent deployment of digital technologies and their rapid and effective inclusion in digital government. A sandbox not only insulates innovations from current regulations which may be restrictive or non-existent, but it also insulates against possible negative impacts on end-users.
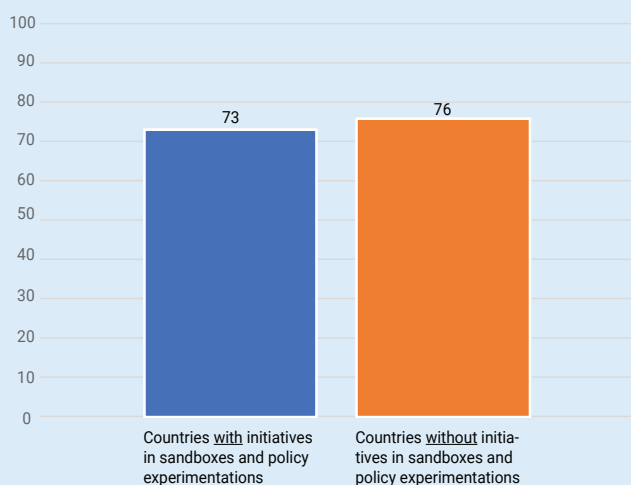
A sandbox has the potential to meet several objectives, including both regulatory and institutional. While regulatory objectives are most commonly limited to security, inclusion, consumer protection, competition, sustainability and among others, institutional objectives may be wider in scope, such as supporting the digital government ecosystem or encouraging collaboration with the private sector and other stakeholders. Sandboxes, however, are not universally designed for all challenges confronting regulatory and policy-making bodies faced with challenges in disruptive innovations.

Historically, sandboxes have been limited to a few fields like financial technology (Fintech). The first regulatory sandbox was launched in 2015 by the Financial Conduct Authority of the United Kingdom, when it first engaged with a wide range of firms and industry bodies to assess the feasibility of a regulator sandbox to drive innovative competition in financial services[3]. This had in turn generated great interest from regulators and innovators in FinTech. The global development of regulatory sandboxes in Fintech has also accelerated demand for regulatory innovations in other digital services, including in health, energy and transport, disrupting the traditional use of sandboxes in the financial sector and opening the concept to other needs. Several countries have developed specific sandboxes in other sectoral areas such as in energy, transport, connectivity and the digital economy. Figure 2 shows the sectors that Bangladesh, Kazakhstan and Maldives are piloting sandboxes in as part of the United Nations Development Account Project on policy experimentation and

3   Armstrong, H, C Gorst, and J Rae (2019), "Renewing regulation: 'Anticipatory regulation' in an age of disruption", Nesta.

| Finance | Energy | Transport | Connectivity | Digital economy |

Sandbox in digital currency[b]: In the pursuit of developing its digital economy, the Government of the **Maldives** has sought to establish a regulatory sandbox for the adoption of digital currency as a key component of its digital economic development. Through digital currency implementation led its Central Bank, the Ministry of Environment, Climate Change and Technology Government seeks to promote more convenient and confidential financial transactions with lower fees, along with financial transaction privacy and identity protection. Providing a cost-effective alternative to the traditional financial system will also potentially support the "unbanked" populace by providing affordable and easy access o formal financial services. Furthermore, the Government seeks to establish a monetary policy that is more transparent, while promoting and facilitating safe online transactions and easier currency exchange, all in the pursuit of achieving a cashless society in the digital economy.

Sandbox in the energy sector: In **Kazakhstan**, the implementation of a regulatory sandbox in the energy sector is expected to achieve three broad goals: (i.) decentralization, (ii.) digitalization, and (iii.) decarbonization. The proposed sandbox aims to tackle the lack of commercial interest in introducing energy-efficient and cost-saving technologies while resolving the high level of amortisation of electrical networks and shortages in electrical grid capacity in a number of regions. It is envisioned that electricity generation sources will be decentralised through the development of requisite network infrastructure. In order to achieve digitalisation, a centre of technological competence will be created, and the information security of modernised trading platforms will be strengthened. In order to achieve decarbonisation, the focus will be on both the decarbonisation of the energy generation sector as well as the development of the renewable and alternative energy sources sectors.

