



## TAKING ACTION TO IMPROVE LIVES

2018 ECOSOC Integration Segment, 1-3 May 2018

**Innovative communities: leveraging technology and innovation to build sustainable and resilient societies**

Conference Room Paper

[30 April 2018]

### Introduction

The theme of *“Innovative communities: leveraging technology and innovation to build sustainable and resilient societies”* is the focus of the 2018 Integration Segment of the Economic and Social Council (ECOSOC), to be convened from 1 to 3 May 2018. The Segment will promote the balanced integration of the three dimensions of sustainable development, in line with General Assembly resolution 68/1. Contributing to the main theme of the 2018 ECOSOC cycle, “From global to local: supporting sustainable and resilient societies in urban and rural communities,” the Integration Segment will: (1) discuss how policy makers can use integrated policy approaches to enhance resilience and inclusion as key enablers to achieve the 2030 Agenda for Sustainable Development at the local, national, regional and global levels taking into account all three dimensions of sustainable development; (2) serve as a platform for exchange of best practices on how technology and innovation can be leveraged as tools to effectively design a resilient future, while leaving no one behind; (3) showcase policy instruments and mechanisms that support risk management and reduction across the hazard spectrum, including external shocks and natural disasters; and (4) discuss how technology and innovation, particularly pro-poor and gender-sensitive solutions, can support efforts to strengthen the resilience of public policy and governance structures through inclusiveness, participation and transparency with the view to fostering sustainable and resilient societies for the achievement of the Sustainable Development Goals (SDGs).

The meeting is a unique opportunity to bring together key stakeholders to assess the status of integration and coherence of actions to build resilience for the implementation of the Sustainable Development Goals, and to provide action-oriented recommendations feeding into the High Level Political Forum on Sustainable Development (HLPF).

This conference room paper consolidates the contributions received from Member States and ECOSOC subsidiary bodies. It further draws on analytical work conducted within DESA and on contributions received from the United Nations system on the theme of the meeting (see box below). The paper aims to contribute to the deliberations by providing an overview of current initiatives, lessons learned and recommendations on the way forward to meet the ambition of the 2030 Agenda and leave no one behind.

**This conference room paper has been based on contributions that were received from Member States, ECOSOC subsidiary bodies, as well as UN entities.**

**Contributions were received from Chile, Colombia, Cuba, Guatemala, Madagascar, Mexico, Nauru, and Turkey, as well as by the following ECOSOC subsidiary bodies: CCPCJ, CDP, CND, CSW, ECA, ECE, ECLAC and ESCAP. The paper further draws on contributions from UN system entities, including FAO, IAEA, IFAD, ITU, OCHA, OSAA, UNDP, UNESCO, UN-Habitat, UNICEF, UNIDO, UNFPA, UNISDR, UNODC, UN Women, WFP and WIPO, as well as IOM and the WB. These contributions are available on the [2018 ECOSOC Integration Segment website](#).**

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## I. Resilience decoded – building blocks towards 2030

We are living in an era where cross-cutting topics abound. This can be both virtuous and challenging. The recognition of transversal areas for policy action is vital to gather political, financial and strategic support to adopt integrated policy frameworks and move away from traditional silos.

At the same time, the cross-cutting realm is often prone to abstraction and generalization. The complexity of the many ways in which root causes intersect and their resulting cross-cutting impacts are often dealt with in an abstract manner. This can be misleading as well as frustrating for anyone trying to find practical solutions for the implementation of the SDGs. The 2030 Agenda for Sustainable Development is in its third year of implementation. The SDGs imply a significant departure from business-as-usual in any decision-making process. We are, therefore, adapting to a new way of thinking and acting.<sup>1</sup>

We are all beginners in this ambitious task. Our collective drive stems from the recognition of the gravity of global threats before us – as individuals as well as communities and nations – and from the urgency to tackle them before it may be too late. The 2030 Agenda for Sustainable Development is the reflection of this recognition and urgency of action, transforming them into a vision that echoes our collective ambition to work for a sustainable future.

Climate change, globalization, technological progress and demographic patterns are transforming our world as we know it.<sup>2</sup> The interactions between these major factors of change are producing several mega-trends that are shaping the way we work, think, create, get medical treatment, interact with each other – ultimately, an important number of areas that determine the way we live.

These changes are making societies nimbler and eliminating previous barriers; at the same time, they are also creating challenges to economic and social structures and environmental resources, within and beyond borders. Therefore, it is important to understand the process by which these forces develop, and their impact on natural resources, economies, industries, businesses, societies and individual lives. Moreover, while they produce significant change per se, when combined their disruptive impact is greatly magnified.

The predicaments contained in the 2030 Agenda have shown thus far to be timely and insightful. Challenges such as instability of financial markets, growing inequality, migration and refugee crises, natural disasters and other environmental shocks, water and food crises, energy insecurity, cybersecurity, as well as further social, economic, environmental and political issues linked to these, are becoming more complex and global in nature. We should, therefore, remain ambitious.

Increasing resilience to shocks and crises opens the way to sustainable paths, as overcoming them will be less disruptive of long-term trajectories. Innovation and technology are fundamental instruments to building resilience, which is defined as the capacity to recover from calamity or to adjust to change. The more resilient a society, the faster it can recover from and prosper after disruptions, like those caused by shocks or crises.

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<sup>1</sup> See for example Saul Griffith, *Climate Change Recalculated*, <http://longnow.org/seminars/02009/jan/16/climate-change-recalculated/>

<sup>2</sup> See remarks by the Secretary General at the occasion of the One Planet Summit, 12 December 2017. <https://www.un.org/sg/en/content/sg/statement/2017-12-12/secretary-general-s-remarks-one-planet-summit>

Technological progress has been instrumental in specifying climate change, as well as finding appropriate ways to deal with it. Advancements in science and technology enabled great improvements in health, transportation, energy solutions and connectivity, among others. Technological progress has also been a major enabler of globalization by boosting international trade and financial integration, as well as in allowing for better and cheaper long-distance communication and real-time exchanges of data and information, bringing people closer and promoting the sharing of ideas. This progress has not been exempt of challenges, such as automation, robotics and the future of work, cybersecurity, and artificial intelligence, as well as the potential impact of these developments on human and civil rights. All these issues need to be tackled in an appropriate way. But if we want to address the growing challenges stemming from a complex and interconnected world, we will need technology and innovation on our side, to help us not only doing things better but also doing better things.

Resilience is not a new concept. It has been applied to various areas at different levels: first introduced in natural sciences, including physics, ecology and biology, it further became prevalent in psychology, sociology, educational sciences and medicine. In recent years, resilience has been applied to an increasing number of areas, including economics, information technology, politics, business continuity, disaster risk reduction and crisis management, and national security.

This spread of the concept of resilience seems to point to the search for more suitable methodological and conceptual frameworks to deal with the growing interrelated and complex nature of current challenges. Nevertheless, only recently has the debate broadened to encompass a true interdisciplinary account of the phenomena, evolving around a definition for resilient societies<sup>3</sup>. This debate is often framed in terms of systems, placing resilience in the inter-disciplinary space of phenomena. Systems theory studies the organization of phenomena and investigates both the principles common to all complex entities and the models that can be used to describe them.

As Internet and cell phone users multiply all over the world, we move towards a model of connectivity that is highly interconnected and decentralized. The same pattern, that of a distributed network, is shaping in the case of energy distribution. Some studies have shown that distributed networks are more resilient than centralized networks because it allows more efficient flows (of information or energy) across the network, and thus malfunctions are less disruptive. Using the systems approach, models are developed on data produced by these networks of entities and the interchanges through them. Here, too, technology and innovation are key tools to convert data into information for decision- and policy- making.

A resilient society in today's world is one that recognizes the pivotal transformative forces at play and develops strategies to address systemic challenges and transform them into opportunities. While this may seem a rather plain definition at first, it embeds some key elements which are highlighted below.

First, in endogenizing the interrelated, complex and global nature of current phenomena, the concept of resilient society intrinsically recognizes the importance of international cooperation for coherent and coordinated action, and normative frameworks. In the context of dynamic global challenges, it has become paramount to recover and uphold the principles of multilateralism.

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<sup>3</sup> Roland Benedikter / Karim Fathi, "What is a resilient society?", International Policy Digest, 17 September 2017, <https://intpolicydigest.org/2017/09/17/what-is-a-resilient-society/>

The 2030 Agenda provides a universal, coherent and unifying normative framework that promotes international cooperation to find global solutions to global problems while recognizing that each country must find its own policy mix in accordance with its particular national circumstances. The 2030 Agenda embeds, explicitly or tacitly, other critical international agreements, such as the Addis Ababa Action Agenda, the Paris Agreement on Climate Change and the Sendai Framework for Disaster Risk Reduction (2015-2030). The New Urban Agenda, adopted at the United Nations Conference on Housing and Sustainable Urban Development (Habitat III) in October 2016, also provides an important framework agreement for sustainable and inclusive urbanization.

Second, integrated policies shaped by coherent normative frameworks are solid bases for national resilience strategies. Multi-dimensionality and integration go hand-in-hand; policy integration is the tool that enables policymakers to properly address phenomena of interrelated and complex nature. Also, the explicit focus of the 2030 Agenda on institutions as an intrinsic component of sustainable development provides an impetus for governments to devote more attention to finding institutional models and public administration approaches that effectively support integrated approaches.<sup>4</sup>

The need to provide integrated responses to unexpected calamities has been demonstrated by experiences in the aftermath of recent events, such as the extreme weather occurrences in the Caribbean region in 2017, the Zika virus epidemic in North and South America in 2015-16 or the Ebola outbreak in West Africa in 2014. Critically, in those countries with high exposure and low resilience, as in the Least Developed Countries (LDCs), the occurrence of disruptive crises sets them off in a vicious cycle of unsustainable development paths: the augmented vulnerabilities considerably limit their ability to enact effective instruments to counteract and overcome the external shocks, which compound on their limited ability to generate sufficient wealth to guarantee the livelihood or wellbeing of their population, further increasing exposure and lowering resilience to shocks.<sup>5</sup>

There is thus an element of strategic thinking and forecasting analysis, based on short- and long-term trends and other relevant data. Future foresight techniques<sup>6</sup> and policy toolkits developed in this context have increasingly attracted attention, due to the possibility of mapping policy options in the context of complex, interrelated, global challenges.

Third, the gap between the growing scale and complexity of current and emerging challenges and the financial, institutional and operational support any given stakeholder can tap into is increasing. In the case of public policy making and implementation, this gap is seen to be widening at an alarming speed. Capacity development and other means of development cooperation are essential complements to efforts on domestic mobilization of resources in developing countries, in particular in LDCs.

While public authorities still count with established institutional systems and networks, it is important to recognize the vital contribution of other stakeholders in building more resilient and sustainable societies. This implies working towards more inclusive decision-making and policy implementation processes, and building stronger partnerships with different actors. It is crucial to engage the private sector in the public policy debate while making sure the latter is not captured by private interests. In

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<sup>4</sup> United Nations, 2018, Working Together: Integration, institutions and the Sustainable Development Goals, World Public Sector Report 2018, Division for Public Administration and Development Management, Department of Economic and Social Affairs, (DPADM), New York, April 2018. Website: [publicadministration.un.org](http://publicadministration.un.org)

<sup>5</sup> See contribution by the [Committee for Development Policy](#).

<sup>6</sup> See for example Scenarios architecture, <http://shirinelahi.com/>

addition, civil society and innovative social movements are becoming pivotal actors in dealing with complex, global challenges. While inclusive processes are becoming more common, civil society is becoming more vocal on a broader number of issues, which seems to indicate a desire to better align people's preferences to public policy design and implementation. A central element in this context is building trust among partners.