Sandbox in digital economy: In **Bangladesh**, a sandbox is being proposed by the Aspire to Innovate (a2i) Office, the ICT Division and the Cabinet Division, with the overarching objective of enabling the digitalization, market access and financial access of cottage, micro, small and medium enterprises (CMSMEs), which form the backbone of the national economy of Bangladesh. In the business sector, CMSMEs have suffered the most during the COVID-19 pandemic because of poor market access since most are not digitally enabled, despite various government's relief measures such as subsidies in the form of low-interest loans. The proposed sandbox, under the theme of "leaving no business behind", aims to inform policy reform and regulatory change, ensuring CMSMEs' access to information about new businesses, new types of skills, markets (especially digital markets), finance, technology and innovation, and business support services.

The **UN Development Account Project "Frontier Technology Policy Experimentation and Regulatory Sandboxes in Asia and the Pacific"** has been conceived and approved, with the objective to enhance the institutional capacity of selected countries in special situations to understand and develop digital technologies' policy experimentation and regulatory sandboxes. The Project is jointly implemented by UN DESA and UN ESCAP. Since the inception of the Project, the implementation has gained traction in all three target countries, namely Bangladesh, Kazakhstan and Maldives, with political leadership and substantive commitment from all three countries.

a   UN DESA, 2021. Ministerial Kick-off Event "2124B Frontier Technology Policy Experimentation and Regulatory Sandboxes in Asia and the Pacific", 16 November 2021. Available online: https://publicadministration.un.org/en/news-and-events/calendar/ModuleID/1146/ItemID/3111/mctl/EventDetails

b   UN ESCAP, UN DESA, 2021. National Consultation on "Frontier Technology Policy Experimentation and Regulatory Sandboxes" in the Maldives, 7 September 2021

regulatory sandboxes, jointly implemented by the UN Department of Economic and Social Affairs and the UN Economic and Social Commission for Asia and the Pacific[4].

BUILDING BLOCKS AND STAGES OF A SANDBOX

If implemented effectively, a sandbox can bring down the cost of innovation and reduce entry barriers, and allow policymakers and regulators to gain important insights before any decision-making. When considering a sandbox, Governments should clearly define the objectives and the challenges that need to be addressed.
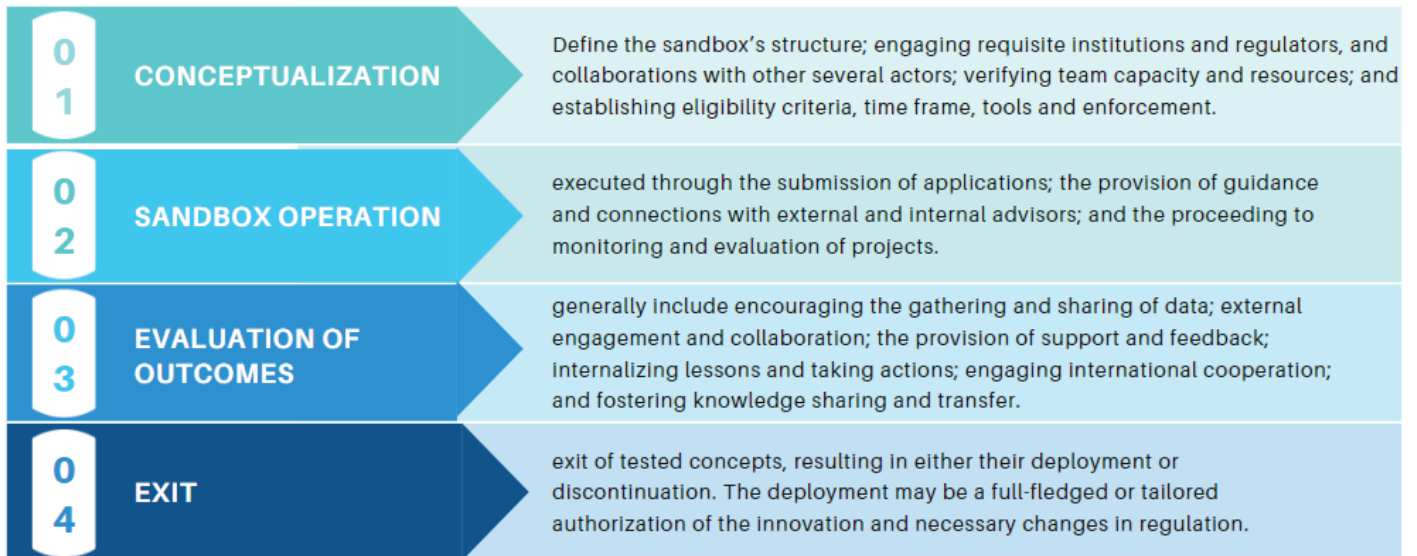
The success of a sandbox relies on the capacities of institutions and the existence of relevant legislation within jurisdictions, allowing for the proper establishment of the sandbox environment. Sufficient resources should be made available to support its implementation and evaluation. Sandboxes and experiments are resource intensive, and policymakers and regulators should be aware of this prior to initiating one. Moreover, institutions may find that sandboxes and experiments demand more of their time and skill than they have anticipated. Lack of technical staff and capacity thus may lead to serious consumer protection risks as well as reputational risks for the institutions, who may be held responsible for undue consequences[5].

4   UN DESA, 2021. 13th tranche Development Account Project "Frontier Technology Policy Experimentation and Regulatory Sandboxes in Asia and the Pacific".

5   World Bank, 2020. Key Data from Regulatory Sandboxes across the Globe   https://www.worldbank.org/en/topic/fintech/brief/key-data-from-regulatory-sandboxes-across-the-globe.

Figure 2
Building blocks and flow of a sandbox[a]

01	**CONCEPTUALIZATION**	Define the sandbox's structure; engaging requisite institutions and regulators, and collaborations with other several actors; verifying team capacity and resources; and establishing eligibility criteria, time frame, tools and enforcement.
02	**SANDBOX OPERATION**	executed through the submission of applications; the provision of guidance and connections with external and internal advisors; and the proceeding to monitoring and evaluation of projects.
03	**EVALUATION OF OUTCOMES**	generally include encouraging the gathering and sharing of data; external engagement and collaboration; the provision of support and feedback; internalizing lessons and taking actions; engaging international cooperation; and fostering knowledge sharing and transfer.
04	**EXIT**	exit of tested concepts, resulting in either their deployment or discontinuation. The deployment may be a full-fledged or tailored authorization of the innovation and necessary changes in regulation.

a   Author's adaption from various sources, including (i) Wechsler, Michael, Leon Perlman, and Nora Gurung. "The state of regulatory sandboxes in developing countries." Available at SSRN 3285938 (2018).

A sandbox functions as a journey or cycle and traverses through four building blocks and stages (1) **conceptualization of the sandbox**, including its eligibility criteria, safeguards and application requirements, organizational structure, and operational details; (2) **sandbox operation** after due diligence is performed; safeguards to be implemented and reporting requirements and protocols to be followed; sandboxes vary considerably in the testing durations used, from two weeks to three years; (3) **evaluation of outcomes**; outcomes may also result in request for an extension period or scaling up to include a wider test sample; and (4) **exit** of sandbox, resulting in either the deployment or discontinuation of an initiative. The deployment may be a full-fledged or tailored authorization of the innovation and necessary changes in regulation. See Figure 2 on the building blocks and flow of a sandbox.

It is important to note that each step must be completed within a defined timeframe. Conditions for each step, however, may vary depending on their design and aims by competent authorities or regulators. To ensure the proper and effective conduct of the regulatory journey, the process through these steps requires a controlled environment with clear boundaries and safeguards[6]. Sandboxes also require institutional support and discretionary supervision throughout the cycle, further implying lenience or supervisory discretion about the way in which the policy or regulatory framework applies to innovative products or services.

Furthermore, precise considerations should be made in formulating and implementing sandboxes and experiments, particularly in countries observing significant disparities in their socio-economic contexts. Institutions should conduct feasibility assessments to gauge the scope of the policy implications and legislative frameworks, as well as the economic, social and sustainability

of the sandbox, and finally the capacity to implement and operate a sandbox itself. It is also important to check viability based on external criteria or influences, for instance market demand, people's needs and the current digital ecosystem.

Institutions governing sandboxes must ensure that participating consumers are not unduly exposed to risks. Consumer protection measures within sandbox frameworks include the need to provide transparent information to consumers on data protection and other governance issues, and clarity on the respective roles of stakeholders.

WHY ARE SANDBOXES AND EXPERIMENTS RELEVANT TO THE SUSTAINABLE DEVELOPMENT GOALS?

Digitalization and technological advances have pushed development to a whole new level, bringing innovative, forward-looking solutions with enormous potential to fast forward the achievement of the 2030 Agenda for Sustainable Development, across all 17 goals and several global targets. The rise of digital technologies, however, as they scale up to be increasingly sophisticated and more pervasive, also presents new risks and amplifies threats to governments and users, such as data breaches, digital frauds, privacy and cybersecurity risks. The advent of frontier technologies such as artificial intelligence, blockchains, 5G, cloud-computing, machine learning, the Internet of Things and robotics, can also leave those unconnected and less digitally literate people further behind, widening existing divides among people digitally, economically and socially.