Communities, cities, nations and regions around the world are taking climate action and setting their own ambitious targets; thousands of private corporations, non-governmental and other civil society organizations and academia are partnering among themselves and with governments to find innovative solutions to various local, national and regional concerns, in the spirit of multi-stakeholder engagement upheld by the 2030 Agenda.

Yet, more needs to be done. Given the magnitude of the challenges before us, business as usual cannot continue. Every decision we take needs to factor in sustainability. Giving the most powerful ministries and institutions responsibility for sustainable development is perhaps the best indication of commitment that governments can provide to the public. It may trigger a range of changes in institutions that support an enhanced potential for integration in practice, such as: adoption of integrated budget frameworks; higher salience of national strategies and plans that reflect integrated approaches; allocation of resources more closely reflecting sustainable development priorities; alignment of incentives for cross-sectoral and vertical collaboration among public institutions; new or strengthened arrangements for external oversight and scrutiny of national progress; and many others<sup>7</sup>. This can only lead to better preparedness and resilience. A private sector optimizing returns in a time- and resource consistent manner should promote sustainable and resilient business practices. This should also lead to more investment in productive, rather than financial, assets, which would in turn fuel the resilience virtuous cycle. Investment in R&D, which eventually defines which technology and innovation is available at a given moment, should also follow sustainability criteria.

Fourth, many resilience strategies have been designed and implemented at the local level. Indeed, while transformative forces have become more global, the biggest impact is felt at the micro, and local level. Furthermore, the success of implementation of policies developed at the international and national levels largely depends on how well they are understood, interpreted and implemented at the local level. This is why the vertical integration is important and why national and global processes have to take into account the needs and concerns of local communities.

Communities have often come together to address collective challenges using inclusive participatory processes, increasing ownership and, in this way, also the success probability of designing and implementing sustainable, custom-made solutions to the community's needs. Cohesive communities that seek to share rights and responsibilities in developing solutions to their common challenges are usually more resilient to adversity<sup>8</sup>. This is due to the strong common support to the end goals, stemming from the shared vision implied in those goals.

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<sup>7</sup> United Nations, 2018, Working Together: Integration, institutions and the Sustainable Development Goals, World Public Sector Report 2018, Division for Public Administration and Development Management, Department of Economic and Social Affairs, (DPADM), New York, April 2018. Website: [publicadministration.un.org](http://publicadministration.un.org)

<sup>8</sup> Assuming these processes also rely on transparent planning and organization, with clear assignment of tasks and definition of goals and outcomes in a way that gathers a majority support in the community.

Many cities around the world<sup>9</sup> have put in place resilience strategies to deal with their main problems as well as to seek to improve services provided to, and empowering, their communities. Smart cities rely heavily on networks, both physical and social. Infrastructure is a crucial element of resilience. With the spread of digitization and networks, utilities and services have become more efficient and cheaper, but also potentially more vulnerable to cyber threats and breaches. Resilient cities see social cohesion, environmental balance and cybersecurity as essential elements in their resilience strategies.

Fifth, as the idiom goes, a chain is as strong as its weakest link. Indeed, as the world becomes more globalized, the foundations for its resilience and sustainability rely on individual behaviors, in particular on individual values. As a point of the network, each individual receives and emits information flows that will add to the data produced by the network. Knowledge is being used and produced at all times, albeit in different ways. This process signifies a decentralization of knowledge and an empowerment of the individual. In this context, education, training and culture gain particular importance. Sensitizing people for the important global challenges with evidence-based information is crucial to form individual opinions that will ultimately be reflected in public policy. But, in order to form characters and values, the nuclear family and early age school education is key to instill sound principles and civic education. Social cohesion is critical for the prosperity of the individual, and thus society. It is in this regard that disorderly and mass migration<sup>10</sup> is a major cause of concern, as it damages the fundamentals of social fabric and jeopardizes sustainable livelihood.

## **II. Technology and disaster risk reduction**

Natural and man-made disasters are among the root causes for displacement and migration. The 2017 hurricane season has illustrated, once more, the need to enhance resilience and reduce disaster risk. The adverse effects of climate change have exacerbated existing vulnerabilities and exposure, resulting in a dynamic risk landscape. Extreme weather events and natural hazards cause substantial hardship to affected communities, impacting human health, leading to consequential losses in biodiversity and economic activity, thereby creating significant stress on countries' institutional systems. Yet, resources continue to flow primarily to post-disaster activities rather than towards disaster risk reduction and the improvement of coping capacity. Against this backdrop, this section will focus on how technology and innovation can be used as effective tools for disaster risk reduction, advancing both the Sendai Framework for Disaster Risk Reduction (2015-2030)<sup>11</sup> and the 2030 Agenda.

Sudden-onset disasters displace an average of 25 million people a year<sup>12</sup>, particularly affecting the poor and the most vulnerable populations. By 2030, there could be 325 million people trapped in poverty and exposed to the full range of natural hazards and climate extremes, particularly in sub-

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<sup>9</sup> See 100 Resilient Cities Initiative, <http://www.100resilientcities.org/>

<sup>10</sup> See General Assembly resolution 71/1 of 19 September 2016, New York Declaration for Refugees and Migrants, <https://undocs.org/A/RES/71/1>

<sup>11</sup> The Sendai Framework outlines seven clear targets and four priorities for action to prevent new and reduce existing disaster risks: (i) Understanding disaster risk; (ii) Strengthening disaster risk governance to manage disaster risk; (iii) Investing in disaster reduction for resilience and; (iv) Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction. It aims to achieve the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries over the next 15 years. See [https://www.unisdr.org/files/43291\\_sendaiframeworkfordrren.pdf](https://www.unisdr.org/files/43291_sendaiframeworkfordrren.pdf)

<sup>12</sup> Internal Displacement Monitoring Centre (IDMC)

Saharan Africa and South Asia, in addition to the impact of man-made and cascading disasters.<sup>13</sup> Annual economic losses from earthquakes, tsunamis, cyclones and flooding soared to an estimated USD300 billion globally, with the World Bank estimating global annual losses at USD520 billion.<sup>14</sup> In 2017, this figure has been far surpassed, as hurricanes Harvey, Maria and Irma caused more than USD300 billion in damages in the United States alone. In the Caribbean region, climate change is estimated to contribute an additional USD1.4 billion to the expected average annual losses (AAL) from cyclone wind damage. For Small Island Developing States (SIDS), AAL from disasters are equivalent to almost 20 per cent of their total social expenditure, whereas heavily indebted middle-income countries and Least Developed Countries (LDCs) witness low commodity prices and financial shocks restrain growth rates below the seven per cent needed to achieve the SDGs.<sup>15</sup> Budgets allocated to post-disaster reconstruction therefore divert resources from much needed investments in other sectors of sustainable development.<sup>16</sup>

Hence, increasing resilience and reducing disaster risk requires creating a “culture of prevention”<sup>17</sup> and a better understanding of “interlinked uncertainties”<sup>18</sup>, i.e. all types of risks, exposures and vulnerabilities across economic, physical, social, cultural, and environmental areas. Integrated and gender-sensitive policies supported by whole-of-system governance structures will be critical in this regard.

However, changing behaviors towards increased investments in disaster risk reduction require a clear articulation and communication of the social and economic benefits. Understanding disaster loss and risk therefore is the first step for risk-informed, evidence-based decision making. Accelerated efforts are required to ensure all countries systematically account for disaster losses and conduct risk assessments to develop national and local disaster risk profiles, as a basis for coherent and inclusive disaster risk reduction policies and plans per target (e) of the Sendai Framework for Disaster Risk Reduction (2015-2030). As women and girls are disproportionately affected by disasters, the development and implementation of integrated and gender-sensitive policies and plans are critical in this regard and can be supported by comprehensive data sets, the collection of which is facilitated by new technology, including Information and Communications Technologies (ICTs), artificial intelligence, drones or social media, to name a few.

In order to strengthen understanding and capacities for resilience building, the Sendai Framework calls to prioritize the development and dissemination of science-based risk knowledge, technology and innovation and to strengthen the science-policy interface. The *Science and Technology Roadmap to support the implementation of the Sendai Framework*<sup>19</sup> was agreed at the first global Conference

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<sup>13</sup> Overseas Development Institute (Oct 2013), The geography of poverty, disasters and climate extremes in 2030. <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8633.pdf>

<sup>14</sup> World Bank (2016), Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters. <https://openknowledge.worldbank.org/handle/10986/25335>

See also contribution by the [Economic Commission for Latin America and the Caribbean \(ECLAC\)](#).

<sup>15</sup> UNISDR, Global Assessment Report on Disaster Risk Reduction 2015. <https://www.unisdr.org/we/inform/publications/42809>

<sup>16</sup> [ECLAC contribution](#).

<sup>17</sup> [UNESCO contribution](#).

<sup>18</sup> Roland Benedikter / Karim Fathi, “What is a resilient society?”, International Policy Digest, 17 September 2017, <https://intpolicydigest.org/2017/09/17/what-is-a-resilient-society/>.

<sup>19</sup> [https://www.preventionweb.net/files/45270\\_unisdrscienceandtechnologyroadmap.pdf](https://www.preventionweb.net/files/45270_unisdrscienceandtechnologyroadmap.pdf)

on Science and Technology for Disaster Risk Reduction in January 2016.<sup>20</sup> Integrated approaches that incorporate risks and climate change factors in public policies within the framework of sustainable development are also considered critical.<sup>21</sup>

Existing technology-enabled solutions that can be leveraged to increase preparedness to and manage the risk of disasters include spatial data, monitoring and early-warning systems, and emergency telecommunications. The potential of big data and drone-technology to foster resilience is being explored in several countries. Innovative solutions are also being applied to “build back better” once a disaster struck. Examples of technology and innovation for disaster risk reduction, response and recovery are analyzed below.

### Managing risk through early warning systems

Many countries are investing in early warning systems and meteorological services, including for earthquakes, tropical storms or droughts, to make informed decisions and increase preparedness. Earthquake early warning systems (EEWS) have been implemented in Mexico, for example.<sup>22</sup> EEWS help to save lives and infrastructure by disseminating timely information about potentially catastrophic earthquake hazards. EEWS use state-of-the-art technology by rapid telemetric analysis of the initial seismic waves generated by an earthquake, detected from a dense network of seismic sensors.<sup>23</sup> Since 2005, the *ESCAP Multi-Donor Trust Fund for Tsunami, Disaster and Climate Preparedness* has contributed to building resilience in communities through regional and national early warning systems for coastal hazards. Existing examples include the *Indian Ocean Tsunami Warning and Mitigation System (IOTWMS)* and the *Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES)*<sup>24</sup>. Moreover, citizen science and community-based observations of changing coastal environments are generating critical data, e.g. through the Sandwatch project<sup>25</sup>, serving as a baseline for measuring impacts of natural disasters and climate change, increasing understanding of risk and enhancing resilience.<sup>26</sup>

In the Asia-Pacific region, the UN Economic and Social Commission for Asia and the Pacific (ESCAP) developed a Regional Drought Mechanism<sup>27</sup> recognizing drought as a multi-dimensional challenge that affects many countries in the region at multiple levels, which weakens resilience within and across communities if timely and appropriate mitigation measures are not taken. In 2015, early warning forecasts for drought in Mongolia were developed through the Regional Drought Mechanism. Additional analysis revealed that drought was forecast for pasture lands, which could have had multi-dimensional impacts on traditional nomadic communities in the region and livestock production as the backbone of people’s livelihoods. By identifying the geographic distribution of poverty and livestock headcount through geospatial information and mapping products, an integrated approach

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<sup>20</sup> <https://www.unisdr.org/we/inform/events/45270>

<sup>21</sup> [Guatemala contribution](#)

<sup>22</sup> See <http://geografica.cenapred.unam.mx/reporteSismosGobMX/>

<sup>23</sup> [UNESCO contribution.](#)

<sup>24</sup> RIMES has worked with individual countries to address capacity gaps with respect to early warning, including through the project "CAP on a MAP -Improving Institutional Responsiveness to Coastal Hazards through Multi-Agency Situational Awareness", implemented with the Asian Institute of Technology (AIT) and the Sahana Software Foundation.

<sup>25</sup> UNESCO, <http://www.unesco.org/new/en/natural-sciences/priority-areas/sids/sandwatch/>

<sup>26</sup> [UNESCO contribution.](#)

<sup>27</sup> Contribution by the [Economic and Social Commission for Asia and the Pacific \(ESCAP\).](#)

was used to strengthen resilience. By delivering the right information to the right people at the right time, within the context of drought monitoring, early warning and poverty alleviation, technology applications can support strengthening the resilience of the most vulnerable communities. Moreover, weather index-based insurance products can be critical in this regard. IFAD and WFP have developed the Weather Risk Management Facility, a joint initiative to support the development of weather risk management instruments. With a broader approach, the Platform for Agricultural Risk Management aims to promote risk management capacity for the agriculture sector in developing countries, with a holistic perspective to risk assessment, capacity-building and product development.<sup>28</sup>

Space technology applications and hydro-meteorological tools can help increase community resilience by building the coping capacity of households through water, land and crop management information forecasting and early warning. ESCAP's Regional Space Applications Programme for Sustainable Development in Asia-Pacific (RESAP) provides at high-risk communities with space applications.<sup>29</sup> The RESAP network in partnership with the Operational Satellite Applications Programme of UNITAR allows to support countries through the facilitation of near real-time satellite imagery and access to geospatial data. Subsequently, disaster-affected countries can receive support for effective community emergency responses, and policy advice on recovery and rehabilitation. Such services for early warning, response and damage assessment of earthquakes, floods, typhoons/cyclones and landslides benefit communities which lack the necessary infrastructure and institutional arrangements required to access and maintain their own well integrated monitoring, early warning and response mechanisms.

#### Assessing disaster risks at the local level

Understanding risks is the first component of building resilient communities and societies. The United Nations Office for Disaster Risk Reduction, with the support of European Commission, IBM, AECOM and other partners and cities participating in the Making Cities Resilient Campaign, have developed a Disaster Resilience Scorecard for Cities<sup>30</sup> that currently is being implemented by 200 cities around the globe. The Scorecard provides a set of assessments that will allow local governments to monitor and review progress and challenges in the implementation of the Sendai Framework for Disaster Risk Reduction (2015-2030) and assess their disaster resilience. It is structured around UNISDR's Ten Essentials for Making Cities Resilient. The Scorecard requires the collaboration of a range of actors – local government, private business, community groups, academic institutions, other organizations or individuals – to assess, maintain and improve city's resilience. Using the framework of indicators and standards enabled cities to create a snapshot of their resilience, to build new relationships between organizations that have a role in mitigating the risks of disasters and to draw on ideas and innovation from across the globe.

#### Spatial data

Having been collected for decades, spatial data has been largely out of reach for most, due to cost, a lack of accessible software, and low capacity in countries that need the data most. The Innovation Lab of the Global Facility for Disaster Reduction and Recovery (GFDRR) has been working to make this data

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<sup>28</sup> Contribution by the [International Fund for Agricultural Development \(IFAD\)](#).

<sup>29</sup> [ESCAP contribution](#).

<sup>30</sup> <https://www.unisdr.org/we/inform/publications/53349>

accessible and useful by collaborating with partners like the Open Data for Resilience Initiative (OpenDRI). The partnership is working to power open source technology and geospatial data sharing platforms and has helped people gain access to risk information.<sup>31</sup> A code for resilience has also been created, connecting local technologists and disaster risk experts to create civic-minded digital and hardware solutions to identify and reduce the risk posed by natural disasters.<sup>32</sup>

Moreover, the *Spatial Data Sandbox* project, being piloted in partnership between UNDP, NASA, National Geographic and academia, will enable over 140 countries to better use spatial data related to the nexus between environment and the SDGs. The spatial data obtained through the *mapx.org* tool supports policy-makers getting a more accurate understanding of changes in biodiversity thereby enhancing decision-making for resilience and environmental conservation.<sup>33</sup>

### Big Data

Moreover, big data derived from the use of ICTs holds great promises to strengthen countries' resilience, e.g. in relation to health-related emergencies. Digital footprints left by using online services, phones and other digital transactions, can be gathered, analyzed and used to develop better policies, and provide more individualized services. Because of the near ubiquity of the mobile-cellular network and as an ever-growing number of people are using mobile phones, data from mobile phone operators are particularly valuable, including in the case of emergencies.<sup>34</sup> ITU's big data project launched in 2015 showcased the potential of big data to facilitate the timely exchange of information to combat the Ebola epidemic - which had gripped West Africa in 2014 - and future health crises. The project used Call Detail Record (CRD) data, which includes information on the use of the mobile phone, including the location, from mobile network operators in Liberia, Guinea and Sierra Leone. Analyzed CDR data can provide critical information on human mobility, including cross-border movement, and the spatiotemporal distribution of people, while safeguarding individual privacy.<sup>35</sup> The Words into Action Guide on 'Disaster Displacement: How to Reduce Risk, Address Impacts and Strengthen Resilience'<sup>36</sup> further offers practical guidance to help government authorities integrate human mobility considerations into regional, national, sub-national and local disaster risk reduction strategies in accordance with target (e) of the Sendai Framework.<sup>37</sup>

Similarly, the "RapidPro" application supports the gathering of accurate and timely data in the areas of health, nutrition, education and child protection, including in remote and hard to reach places.<sup>38</sup> For example, in Indonesia, RapidPro provided real-time tracking and troubleshooting for the country's largest-ever measles and rubella vaccination campaign. The RapidPro platform was highlighted as a model for cooperation by developers across countries in the global South.<sup>39</sup>

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<sup>31</sup> World Bank, <https://www.gfdrr.org/>

<sup>32</sup> [World Bank contribution.](#)

<sup>33</sup> [UNDP contribution.](#)

<sup>34</sup> [ITU contribution.](#)

<sup>35</sup> Ibid.

<sup>36</sup> Developed by IOM, the Norwegian Refugee Council (NRC), the Platform on Disaster Displacement, UNHCR, UNISDR, and the Internal Displacement Monitoring Center (IDMC).

<sup>37</sup> [IOM contribution.](#)

<sup>38</sup> [UNICEF contribution](#)

<sup>39</sup> Ibid.

Innovative projects in the area of data collection for better risk assessment are also supported by the *Challenge Fund*<sup>40</sup>. Currently, 15 creative initiatives aim at better understanding disaster risk in over 20 countries. “Floodtags”, for example, collects data through Twitter for on-the-ground flood observations in the Philippines. ThinkHazard!, a risk visualization tool, will allow users to quickly develop risk profiles on eight different types of hazards. Operating as an open source platform, the data can be used without charge, empowering non-experts to determine the level of natural hazards in their locality and encouraging greater incorporation of risk management into project planning and design.<sup>41</sup>

### Resilient telecommunications infrastructure and emergency telecommunications

When disasters strike, people living in remote and isolated areas with no access to basic information and communication facilities are particularly affected. Consequently, ensuring the resilience of telecommunications infrastructure and emergency telecommunications plays a critical role in disaster risk reduction and management, including by delivering early warnings and ensuring timely flow of vital information in the immediate aftermath of disasters.<sup>42</sup> Strengthening the cooperation between operators of telecommunication services and national disaster offices is critical in this regard.<sup>43</sup>

Besides existing mechanisms, such as the Humanitarian Connectivity Charter<sup>44</sup> and the Crisis Connectivity Charter<sup>45</sup>, social media offer new avenues for enhancing disaster risk reduction and alerting vulnerable populations. During the response to hurricane Irma in the Caribbean, a free social messaging tool, “U-report”, designed to allow users to speak out on development issues, support child rights and improve communities, was deployed to deliver potentially life-saving messages to more than 25,000 people within the first 14 days of the response.<sup>46</sup> Follow-up surveys showed that U-Report was the only source of preparedness information for more than one third of its 4.6 million users active in 40 countries. More than 80 percent of U-Reporters shared the information with at least one person. The OCHA-managed Ethiopian Humanitarian Fund is another example of using technology and innovative humanitarian approaches to respond to large-scale drought emergencies and the associated disease outbreaks, like the one experienced in Ethiopia in 2017. The project facilitated the movement and living expenses of health workers surged to Somali region by the federal government in response to the expanded acute watery diarrhea outbreak.<sup>47</sup>

Furthermore, the *Improving Resilience to Emergencies through Advanced Cyber Technologies (I-REACT)* project combines information from monitoring systems, earth observations, historical information and weather forecasts with data gathered by new technological developments created by I-REACT. These include a mobile app and a social media analysis tool to account for real-time crowdsourced information, drones to improve mapping, wearables that provide an accurate positioning, as well as augmented reality glasses to facilitate reporting and information visualization by first responders.

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<sup>40</sup> Joint Initiative of the Global Facility for Disaster Reduction and Recovery (GFDRR) and the UK’s Department for International Development (DFID), <https://www.gfdr.org/en/challenge-fund>.

<sup>41</sup> [World Bank contribution](#).

<sup>42</sup> [ITU contribution](#).

<sup>43</sup> ECLAC, (2017), [“Strengthening cooperation between telecommunications operators and national disaster offices in Caribbean countries”](#).

<sup>44</sup> An agreement between mobile network operators in 100 countries to support access to communication and information for those affected by conflict and natural disasters. [OCHA contribution](#).

<sup>45</sup> A similar agreement for the satellite industry. [OCHA contribution](#).

<sup>46</sup> [UNICEF contribution](#).

<sup>47</sup> [OCHA contribution](#).

Citizens are thereby enabled to report first-hand information, policymakers are supported in the decision-making process, and first responders are equipped with essential tools for early warning and response.<sup>48</sup> OCHA is also working through its Centre for Humanitarian Data to develop an infrastructure to enable the safe sharing of data about crisis-affected people through OCHA's Humanitarian Data Exchange (HDX) platform. The goal of HDX is to make humanitarian data easy to find and use for analysis.<sup>49</sup>

In Nepal, ICTs are being used to increase communities' resilience to landslides and flooding through a participatory approach to knowledge generation and risk governance. The research project "Landslide Environmental Virtual Observatories (EVO)" and a similar Mountain EVO offer decentralized and open technology platforms for knowledge generation and exchange that enable participation of marginalized and vulnerable communities bypassed by traditional mechanisms.<sup>50</sup>

### Drone-based technology

Several countries in collaboration with UN entities are exploring drone-based technology for a range of applications, including vaccine and medical supply delivery or transport; improved connectivity in hard-to-reach communities; and aerial imaging for better preparedness and response in emergencies. In 2017, two drone testing corridors have been established in Malawi and Vanuatu.<sup>51</sup>

Similarly, drones are being utilized in the Maldives to provide risk maps of the island communities that are most vulnerable to the impacts of natural-hazard induced disasters and climate change. This project enables better informed policy decisions and actions to ensure the resilience of over 160 inhabited islands spread over a vast area. The use of drone technology has helped reduce the time required for mapping from one year to one day. Bhutan has also deployed drones to assess the damage of natural disasters in a time efficient manner which is particularly relevant in mountainous landscapes. Costa Rica is using drones to monitor wetlands, Rwanda is leveraging sensors via the Internet of Things (IoT) for water management. Zambia, Former Yugoslav Republic of Macedonia and Nepal are also exploring the use of sensor data from drones to inform local solutions.<sup>52</sup>