The effective introduction of sandboxes and experiments can address policy or regulatory gaps, while striking a balance between policy and regulation constraints and the promotion of

6   World Bank, 2020. Key Data from Regulatory Sandboxes across the Globe   https://www.worldbank.org/en/topic/fintech/brief/key-data-from-regulatory-sandboxes-across-the-globe.

technology-driven innovations, in order to achieve optimal contributions to sustainable development, while containing risks of new technologies to the minimum.

LIMITATIONS OF SANDBOXING AND EXPERIMENTING

Sandboxing and experimenting can enable Governments to engage in efficient, targeted and creative solutions and technologies in priority areas for sustainable development and in post-COVID recovery. They are, however, subject to variWous limitations.

Contextualisation matters

Generally, sandboxes provide a case-by-case rather than a one-fits-all approach. As sandboxes facilitate coordination and adaptation between technologies, policies and regulations, successful experiments may result in specific policy reforms or regulation adjustments. It must be stressed, however, that policy experiments and regulatory sandboxes should be considered as tools for flexibility and responsiveness to the needs of particular socio-economic situations. While there is no universal blueprint or set of best practices to follow, institutions regulators can consult publicly available resources before implementing a sandbox.

Limited transparency

While details about sandbox participation agreements are generally not made public and often subject to confidentiality agreements, care should be taken to avoid exclusion of segments of industries or the population, especially vulnerable groups, or causing negative public perception such as privacy and other data governance issues[7]. In concluding a successful sandbox implementation, due consideration must be taken for existing partners of the sandbox who may enjoy significant benefits over others from special status through accommodation of relaxation of regulations and communication with the competent institution or regulator[8].

A sandbox is not a panacea for all digitalization challenges

A sandbox is not a panacea in addressing the potential or risks of all digitalization challenges, nor is it the only solution[9]. Other options include agile regulatory and adaptive approaches to test new innovations under specific circumstances. Nonetheless, compared to other approaches, sandboxes are deemed to be more structured and objective-driven, but also more bureaucratic and resource-intensive[10].

7   Wechsler, Michael and Perlman, Leon and Gurung, Nora, The State of Regulatory Sandboxes in Developing Countries (November 16, 2018). Available at SSRN: https://ssrn.com/abstract=3285938 or http://dx.doi.org/10.2139/ssrn.3285938

8   Ibid.

9   Molly Lesher, 2020. Bringing new digitally enabled products and services to market: Sandboxes and the role of policy experimentation. Available online: https://voxeu.org/article/sandboxes-and-role-policy-experimentation

10 United Nations Secretary-General's Special Advocate for Inclusive Finance for Development, 2018. "Briefing on Regulatory Sandboxes, UNSGSA Fintech Sub-Group on Regulatory Sandboxes".

Box 3
Other recommendations shared by experts at a sensitization workshop[a]

Creating conducive enabling environments for sandboxing and experiments

The most important aspect of regulatory sandboxes is the will of the decision-maker and, as such, when conducting sandboxing, clear leadership within the government and a high degree of inter-agency cooperation is critical in developing a mechanism for learning when it comes to regulatory trials and sandboxes, to allow for the government to make better informed regulatory decisions. As an example, Singapore takes an expert-driven, technocratic approach to governance and a soft risk management approach when it comes to regulatory sandboxes, allowing for it to make regulatory decisions at a fast pace.

Creating collaborative efforts with the private sector, think tanks and others

When conducting sandboxing, project timelines and expectations should be clear. Government stewardship is key and managing the expectations of private enterprises and public interests is the responsibility of the government. Established stakeholders may at times form a barrier for new stakeholders seeking to enter various industries. The government must take responsibility when managing the competing interests of stakeholders so as to mitigate conflict between stakeholders, and regulatory sandboxes provide a kind of solution that allows for emerging stakeholders to enter industries in a limited fashion without directly challenging established stakeholders.

Furthermore, government entities cannot act in silos and there must be clear guidelines established on which agency is responsible for what because when an issue is "ring-fenced," other government agencies view that issue as being the responsibility of the particular agency or other stakeholder that is in control of the "ring-fenced" issue. Therefore, transparency, both between government entities and between the public and private sector is crucially important because information asymmetry poses a problem to the success of sandboxing. It is important that agreements to access relevant information are in place and there exists a mechanism to allow for benefits from cooperation and learning between public and private stakeholders. The formation of public-private partnerships (PPPs) is beneficial in the long-term for the Governments in maintaining regulatory oversight and PPPs allow for the public sector to be able to access skills and human capital that it may not have, to invest in training. In addition, the expert speakers noted the vital role of cooperation and communication between all stakeholders to maximize local and international recourse.

a   UN DESA, 2021. Sensitization Workshop on "Frontier Technology Policy Experimentation and Regulatory Sandboxes", 3 June 2021.