### Leveraging technology-enabled solutions to "build back better"

Technology-enabled solutions are also critical to support the recovery from disasters and to "build back better" as a key element to prevent future loss and damage.<sup>53</sup> This includes, for example, the assessment of whether public buildings, such as schools or hospitals, are safe for public use. "Non-destructive testing" (NDT) techniques, including radiography and gamma tomography<sup>54</sup>, are being applied to detect invisible structural defects that cannot be discovered through traditional testing

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<sup>48</sup> [UNESCO contribution.](#)

<sup>49</sup> [OCHA contribution.](#)

<sup>50</sup> [UNESCO contribution.](#)

<sup>51</sup> [UNICEF contribution.](#)

<sup>52</sup> Through 2017, UNDP in partnership with UNOOSA, UNITAR/UNOSAT, UNV and space agencies supported 26 country offices with geo-spatial maps and capacity building to support their analysis and disaster response. [UNDP contribution.](#)

<sup>53</sup> ECLAC has developed the Damage and Loss Assessment (DaLA) methodology in 1972, and the Post Disaster Assessment (PDNA) methodology. See [ECLAC contribution.](#)

<sup>54</sup> Based on the differential absorption in different materials of gamma rays emitted from a radioactive source. These techniques were applied in the aftermath of the earthquakes in Nepal in 2015 and in Ecuador in 2016.

methods.<sup>55</sup> Similarly, VISUS, a technical-triage methodology<sup>56</sup> that has been piloted in Italy, El Salvador, Lao People's Democratic Republic, Indonesia, Peru, Haiti and Mozambique, helps to assess the vulnerabilities to natural hazards of existing school facilities. The methodology thus allows for science-based decisions on cost-effective safety-upgrading strategies.<sup>57</sup>

Post-earthquake field investigation is also supported by the International Platform for Reducing Earthquake Disasters (IPRED), a collaborative platform in the field of seismology and earthquake engineering to share findings and lessons from earthquake disasters with other earthquake-prone countries to enhance future disaster risk reduction.<sup>58</sup> Furthermore, training in energy efficiency and the use of energy efficiency indicators would enable countries to strengthen disaster and emergency strategies to ensure the resilient recovery of their energy sectors.<sup>59</sup>

Strengthening infrastructure in the areas of energy, transportation, water and communication is therefore critical to minimize disaster risks. In Turkey, different strategies have been prepared to prevent or mitigate possible physical, economic, social and environmental damages of disasters and design better post-disaster response and recovery activities as well as to build new urban spaces which are resilient, safe, well-prepared and sustainable. In this context, the Urban Transformation Law calls for the regeneration of weak and illegal structures, building safe and good quality settlements which are important elements of disaster risk reduction. This Law also includes financial incentives for enhancing cities and buildings resilience. In addition, a Disaster Insurance Law was enacted to secure the economic damages in buildings directly caused by earthquakes.<sup>60</sup>

### **III. Balancing infrastructure development and sustainability at the local level**

Population growth, the changing demographic structure of populations already settled in cities, and the increasing migration between cities are the emerging urban demographic dynamics. Trends in urbanization are integrally linked to sustainable development. With good planning and governance, the increasing concentration of people in urban settlements can facilitate economic and social development, while also offering opportunities to mitigate the adverse impact of consumption and production on the environment. However, rapid and unplanned urban growth threatens sustainable development when the necessary infrastructure is not developed or when policies are not implemented to protect the environment and ensure that the benefits of city life are equitably shared.<sup>61</sup> Moreover, as extreme weather events intensify with climate change, the exposure of informal settlements to disaster risk are also likely to become more severe. Addressing inequalities both through social policy tools and urban planning, in addition to policies for affordable urban land and housing access, is essential for building urban resilience.<sup>62</sup> In this respect, investing in gender-responsive and quality, reliable, sustainable and resilient infrastructure, in urban as well as in rural areas, for safe drinking water and sanitation, energy, transport, water for irrigation, and technology,

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<sup>55</sup> [IAEA contribution.](#)

<sup>56</sup> Developed in collaboration of UNESCO and SPRINT-Lab researchers at the University of Udine, Italy.

<sup>57</sup> [UNESCO contribution.](#)

<sup>58</sup> [Ibid.](#)

<sup>59</sup> [ECLAC contribution.](#)

<sup>60</sup> [Turkey contribution.](#)

<sup>61</sup> United Nations (2014), "[World urbanization prospects](#)".

<sup>62</sup> [ECLAC contribution.](#)

including information and communications technology, and other physical infrastructure for accessible public services<sup>63</sup> can significantly increase a community's successful response to shocks.<sup>64</sup>

While urbanization is without a doubt one of the 21<sup>st</sup> century's megatrends, the share of Latin America and the Caribbean population living in megacities and large cities is set to plateau towards 2030, with mid-sized cities interlinked with existing metropolitan systems registering higher growth.<sup>65</sup> To enhance socio-economic resilience across communities, it is therefore vital to encourage urban-rural interactions and connectivity and eliminate geographic and territorial disparities by strengthening gender-responsive sustainable and affordable transport and mobility, technology and communication networks and infrastructure<sup>66</sup>, and adopting territorial approaches, stronger metropolitan coordination as well as governance systems as a cornerstone of urban resilience strategies.<sup>67</sup> In this context, UN-Habitat defines urban resilience as the measurable ability of any urban system, with its inhabitants, to maintain continuity through all shocks and stresses, while positively adapting and transforming toward sustainability. The City Resilience Profiling Tool (CRPT) provides a transversal diagnosis and pathway to resilience-based sustainable urban development.<sup>68</sup>

Technological advances can also play an important role in enhancing countries' and communities' resilience to external shocks<sup>69</sup>, by protecting infrastructure, while respecting the environment. For example, spatial planning and infrastructure development have a critical impact on the environment and the resilience to disasters. The Geneva UN Charter on Sustainable Housing acknowledges the need to promote and monitor integrated urban development and regeneration, while taking into account potential dangers and hazards and increasing resilience to climate change. Appropriate risk assessment and disaster forecasting are necessary to adopt preventative measures. Country Profiles on Housing and Land Management carried out by the Economic Commission for Europe (ECE) have assessed different aspects related to housing, urban development and land administration systems to identify existing challenges and provide policy recommendations. The outcomes of these participatory policy assessments are sometimes incorporated in national action plans, as in the recent Country Profile of Armenia.<sup>70</sup>

Furthermore, as broadband networks and technologies are the prerequisite for reaping the benefits of ICTs, limited growth rates in fixed broadband subscriptions pose a major challenge to a community's development. To fully capitalize on the opportunities of e-commerce, paperless trade, transport facilitation, e-health and e-learning, underlying broadband infrastructure should be available and resilient in urban as well as rural communities of developing countries. In this context, ESCAP has been supporting the Asia-Pacific Information Superhighway (AP-IS) initiative, which aims to develop seamless regional broadband networks to achieve inclusive sustainable development in the region.<sup>71</sup> ECLAC, on the other hand, acts as the technical secretariat of the Regional Conference on Information Society in Latin America and the Caribbean which facilitates the follow-up to the Regional Digital

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<sup>63</sup> [Commission on the Status of Women \(CSW\) contribution.](#)

<sup>64</sup> [Ibid.](#)

<sup>65</sup> [ECLAC contribution.](#)

<sup>66</sup> [CSW contribution.](#)

<sup>67</sup> [ECLAC contribution.](#)

<sup>68</sup> See [UN-Habitat contribution](#) and <http://urbanresiliencehub.org/tools-for-action>.

<sup>69</sup> [Nauru contribution.](#)

<sup>70</sup> [Economic Commission for Europe \(ECE\) contribution.](#)

<sup>71</sup> [ESCAP contribution.](#)

Agenda for Latin America and the Caribbean.<sup>72</sup> The mission of the Digital Agenda is to develop a digital ecosystem that builds on a regional process for integration and cooperation that favors policies underpinning a society based on knowledge, inclusion, equity, innovation and environmental sustainability.<sup>73</sup> However, in the context of technological progress, risk management in the digital realm becomes increasingly important. As cities across the globe are building a ‘smart’ infrastructure - using networked solutions to increase the effectiveness of their transportation systems, water management and electricity networks - the protection of these infrastructures depends on innovative solutions to build ‘cyber-resilience’. In this context, the Commission on Crime Prevention and Criminal Justice (CCPCJ) is working on strengthening international cooperation to combat cybercrime (CCPCJ resolution 26/4), including through an intergovernmental expert group on cybercrime.<sup>74</sup>

Additionally, the provision of stable, sustainable and affordable energy will be crucial to secure the resilience of the ever-expanding urban centers and for the development of rural ones. However, the ways energy is produced, transmitted, and accessed are all transforming, while electricity is and will remain one of the few commodities in the modern world that must be produced, distributed and delivered in real time to meet demand. In this transitioning energy environment innovation is critical to address future pressures, whilst tackling the environmental problems associated with climate change. Approaching the energy sector in a holistic manner – considering climate technology and innovation, energy systems and infrastructure, as well as climate policy and partnerships – is imperative. To this end, UNIDO’s clean energy program aims at enhancing the use of renewable energy and the efficient use of energy by industry. It is also facilitating access to affordable and sustainable energy for productive activities and income and employment generation.<sup>75</sup>

Enhancing economic resilience at the local level will also have a critical impact on the overall ability of a community not only to remain strong but also to prosper. Responsible investment and sustainable technology have the potential to contribute to economic transformation and lead to greater prosperity and resilience by expanding the production base, improving market access and infrastructure development. In addition, the advent of the Industry 4.0 creates new opportunities to improve productivity, competitiveness, and resource efficiency and effectiveness, thus, contributing to more sustainable production and consumption patterns and a more resilient economy.<sup>76</sup> As improved market access does not directly solve the problem of the lack of productive capacity, supply-side oriented support to infrastructure-building, enhancing firm productivity and trade policy reform, as envisioned under the Aid for Trade initiative, can be instrumental. However, there is an urgent need to shift Aid for Trade allocation towards countries most in need of such support such as the Least Developed Countries.<sup>77</sup>

Nonetheless, as in many LDCs, low agricultural productivity is a major cause of food insecurity and a constraint on shifting economic activities towards manufacturing and modern services, sustainable agriculture can be the backbone of economic development.<sup>78</sup> In rural areas that heavily rely on agriculture for their livelihoods, the risks associated with investing in agriculture remain prohibitive

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<sup>72</sup> Agenda digital para America Latina y el Caribe, [eLAC 2018](#).

<sup>73</sup> [ECLAC contribution](#).

<sup>74</sup> Commission on Crime Prevention and Criminal Justice ([CCPCJ contribution](#)).

<sup>75</sup> [UNIDO contribution](#).

<sup>76</sup> [UNIDO contribution](#).

<sup>77</sup> [CDP contribution](#).

<sup>78</sup> *Ibid.*

for many national and international private actors due to uncertainties associated with seasonality, climate, vulnerability to economic and natural shocks, as well as guaranteeing required quality and quantity of produce.<sup>79</sup> This requires policies that boost productivity by providing access to advanced agricultural inputs, extension services, infrastructure and credit, as well as removing gender-specific constraints on the sector.<sup>80</sup> Since 2012, the International Fund for Agricultural Development (IFAD) has been blending climate finance with regular investments under its Adaptation for Smallholder Agriculture Programme (ASAP) to support the adaptation of poor smallholder farmers to climate change by incorporating resilience-building activities into projects that aim to improve food security and economic outcomes in rural communities. ASAP has delivered improved early warning systems for drought and flood prone areas, submersible roads that will not wash away after a few years, and community infrastructure to protect coastal areas from the brunt of monsoon storms. ASAP is also investing in upgrading building codes of rural infrastructures to make them more resilient and bring climate adaptation to policy dialogues.<sup>81</sup>

In the case of Small Island Developing States (SIDS), sustaining economic growth can be challenging due to their small size, remoteness, narrow resource and export base, and exposure to global environmental challenges and external economic shocks, including to a large range of impacts from climate change and potentially more frequent and intense natural disasters. In the case of Nauru, for example, the risks associated with climate change impacts exacerbate the country's vulnerability as nearly all population and vital infrastructure are concentrated in the coastal areas. Prolonged drought periods, also significantly impact health, food, water and economic security. To address these challenges, the government, with the support of partners, is investing in the use of renewable energy and non-diesel power generation, water, waste management, roads, sea and air transport services. Additionally, Nauru is developing climate resilient port infrastructure to offset the risk of monetary value loss and food shortages. Ongoing challenges remain, including inadequate water storage capacity, water delivery standards and the lack of specialized capacity in modern technologies.<sup>82</sup>

#### **IV. National strategies for resilience**

Reducing vulnerabilities across multiple sectors requires strategic planning and coordination. Yet, capacity gaps remain at the local, national and global levels to effectively do so.<sup>83</sup> Drawing on contributions received from Member States and the UN system, this section features examples of integrated national strategies and policies that foster sustainable development and resilience, with emphasis on how technology and innovation can be leveraged to support the implementation of those strategies, policies and initiatives.

The main risks faced by many countries around the globe are related to climate change induced extreme weather events and natural disasters, as well as earthquakes, exacerbated by water and food crises. As many of these hazards are of transboundary nature, cross-border and regional initiatives, policies and institutional frameworks are important additional layers in resilience planning, which requires coordination at and between different levels of governance. Institutional frameworks at the

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<sup>79</sup> [IFAD contribution.](#)

<sup>80</sup> [CDP contribution.](#)

<sup>81</sup> [IFAD contribution.](#)

<sup>82</sup> [Nauru contribution.](#)

<sup>83</sup> See [Nauru contribution.](#)

international level also play an important role in driving political support, increasing public awareness and catalyzing financial and technical assistance, as well as in ensuring coherence of actions and providing a framework for monitoring and follow-up.

As demonstrated in section II, countries are investing in early warning and climate prediction systems to make informed decisions about natural resources management<sup>84</sup>, particularly water and renewable energy, and to strengthen national policy frameworks for resilience, in line with the Sendai Framework, the 2030 Agenda and the Paris Agreement on Climate Change. Nauru, for example, has established a Department of National Emergency Services (NES) which includes a Meteorology office, and aims at enhancing capacity, amongst other things. The government is also investing in setting up a new office for NES that can house all the necessary technical equipment to ensure that NES is able to effectively coordinate all communication and emergency responses. Moreover, the National Disaster Risk Management Act 2016 supports a more proactive approach to manage disasters. It prioritizes preparedness and risk reduction measures, and established a new disaster management architecture.<sup>85</sup>

Enhancing the capacities of local authorities and sectors in charge of early warning systems is also of particular concern to Cuba. Different initiatives have been launched in this regard, including management centers for disaster risk reduction, geographic information systems and studies on threats, vulnerabilities and risks that will gradually identify the different threats affecting the country.<sup>86</sup> Efforts are also undertaken to incorporate a gender and generational focus in existing disaster risk reduction strategies. The latter are updated on an annual basis and early warning systems are tested every year at the national and local levels. Since 1986, Cuba has conducted annual prevention and awareness raising exercises (“Meteoro Exercise”) to increase the level of preparedness of its citizens and minimize losses when disasters strike. The role of the media to provide information and raise awareness is critical in this regard.<sup>87</sup> While ICT and social networks are becoming increasingly available, there remain coverage gaps in rural areas. Likewise, indigenous languages need to be taken into account for inclusive and efficient transmission of risk reduction protocols and information.<sup>88</sup> In Mexico, a National Risk Atlas is available to everyone.<sup>89</sup>

The coordination within government and between the different levels of government has been highlighted as critical for building resilient societies. Participatory approaches involving academia, civil society and the private sector in the policy making and implementation processes of resilience strategies are also crucial for the effectiveness of the latter. Turkey, for example, has established 70 ad-hoc committees and working groups through which contributions of public institutions and organizations, academia, private sector and nongovernmental organization to the policy making process are ensured. The Disaster and Emergency Management Administration (AFAD) was established in order to improve disaster risk reduction and preparedness activities and ensure cooperation and coordination among agencies working on disaster issues.<sup>90</sup>

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<sup>84</sup> See for example contributions by [Cuba](#), [Nauru](#), [Turkey](#).

<sup>85</sup> [Nauru contribution](#).

<sup>86</sup> See [Cuba](#) contribution.

<sup>87</sup> Ibid.

<sup>88</sup> See contribution by [Mexico](#).

<sup>89</sup> Ibid.

<sup>90</sup> See contribution by [Turkey](#).

In Nauru, coordination mechanisms have been created to foster more collaborative approaches, e.g. to implement the national sustainable development strategy and to mainstream climate change and disaster risk reduction. However, capacity challenges remain to ensure effective planning using a whole-of-government approach. Nauru has identified the need to break down silos through cross-sectoral meetings, where mandates and responsibilities overlap and information is shared where necessary. This approach would also apply vertically.<sup>91</sup>

Chile, for example, has adopted several planning instruments and put in place inter-sectoral mechanisms in the area of disaster risk management to reduce risks in a comprehensive manner. The country is also aligning its national policy and strategic plan for disaster risk reduction 2019-2030 to the Sendai Framework. The adoption of a research, development and innovation approach to disaster risk reduction has initiated a cross-sectoral process in the country, with a disaster risk reduction strategy crafted by a Commission mandated by the President. The use of technology has allowed to refine, amongst other things, early warning, information gathering and needs assessment, thereby improving the disaster response. Innovation can contribute to enhance the understanding of risk factors and thus, strengthen evidence-based decision making.<sup>92</sup>

Similarly, Guatemala has adopted several laws and regulations aimed at reducing the country's vulnerability to natural disasters and climate change. The National Development Plan consists of five pillars, including "protecting and enhancing natural resources in balance with social, cultural, economic and territorial development"<sup>93</sup>, along with the declared objective to establish responsible institutions. The country also created the position of National Coordinator for the Reduction of Disasters. Guatemala further adopted a planning and land management methodology to promote municipal development with a particular focus on environmental sustainability, gender equity and risk management to strengthen resilience. The Alliance for Resilience has supported Guatemala in developing six tools to incorporate risk management and a gender perspective through the Resilient Schools Programme.<sup>94</sup> Online surveys are currently being designed to measure the progress of risk management at the municipal level.<sup>95</sup> To develop the various strategies and policies, Guatemala has closely worked with academia, including the System of Climate Change Sciences of Guatemala, a multi-stakeholder network composed of academia, civil society, public institutions and the private sector.<sup>96</sup>

In Colombia, disaster risk reduction is understood as a social process encompassing risk awareness, reduction and disaster management as enshrined in the National Disaster Risk Management Policy adopted in 2012. The National Disaster Risk Management System created in the same year is understood as a *"set of public, private and community entities, of policies, norms, processes, resources, plans, strategies, instruments, mechanisms, as well as the information related to the subject, which is applied in an organized manner to ensure risk management in the country"*<sup>97</sup>. In the framework of these instruments, several actions have allowed to significantly reduce disasters. The National Disaster Risk Reduction Plan as a planning instrument to direct the actions of the government and civil society regarding risk awareness, risk reduction and disaster management complements the National Policy on Disaster Risk Management. The Plan is aligned with the strategic objectives of the Sendai

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<sup>91</sup> [Nauru contribution](#).

<sup>92</sup> Contribution by [Chile](#).

<sup>93</sup> Contribution by [Guatemala](#).

<sup>94</sup> See <http://partnersforresilience.nl/en/countries/guatemala>.

<sup>95</sup> Contribution by [Guatemala](#).

<sup>96</sup> Ibid.

<sup>97</sup> Contribution by [Colombia](#).

Framework. The country has also created disaster risk management funds and plans at the subnational and the local levels.

As part of the country's efforts to strengthen resilience, Colombia is also developing its e-government strategy which is aimed at enhancing the efficiency and transparency of government services and fostering citizen participation. It is expected that e-government will (i) provide better online services to citizens; (ii) improve government management; (iii) empower citizens; (iv) incentivize and facilitate the achievement of the SDGs through the effective enjoyment of rights through the use of ICT. The e-government strategy centers on four thematic axes: (i) ICT for open government: build a more transparent and collaborative State, in which citizens can actively participate in decision-making through ICT; (ii) ICT for services: simplifying and improving online services, so that citizens can access government services in a more expedite manner; (iii) ICT for management: increase the efficiency of the national administration; (iv) information security and privacy: increase the security of citizen data.<sup>98</sup>

Turkey has leveraged technology-enabled solutions to support its disaster management system as one of the priorities of its National Development Plan. In line with the latter, projects of government institutions are funded by the investment program of the country. In this context, the *Integrated Decision Support System for Incidents (AYDES)*, a software-based management model that manages the preparation, planning and response processes of disaster management of the service groups, has been launched.<sup>99</sup>

## **V. Leveraging technology and innovation to support resilience and inclusiveness in Africa in the context of the 2030 Agenda and Agenda 2063**

Since 2000, several African countries have achieved remarkable economic growth that has led to significant socio-economic progress. Strong domestic demand, a thriving business environment and improved macroeconomic management continue to enhance investment and growth.<sup>100</sup> According to the World Bank, six African economies are expected to feature among the top ten fastest growing economies in 2018.<sup>101</sup> In addition, the continent is rapidly urbanizing and the middle class is growing. Africa's burgeoning youth population also presents opportunities for harnessing the demographic dividend.<sup>102</sup> However, the region continues to fight with significant development challenges. The number of people living with under \$1.90 per day is alarmingly high, as 389 million Sub-Saharan Africans still live in extreme poverty— accounting for half of the world's poor.<sup>103</sup>

Building resilience is therefore a priority for Africa. Both the 2030 Agenda and Agenda 2063 share a deep commitment to promoting resilience and inclusiveness as demonstrated by their people-centered approach and the promise of leaving no-one behind. In this context, it is considered critical that efforts to build sustainable and resilient societies are supported by development partners to make progress across the SDGs, while paying due attention to addressing capacity gaps in the quality

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<sup>98</sup> Ibid.

<sup>99</sup> Contribution by [Turkey](#).

<sup>100</sup> [Office of the Special Adviser on Africa \(OSAA\) contribution](#).

<sup>101</sup> World Bank (2018), "[Global Economic Prospects: Broad-based upturn, but for how long?](#)".

<sup>102</sup> [OSAA contribution](#).