WHAT CAN GOVERNMENTS DO TO START EXPERIMENTING AND SANDBOXING?

Build an institutional culture and institutional capacity of experimenting and agile government

The capacity to operate sandboxes and experiments effectively may in turn strengthen the digital capacity of institutions and regulators. Building an institutional culture in sandboxing and experimenting may also result in facilitating more open and active dialogues with innovators, increasing agility and responsiveness through digital government. Sandboxes and experiments can help break down policy and regulatory barriers to bringing in digital technologies for development. Institutions and regulators should build capacities in order to be able to give thoughtful consideration to whether innovations should be tested in a sandbox or experiment.

Inclusion and leaving no one behind

Sandboxes and experiments may open space for inclusion through digital technologies - for example, the use of digital ID, biometric ID, blockchain-based land registrations, and new business models serving marginalized clients. But they may also result in exclusion if not created with inclusiveness by design at the onset. It is important to plan deliberately for inclusion in roll-out with positive outcomes of the sandbox, with appropriate adjustments made to both the innovative concepts and technologies evaluated, and the policy and regulatory frameworks to be adjusted for all beneficiaries, beyond the sandbox target group.

Data governance in managing and evaluating sandbox operation

For successful implementation of sandboxes and experiments, data are key in the life cycle of the sandbox, including its conceptualization, operation, evaluation and exit. Timely, reliable, quality and disaggregated data, and appropriate data governance measures, are needed to facilitate the operation and evaluation of a sandbox. Data and its governance are especially important since the sandbox approach is relatively new. The utility of sandboxes and their impact on sustainable development can be further examined and substantiated through practical implementation or academic research.

Collaborative approaches, partnerships and knowledge transfer

In pursuing sandboxes and experiments, institutions and regulators will need to come together as a whole-of-government -- across sectors and levels of government, and as a whole-of-society – in collaboration with the private sector, think tanks, the academia and other stakeholders. While there is no universal blueprint or set of best practices to follow, institutions can consult global and regional bodies and other publicly available resources. It is also important to engage industry and other stakeholders early in the process to get diverse perspectives and to secure buy-in from various concerned partners and stakeholders[11]. These include other jurisdictions with a sandbox in place, international development organizations such as UN DESA, other institutions through peer learning platforms or think tanks.

EXPERIMENTING AND SANDBOXING IN POST-COVID-19 RECOVERY

The COVID-19 pandemic has caused widespread sufferings across all facets of our society and upended the daily lives of people, especially vulnerable groups. The pandemic has not only brought about unprecedented challenges to sustainable development, but has also accelerated digital government and digital transformation in many areas. While many governments and businesses have rapidly turned to digital platforms and digital solutions, the COVID-19 pandemic has exposed harsh fragilities and digital divides, especially for countries in special situations. Because of such digital divides, the adverse impacts of the pandemic have unevenly affected countries in special situations.

The use of digital technologies in managing challenges brought about by the pandemic across countries, such as in tracking and tracing cases or in delivering healthcare, has been promising. The emergency authorization and use of contact tracing apps, for instance - while not technically termed or referred to as a regulatory sandbox - is essentially a sandbox, as it operates in exactly the same way by allowing for the experimentation of a new technology and the collection of resulting data, facilitating communication between innovators and regulators to craft individual approvals, and allowing real-world deployment after successful, rapid pilots.

In striving to recover better post-COVID-19, we must refocus on the most pressing development issues. A number of sectoral and policy issues that are highlighted as critical in the Decade of Action and Delivery of the Sustainable Development Goals have retrogressed to different extents due to the pandemic. Such issues include climate change, global hunger, renewable energy, digital identity and social protection. Lessons learned through rapid experiments and sandboxes during the pandemic could be invaluable – in doing more with less through technology and innovation, and to have an accelerated path in addressing questions by policymakers on how to incentivise and stimulate the use of digital technologies for sustainable development.

In essence, the pandemic has fomented a force that has accelerated progress in many policy areas, including through sandboxes and experiments. The challenge remains to pick up the momentum, and to create a similar sense of urgency to leverage on digital technologies to resolve critical issues key to sustainable development for all.

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11 Ibid.