<sup>103</sup> World Bank Data, <http://www.worldbank.org/en/topic/poverty>.

of and access to basic services and preparedness to tackle natural, health and other crises. It is also imperative to continue to promote socio-economic transformation, including through building productive capacity and expanding economic opportunities, particularly for women and youth.<sup>104</sup>

## **Economic growth**

Challenges to strengthening resilience across the African continent include the lack of fiscal and monetary resources, as this directly impacts the ability to invest in the necessary change. In addition, lack of capacity, both in terms of human capital and at the institutional level, impacts the ability to absorb and develop the requisite knowledge and skills, impeding the capacity to successfully react and adapt to externalities and shocks.<sup>105</sup> Attaining sustainable and inclusive economic growth calls for the adequate and stable flow of financial and other resources. According to the African Development Bank, after low growth of 2.2 per cent in 2016, average real GDP rebounded in 2017 reaching 3.6 per cent, and is projected to reach 4.1 per cent a year in 2018 and 2019.<sup>106</sup> These growth levels paint a picture of a moderate, but promising progress. As African economies continue to suffer from low growth, fiscal imbalances, corruption, and account deficits, the call for enhancing the multiple and interlinked dimensions and elements of resilience becomes ever so strong. Economic diversification, socially inclusive societies, a diverse and productive natural capital base, and climate-proof economies, among others will be crucial in reducing vulnerability, driving adaptive capacity, and enabling societies and economies to bounce back from shocks.<sup>107</sup>

For starters, the transition to an inclusive green economy demands deliberate efforts and investments to establish an enabling environment including institutional arrangements for diverse actors to work together to plan and craft coherent policies and strategies based on holistic and integrated thinking. This calls for tools for effective integrated assessment. Additionally, strengthened capacity is needed in innovation and green technologies development and application to drive the green economy. Several African countries have designed frameworks that are providing strategic direction and insights in this regard. Ethiopia's Climate-Resilient Green Economy Strategy and Rwanda's Green Growth and Climate Resilience National Strategy for Climate Change and Low-Carbon Development are such examples.<sup>108</sup>

Moreover, there is a need for a structural transformation in Africa to achieve sustained, inclusive and job creating growth built on diversified and resilient economies. Leveraging technology and partnerships is key to track, stop and reverse illicit financial flows which is estimated at \$60 billion dollars per annum superseding total Official Development Assistance to the continent. Resources freed from this domain could be utilized to build resilience across the vital sectors of society.<sup>109</sup> Financial inclusion is also necessary to ensure that economic growth is inclusive and sustained. New and emerging technologies such as financial technology (FinTech) may help countries to extend financial services to currently excluded communities, especially youth and women and drive inclusive growth and innovation. Currently, there are about 301 Fintech startups in Africa that offer a range of technological solutions in areas such as payment, lending, retail banking, asset management, fraud

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<sup>104</sup> [OSAA contribution.](#)

<sup>105</sup> [UNIDO contribution.](#)

<sup>106</sup> African Development Bank (2018), "[African Economic Outlook 2018](#)".

<sup>107</sup> [OSAA contribution.](#)

<sup>108</sup> [Economic Commission for Africa \(ECA\) contribution.](#)

<sup>109</sup> [OSAA contribution.](#)

protection and regulatory compliance.<sup>110</sup> Intergovernmental and interregional cooperation will also be critical to tackle the root causes of conflict pertaining to youth unemployment, inequality, and economic and social exclusion. The African Peace and Security Architecture and the African Governance Architecture are important initiatives promoting sustainable and resilient societies in Africa.<sup>111</sup> The facilitation of intra-African trade is also key. The recent decision of the African Union (AU) to establish the African Continental Free Trade Area (AfCFTA) is critical as it will be one of the world's largest trading blocs with over 50 countries, and has the potential to boost intra-African trade by 52.3 per cent by eliminating import duties.<sup>112</sup> This is an important step towards achieving the SDGs and delivering on the African agenda of peace and prosperity.

## Agriculture

Diversified and robust socioeconomic sectors and ecosystem assets are necessary for Africa's resilience. Although agriculture is often recognized as a critical sector in driving the continent's transformation, shortcomings faced by the sector have impeded it from realizing its full potential. For instance, due to its low productivity at merely 20 per cent of crop yields potential in Sub-Saharan Africa, the continent is lagging in its effort to achieve food security.<sup>113</sup> Rural people are disproportionately represented among the number of poor and hungry. Many of the challenges facing rural communities are among the root causes of fragile situations – climate change, weak institutions, conflicts over land and natural resources, social tension and inequality, scarcity of opportunities for youth, and a lack of availability of basic services. Smallholder farmers, despite producing a significant share of the world's food, are among the most vulnerable to these challenges. Building a sustainable agriculture sector is key to improving resilience in vulnerable rural areas of developing countries and to achieving the SDGs, with no one left behind.<sup>114</sup> The *Farm to Market Alliance* - a consortium of public and private institutions helping smallholder farmers move from subsistence farming to market-oriented agriculture in Kenya, Tanzania, Rwanda and Zambia – has already benefited 170,000 farmers (almost half are women). On the other hand, the Virtual Farmers' Market - an app-based marketplace – is an innovative solution connecting smallholder farmers with buyers in Zambia that provides a transparent, open and trustworthy space to negotiate fair prices and deals.<sup>115</sup>

Mainstreaming and adopting inclusive green economy principles in the agriculture sector could offer vast opportunities for Africa to achieve structural transformation, and enhance resilience, food security, quality growth, job creation, poverty eradication, and productivity, while reducing environmental risks, ecological scarcities and imbalances. Currently, Mozambique, South Africa and Zambia have green economy frameworks with a greater number of African countries working towards achieving one, at varying stages of progress. Along the way, however, institutional set-up and regulation frameworks need to be developed and adapted, market participation should be fostered, and investment in research and development in the agriculture sector should be reinforced, while promoting preservation of the environment.<sup>116</sup>

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<sup>110</sup> [ECA contribution.](#)

<sup>111</sup> [OSAA contribution.](#)

<sup>112</sup> <https://www.tralac.org/resources/by-region/cfta.html>

<sup>113</sup> [ECA contribution.](#)

<sup>114</sup> [IFAD contribution.](#)

<sup>115</sup> [WFP contribution.](#)

<sup>116</sup> [ECA contribution.](#)

The increasing frequency of drought due to climate change has had a disproportionate impact on less resilient households, leading to a significant increase on the numbers of people dependent upon food aid and unacceptably high levels of malnutrition. Timely and targeted support - tailored to different wealth categories - and a focus on the link between livestock, malnutrition and food prices can improve the situation. An interesting initiative that leverages technology and innovation to build resilience and improve food security is the Predictive Livestock Early Warning System tool developed by FAO at the request of the government of Kenya. This tool supports the development of accurate triggers for drought response and provides a useful insight into the relationship between available feed for livestock, the predominant source of income and malnutrition. The potential for this to be used in enabling timely and informed decisions in the future is significant.<sup>117</sup>

## **Industrialization**

Structural transformation in Africa's economies remains the highest priority, and industrialization is the top strategy for achieving it in practice.<sup>118</sup> Greening industrialization can ensure that the structural transformation process can avoid stranded assets, and enable the region to cope with its rapid urbanization. Moreover, it can reduce resource inputs and increase efficiency in the production process; cut back on harmful waste emissions; and strengthen infrastructure to reduce negative environmental impacts, and maintain or improve the natural resource base.<sup>119</sup>

One of the central strands in greening Africa's industrialization is investment in resilient and sustainable energy infrastructure. Boosting the region's renewable energy will propel industrialization help resolve Africa's overall energy deficit and diversify economic opportunities, crucial to resilience building. To this end, African countries are seizing the opportunities offered by new innovations and technologies. For example, Kenya is investing in green geothermal energy technologies. In Nigeria, projections are that by 2020, growth in renewable energy generation will be achieved through additional capacity in solar (387 MW), wind (412 MW), small hydro (675 MW) and biomass (526 MW). Ethiopia is an excellent example of a country that combines integrated policies that link greening, infrastructure, industrialization and climate resilience.<sup>120</sup>

## **Health challenges**

The lack of access to health services can cost people their future and even their lives as well as dramatically hinder a country's development efforts. Improving health outcomes for all is central to achieving the SDGs and realizing the aspirations of Agenda 2063. However, many African countries suffer immense capacity constraints in terms of health systems. For example, Africa bears one-quarter of the global disease burden, yet has only two per cent of the world's doctors. Moreover, in sub-Saharan Africa, infectious diseases such as malaria and HIV/AIDS cause 69 per cent of deaths. Historically, short-term aid and the development of innovative vaccines or treatments for these diseases have been effective solutions that have helped relieve the burden. However, in the long-term, the underlying challenge of weak healthcare systems will need to be addressed.<sup>121</sup>

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<sup>117</sup> [FAO contribution.](#)

<sup>118</sup> [ECA contribution.](#)

<sup>119</sup> United Nations Economic Commission for Africa (2016), "[Greening Africa's industrialization](#)".

<sup>120</sup> [ECA contribution.](#)

<sup>121</sup> World Economic Forum (2015), "[3 ways to improve healthcare in Africa](#)".

In recent years, the Ebola outbreak has put into focus the prevalence of infectious diseases on the continent. Ebola has engendered immense losses both in terms of human lives and livelihoods, bringing economic activity almost to a halt in affected countries and deepening the structural weaknesses of neighboring countries.<sup>122</sup> The 2014–2016 outbreak in West Africa was the largest and most complex Ebola outbreak since the virus was first discovered in 1976.<sup>123</sup> Improving prevention, detection, and response to emergencies and complex health challenges is of critical importance to help build resilience and close dangerous gaps in Africa’s public health system. Considering the financial and institutional limitations faced by many African countries, multi-stakeholder partnerships and the use of innovative tools and technology can help tackle the region’s health challenges. One such initiative has been the establishment of the Africa Centres for Disease Control and Prevention by the African Union. By working closely with the World Health Organization and Ministries of Health, the Africa CDC will help bolster local disease prevention and monitoring, improve laboratory diagnosis of pathogens, and strengthen emergency response to outbreaks.<sup>124</sup>

Health technologies, especially medical devices, are also needed to empower health workers to provide lifesaving healthcare services. The Economic Commission for Africa (ECA) has developed an initiative that has integrated training of undergraduate and postgraduate biomedical engineers, promoted innovation through competitions and awards and encouraged entrepreneurship through showcasing and mentorship. To ensure sustainability, ECA has also inspired the formation of the African Biomedical Engineering Consortium, which is promoting the training of students and the design of medical devices.<sup>125</sup>

### **Peace and security**

Conflict prevention and addressing existing and emerging threats to peace and security, such as organized crime, terrorism and forced migration, are central to any successful effort to build sustainable and resilient societies in Africa. The “Silencing the Guns” Initiative spearheaded by the AU aims at enhancing capacity in the areas of conflict prevention and resolution, peacekeeping, peacebuilding and post-conflict reconstruction and development. The African Peer Review Mechanism is also promoting good governance and economic, social and political inclusion.<sup>126</sup>

### **Digital divide**

Information and Communication Technologies (ICTs) hold great promise to help address global development challenges as they can promote social and digital inclusion, especially of disadvantaged and remote populations. For example, broadband internet has been categorized as one of the world’s most important platform technologies, able to dramatically impact social structures and entire economies.<sup>127</sup> The SDGs call for universal and affordable access to the Internet in LDCs by 2020.<sup>128</sup> However, Africa is still lagging with only 18 per cent of households having internet access at home

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<sup>122</sup> [OSAA contribution.](#)

<sup>123</sup> World Health Organization, <http://www.who.int/mediacentre/factsheets/fs103/en/>.

<sup>124</sup> [OSAA contribution.](#)

<sup>125</sup> [ECA contribution.](#)

<sup>126</sup> [OSAA contribution.](#)

<sup>127</sup> World Economic Forum, (2016), [“The Global Information Technology Report 2016: Innovating in the Digital Economy”](#).

<sup>128</sup> See SDG 9c. <https://sustainabledevelopment.un.org/sdg9>.

compared to 84 per cent in developed countries. In addition, while the gender gap has narrowed in most regions since 2013 in using the Internet, it has widened in Africa where the proportion of women using the Internet is 25 per cent lower than the proportion of men.<sup>129</sup> Collaborations such as the ‘African Girls can Code Initiative’, a joint effort by ITU and UN Women, are directed at helping to bridge such digital divides. Harnessing the full potential of ICT for development requires targeted investments in broadband infrastructure, networks and technologies. The ITU works on all these issues including through its Regional Office in Africa. In addition, ECA has facilitated the monitoring and evaluation of countries’ progress on the implementation of the action lines of the World Summit on Information Society (WSIS) and in mapping them against the SDGs targets and the targets of Agenda 2063.<sup>130</sup>

## Technology and innovation

New technologies and innovative solutions are vital to increase resilience. While recognizing the funding, regulatory and institutional constraints, building capacity in the area with the participation and contribution of all relevant stakeholders can be a game changer. The four Senior Experts Dialogue (SED) on Science, Technology, and Innovation and the African Transformation Agenda organized by ECA since 2014 aim to provide a forum for knowledge sharing, peer learning and for consensus building on how best to deploy science, technology, and innovation to achieve all Agendas. ECA has also provided technical and substantive support to the AU on the development of the continental Science, Technology and Innovation Strategy for Africa 2024, and together with NEPAD has been building the capacity of 35-member states to assess and measure research and development as well as innovation activities. As a result, some countries, such as Kenya and Uganda, have acquired the necessary expertise and are serving as trainers, while countries such as Egypt, South Africa and Tunisia have also been instrumental in creating a community of experts capable of undertaking STI assessments, reporting and policy advice.<sup>131</sup>

## Climate

Climate change continues to have disruptive effects on livelihoods and weaken resilience across communities.<sup>132</sup> Climate variability and change is causing significant stress on a range of economic sectors and commodities that threaten the overall economic development and wellbeing of human and ecosystems in Africa. The continent is at serious risk of not attaining its development goals, if climate change is not integrated into development planning at all levels and scales.<sup>133</sup> Disasters, further exacerbated by climate change, continue to destroy years of development gains and cause thousands of deaths and billions of economic losses every year. Recurrent setbacks to development caused by disasters particularly affect the poor and most vulnerable populations, and people living in fragile and conflict-affected countries.<sup>134</sup> The lack of access to quality, timely and fit-for-purpose climate data and information services needs to be addressed, if climate change is to be effectively mainstreamed in the planning of sustainable and resilient development in Africa.

Agriculture, crop production and hence food security is being seriously impacted as demonstrated by recent droughts and famine in the Horn of Africa Region. Erratic shortages in food supply triggered by

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<sup>129</sup> International Telecommunications Union, (2017), “[ICT facts and figures, 2017](#)”.

<sup>130</sup> [ECA contribution.](#)

<sup>131</sup> [Ibid.](#)

<sup>132</sup> [OSAA contribution.](#)

<sup>133</sup> [ECA contribution.](#)

<sup>134</sup> [UNISDR contribution.](#)

climate variability and climate change impacts on agricultural production systems have often generated escalations in food prices exacerbating livelihood insecurity. In the absence of adequate meteorological infrastructure, as is the case with most African countries, accessible and customizable numerical weather prediction systems based on open source tools become essential. Cloud based computing and open source software and tools have emerged as frontier technologies opening new opportunities. Despite its key constraint of reliable Internet access, cloud computing and open source systems are disruptive innovations pushing the frontiers of intellectual property and new solutions to complex challenges. ECA's African Climate Policy Centre is deploying a cloud-based high resolution 1km operational numerical weather prediction and early warning system to enable African SIDS manage weather and climate-related risks in a cost-effective way. Crop suitability mapping for existing land areas and soil conditions also presents a unique and transformational opportunity to capitalize on emerging opportunities for agricultural production and trade by de-risking agricultural investments and transactions.<sup>135</sup> African institutions, including the NEPAD Agency are also strongly focused on promoting climate-smart agricultural practices.<sup>136</sup>

Transforming African economies to attain development objectives requires widespread access to modern and sustainable infrastructure and infrastructure services. Closing the huge infrastructure gap in Africa and building a solid foundation for Africa's response to climate change impacts requires investments of the order of USD 100 billion a year. The African Climate Resilient Investment Facility is an Africa-based networked center of technical competence and excellence with the overall objective to strengthen the capacity of African institutions and the private sector to plan, design, and implement infrastructure investments that are resilient to climate variability and change in selected sectors.<sup>137</sup>

The Paris Agreement ushers in a paradigm shift to climate-integrated development planning.<sup>138</sup> African countries continue to take measures to address the negative effects of climate change to reduce vulnerability and strengthen resilience as demonstrated through the adoption of national strategies for the protection and promotion of biodiversity as well as national climate change adaptation strategies.<sup>139</sup> The Climate Change and Development in Africa Conference provides a marketplace for innovative solutions that integrate climate change into development processes through entrepreneurship among youth and gender groups. A dedicated day, the Climate Information Services Day, also focuses on promoting the importance of climate information services in Africa's development agenda, human wellbeing and economic prosperity with the ultimate goal of increasing policy uptake of the recommendations generated. Lastly, the Partnership and Climate Resource Platform and Information Service for Africa provides a coordinated approach and framework for making these data widely available for development planning. The Platform is an open architecture one-stop go-to place for quality and timely climate data, climate information services, open-source climate-related modeling tools and online advisory services, learning and capacity development resources and helpdesk for stakeholders, as well as an online convening and community forum for regional climate research and user groups.<sup>140</sup>

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<sup>135</sup> [ECA contribution.](#)

<sup>136</sup> [OSAA contribution.](#)

<sup>137</sup> [ECA contribution.](#)

<sup>138</sup> [Ibid.](#)

<sup>139</sup> [OSAA contribution.](#)

<sup>140</sup> [ECA contribution.](#)

## Urbanization

Africa's urban population is expected to triple in the next 50 years as a result of natural increase and migration. The urban population is young, as Africa has the largest concentration of young people in the world. Africa's youth population is increasing rapidly and expected to double, reaching over 830 million by 2050; while Africa's general population is estimated to reach almost 2.5 billion in 2050.<sup>141</sup> Therefore, the processes of urbanization and population growth, and the potential and risks embedded therein, present invaluable opportunities and challenges for Africa hence the need for new transformative and adapted technology to harness to benefits of the demographic dividend. SDG 11 and the goals and targets of Africa's Agenda 2063 also highlight urbanization as a strong driver of structural transformation. The Common African Position on Habitat III, endorsed by Heads of State at their Summit in July 2016, identified the dynamism from the urban dividend and the expansion of its youthful population in its third Pillar, "*Enhance people-centred urban and human settlements development.*"

## VI. Designing a resilient and sustainable future – a toolkit to better prepare for tomorrow

In addition to the various instruments showcased throughout the previous sections, such as multi-hazard early-warning systems<sup>142</sup>, space technology applications, and big data, amongst others, this section will focus on innovation-oriented elements that can be leveraged for integrated policy planning, including foresight techniques and horizon scanning as well as modelling instruments. The role and contribution of technology at different positions of the spectrum – from mobile phones to fiber-optics to frontier technology, such as artificial intelligence and nanotechnology – will be assessed through examples, experiences and lessons learned that have been shared by Member States and UN entities. Capacity building and multi-stakeholder partnerships underpin all these tools and will be critical to transition from disaster management and risk minimization to long-term resilience and sustainable development.

### Foresight techniques and modelling

Building resilience requires the capacity to understand complexity and to employ a systems-thinking approach, including across communities of practice or through innovation labs. Futures thinking and foresight are key methodologies in increasing the capacity of governments to create contingency plans and devise procedures for responding to different risk scenarios.<sup>143</sup> Foresight techniques help to better understand a range of plausible futures, and therefore can contribute to identifying robust strategies to detect emerging issues and to cope with uncertainty but also to recognize opportunities.

The "Magic Box", a collaborative platform created by UNICEF in partnership with the private sector, harnesses real-time data to gain insights into the needs of vulnerable populations, and allow better informed decisions on how to invest resources to respond to disasters and epidemics.<sup>144</sup> Currently, the portfolio encompasses four applications: fighting epidemics; mapping schools; measuring gaps in a child's access to information; and generating real-time inequality indicators using satellite imagery

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<sup>141</sup> United Nations (2017), "[World population prospects: Key findings and advance tables](#)".

<sup>142</sup> See for example section II. See also <http://geografica.cenapred.unam.mx/reporteSismosGobMX/>.

<sup>143</sup> [UNDP contribution.](#)

<sup>144</sup> [UNICEF contribution.](#)

and artificial intelligence in ten countries spanning five regions. In May 2017, a computational model was developed to simulate the spread of Ebola in the Democratic Republic of the Congo and the Central African Republic. The analysis led to a partnership with local telecommunications companies to provide real-time data on human movement, which can support the prevention of future disease outbreaks.<sup>145</sup>

### Data innovation for resilience

As the world grows ever more connected - through mobile phones, social media, internet, satellites, ground sensors and machines - governments and societies at large need better ways to harness these data flows for insights towards targeted policies and actions that strengthen resilience, especially amongst the most vulnerable. To effectively use these large data sets for policy planning, innovation and public-private partnerships are required for better data collaboration.<sup>146</sup>

Emerging data platforms have the potential to improve near real-time monitoring and programming. Tools developed in partnership between government, UN entities, the private sector and academia include, for example, WhatsApp survey tools piloted in Lebanon to map social stability and inter-community tensions. The tool aims to gather localized data by establishing an open two-way communication channel between UN entities and their beneficiaries, serving the dual purpose of a proactive crisis response system.<sup>147</sup> Similar technology is being tested in Sudan to tackle the traditional data gaps prevalent in poverty mapping in conflict-affected areas. Official poverty statistics are being complemented by big data from night time lights, mobile top-up data and electricity consumption to provide policy-makers with a more complete picture of where disadvantaged populations reside and to effectively address poverty.<sup>148</sup>

The Big Data Innovation Challenge, launched in 2016, invites innovators across the world to reimagine climate resilience through big data solutions that address the nexus areas of food security and nutrition, forests and watersheds. Big data approaches, including machine learning, predictive analytics, crowdsourcing applications, and dynamic visualizations, can be used to improve the ability to inform and take climate action.<sup>149</sup>

However, the potential offered by big data comes with a new set of risks.<sup>150</sup> High-risk data is generally understood as data that includes attributes about individuals, also known as personally identifiable information. Data can create risk when it identifies communities or demographics within a group and ties them to a place. Furthermore, risk is created when this type of data is collected and shared without proper authorization from the individual or the organization acting as the data steward; or when the data is being used for purposes other than what was initially stated during collection. Unless these issues are addressed and resolved, the potential of digitalization and the use of technology will be hampered.<sup>151</sup> In this context, the Centre for Humanitarian Data is developing an infrastructure to

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<sup>145</sup> Ibid.

<sup>146</sup> [World Bank contribution.](#)

<sup>147</sup> [UNDP contribution.](#)

<sup>148</sup> Ibid.

<sup>149</sup> [World Bank contribution.](#)

<sup>150</sup> See [UNFPA contribution.](#)

<sup>151</sup> [OCHA contribution.](#)

enable the safe sharing of data about crisis-affected people through the Humanitarian Data Exchange (HDX) platform.<sup>152</sup>

### Federated Information System for the SDGs

Data collaboration for the SDGs is supported by the UN Statistics Division, including through the development of a federated information system for the global goals to support policy and decision making at local, national, regional and global levels. This initiative aims to establish a scalable global network of interoperable and country-led SDG data hubs to manage, integrate, and disseminate statistical, geospatial, and other data and information relevant for sustainable development.

For example, Mexico is integrating data from existing statistical legacy databases into a modern web GIS platform to achieve integration of statistical and geospatial information and to improve data interoperability with other platforms. As part of this initiative, Ireland has recently launched a data platform based on a web GIS environment that includes approximately 95 maps and allows to publish web applications that combine text, data visualizations and interactive maps. The United States made its national reporting platform available in GitHub to manage not only code, but also data regarding, for example, version control and collaboration. At the global level, UNSD has recently set up a UN Data Hub linked to existing national hubs and will continue facilitating the expansion of this network by providing support to the development of additional national hubs.

UNSD and the Global Partnership for Sustainable Data have launched a multi-stakeholder collaborative on SDG data interoperability, where members from different stakeholder groups can work together to address data governance issues and to design and prototype technical solutions to specific SDG data interoperability challenges. The collaborative aims to coordinate progress towards a shared vision of a global data ecosystem in which multiple sources of sustainable development data can be easily accessed and integrated seamlessly in applications that enable improved analysis, decision-making and accountability.<sup>153</sup>

### Digital Identity

The international community recognizes that the right to a legal identity is fundamental to accessing a host of other rights and services, from nationality to health care to protection from human trafficking. More than 1 billion people lack an officially-recognized identity; 40 per cent are under 18 years of age and 78 per cent are in sub-Saharan Africa and Asia. Even in developed countries, many people lack access to identification or might find themselves in a situation in which the paperwork that allows them to prove their identities has been destroyed in an emergency. Without a means of proving who they are, these individuals cannot open bank accounts, access critical services, or receive cash and other forms of assistance during natural disasters or humanitarian emergencies. Governments are also deprived of accurate population data, meaning that services may be misallocated.<sup>154</sup>

In this context, digital identification – if done in the right way and ensuring the respect of privacy – may offer a possibility to leapfrog over old, paper-based systems. However, there is currently both market failures (the private sector alone cannot address this issue, as it involves citizenship and human

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<sup>152</sup> The growing collection of datasets (as of 28 February 2018, 6589 datasets, based on 1021 sources) has been accessed by users in over 200 countries and territories. [OCHA contribution](#).

<sup>153</sup> Contribution by the UN Statistical Division.

<sup>154</sup> [OCHA contribution](#)

rights and thus public policy is imperative) and a clear need for coordinated multilateral action (governments cannot do this in isolation or they will build systems that are incompatible). Harmonization of action is also required within the UN system as different agencies use different digital ID systems. The promotion of integrated policies on digital identification, i.e. electronically captured and stored attributes and credentials that can uniquely identify a person, has been identified by various UN entities as an action area that ECOSOC could consider for promoting resilient and inclusive societies, benefiting from the work and expertise of relevant UN entities.<sup>155</sup>

For example, WFP currently holds 25 million digital identities in SCOPE, its identity-based transfer system. The digital identities allow WFP to rapidly and effectively provide urgent assistance, especially in emergency situations.<sup>156</sup> IOM is expanding its Displacement Tracking Matrix (DTM), a system to monitor displacement and population mobility, and building its interoperability with the WFP-SCOPE system.<sup>157</sup> DTM registers individuals or households to establish the information required to identify beneficiaries for the provision of humanitarian assistance. Moreover, MigApp allows its users to store important travel and identification documents into an online safe space. “Dr Translate” allows migrants to describe in their language what ails them and translates this into the language of the doctor they are seeing to facilitate communication.<sup>158</sup> Consequently, there is a strong global demand for the development of technical standards that would ensure interoperability across governments, businesses, NGOs, and the UN community. A multi-sectoral, multi-stakeholder approach is necessary to align incentives and ensure that digital identity is rolled out in a manner that is scalable, secure, sustainable, and responsible.<sup>159</sup>

#### Capacity building and multi-stakeholder partnerships

Critical gaps remain in promoting transfer of knowledge and context-sensitive technology solutions. Capacity building and multi-stakeholder partnerships are therefore essential components of all initiatives aimed at enhancing resilience and showcased throughout this paper. Projects dedicated to building capacity range from, for example, building capacity in community-based water management as a source to prevent conflict or rebuilding disaster-resilient cold chain systems for the transport and storage of vital medicines in the aftermaths of hurricanes<sup>160</sup>, to improving country’s management, administration and utilization of technical and scientific information with a view to building their appropriate technology base.<sup>161</sup> Similarly, the Global Observatory of Science, Technology and Innovation (GO-SPIN), a database and platform, aims at advancing inclusive research and innovation strategies, particularly in developing countries. GO-SPIN enables benchmarking, gives access to STI policy, legal and institutional instruments and serves to inform government decisions on investment in STI, including in relation to innovative technologies to enhance resilience.<sup>162</sup>

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<sup>155</sup> See contributions by [OCHA](#), [WFP](#), [IOM](#).

<sup>156</sup> [WFP contribution](#).

<sup>157</sup> [IOM contribution](#).

<sup>158</sup> Ibid.

<sup>159</sup> [OCHA contribution](#).

<sup>160</sup> [UNICEF contribution](#).

<sup>161</sup> See for example WIPO’s “Capacity Building in the Use of Appropriate Technology, Specific Technical and Scientific Information as a Solution for Identified Development Challenges”. [Contribution by WIPO](#).

<sup>162</sup> [UNESCO contribution](#).

Capacity building in the use of new technologies will be critical to harness the potential of the latter. Yet, generating more productive and better-quality jobs and incentivizing economic growth will require a holistic approach, including considering education curricula, research and development parameters, patent systems and social protection systems. Programmes such as “Tech for Food” in Guatemala provide tailored digital training courses, e.g. data cleaning, picture tagging and graphic design, and soft skills that can support vulnerable groups in finding a new career in a globalized job market.<sup>163</sup>

The need to foster public-private partnerships has been highlighted as an effective means to promote the use of technology and innovation to strengthen resilience.<sup>164</sup> Examples for strengthening community structures and capacities through local partnerships include the “National Food and Nutrition Security Committee” in Zimbabwe. The multi-stakeholder platform brings together several government Ministries, UN agencies, donors, civil society organizations, academia and business networks.<sup>165</sup> Likewise, partnership platforms in the area of health can provide critical support for building resilient societies. Re:Search<sup>166</sup> provides a searchable public database of available IP assets, including pharmaceutical compounds, technologies, and know-how and data available for research and development for neglected tropical diseases (NTDs), tuberculosis, and malaria.<sup>167</sup>

#### Innovative financing to build resilience

While technology can go a long way in supporting efforts to shift the world onto a resilient pathway, innovative financing models are critical in bringing about and sustaining this shift. Serbia became one of the first countries to explore the possibility of a national universal basic income as a potential solution to the threat that unemployment and job displacement poses to social cohesion of communities. The country has also deployed a social impact bond to address youth unemployment.<sup>168</sup>

Innovative financing models for resilience are being explored for countries carrying varying combinations of multilateral, bilateral and private debt. ECLAC’s “debt-for-climate adaptation swaps” proposal builds on the concept of a trilateral “debt-for-nature swap”, intended to reduce the debt of a country while at the same time ensuring an increased commitment towards environmental conservation. Two different mechanisms are proposed for the initiative involving the government of the indebted country, the creditor and an International Non-Governmental Organization: (i) for countries with high debt from official creditors, the Green Climate Fund would be used to write-off 100 percent of multilateral and bilateral debt at a negotiated discount; and (ii) for countries with high debt from private creditors, a debt buyback scheme as well as debt for equity swaps would be utilized.<sup>169</sup> The mechanism thus would address the debt overhang while sourcing climate change funds for adaptation projects and investment in green industries, to be administered through a Caribbean Resilience Fund (CRF).<sup>170</sup> Such a CRF would be expected to provide financing for a balanced mix of private and public private green industry projects that meet the standards of the Green Climate Fund

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<sup>163</sup> See WFP Innovation Accelerator.

<sup>164</sup> [Guatemala contribution.](#)

<sup>165</sup> [UNICEF contribution.](#)

<sup>166</sup> <http://www.wipo.int/research/en/>

<sup>167</sup> [Contribution by WIPO.](#)

<sup>168</sup> Together with UNDP, local partners and the Finnish Innovation Fund Sitra.

<sup>169</sup> [ECLAC contribution.](#)

<sup>170</sup> Ibid.

and promote the development of a green industrial value chain as a critical element for enhancing resilience.<sup>171</sup>

## VII. Key messages and recommendations

Based on the contributions received from Member States, ECOSOC subsidiaries and the UN system, showcased throughout the paper, the following recommendations are suggested to promote science, technology and innovation to reduce economic, social and environmental shocks and enhance sustainable and resilient societies:

1. In an interdependent world, there is a need for a holistic, systems-based approach to enhancing resilience through participatory and science and technology-based decision-making that is demand-driven and takes into consideration indigenous knowledge.
2. Advancing sustainability and enhancing resilience requires long-term action that integrates different policy areas. There is the need to coordinate different government levels and involve society at large. Experience show that governments alone cannot tackle multidimensional hazards and address existing risks. Partnerships involving multiple actors are critical to identify potential options and implement the necessary actions. Access to information is necessary to provide a solid foundation for these partnerships and to ensure that decisions take on board public concerns.
3. The resilience and adaptive capacity of all people should be strengthened to respond to and recover from economic, social and environmental shocks, humanitarian emergencies and adverse impacts of climate change, natural disasters and extreme weather events, including through leveraging appropriate technologies.
4. It is important to base decisions on science and technology, but this also requires validating indigenous knowledge and using it systematically along with modern innovations and technologies. It is also important to ensure that risk reduction decisions at all levels are based on appropriate science and technology, and are designed and communicated in an inclusive and transparent manner. This is especially relevant for infrastructure development, revising standards and guidelines, and developing early warning systems and the like.
5. Investments in science, technology and innovation, as well as capacity building, will be critical, both from governments as well as the private sector. Research institutions and universities should be encouraged to undertake innovative research through the establishment of appropriate grant systems and partnerships with the private sector and other stakeholders.
6. In the context of Africa, investment in human capital is critical to spur innovation, research and development that would enhance the multiplier effects of technology and innovation in

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<sup>171</sup> See contribution by [ECLAC](#). See also [UNIDO](#)'s work on green value chains, exemplified by projects that set-up eco-innovative zero water discharge smart labs, and incorporated business networking, scouting and matchmaking for supply chain green market opportunities, and reverse logistics for upcycling and recycling of waste.

development across the region and prevent a 'brain drain' effect. The realignment of public finance with development plans and better mapping of domestic resources should also be undertaken to ensure adequate financing to unlock opportunities and strengthen competitiveness of African economy.

7. In the context of technological progress, risk management in the digital realm becomes increasingly important. The fact that new technologies are relatively unregulated poses significant risks, such as invasion of privacy, while methodologies such as behavioral insights also pose questions regarding the ethics of nudging humans to adopt certain behaviors. Also, as cities and countries across the globe are building a smart infrastructure, the protection of these infrastructures depends on innovative solutions to build 'cyber-resilience.'
8. More than 1 billion people lack an officially-recognized identity and, without that, they face financial and social exclusion. A multi-sectoral, multi-stakeholder approach is necessary to align incentives and ensure that digital identity is rolled out in a manner that is scalable, secure, sustainable, responsible and properly regulated, so that it does not interfere with privacy.
9. The UN system should strengthen processes to scale innovation effectively across the system in a lean and agile manner, including through increased inter-agency collaboration and internal operational and regulatory frameworks to support the use of frontier technologies. It should develop internal innovative capacity through a process of human-centred design to develop products and services that fit the needs of vulnerable communities; and engage with grassroots companies and start-ups, to integrate the potential of entrepreneurship and youth.
10. To ensure sustainable and resilient societies, innovative projects should be focused on desired impact using technology as a means to an end. Innovation efforts should be tied to concrete outcomes with scalability at the heart of the design and initiatives should utilize foresight techniques to analyze alternative future scenarios and determine the solutions that will have the highest chance of endurance. Initiatives should assess risks in advance and aim to harness the power of new technologies or methodologies in responsible ways.
11. The UN system could facilitate the exchange of good practices among countries with similar contexts, and help share robust methodologies and databases. It could also facilitate regional cooperation of countries sharing similar risks and interests. Sustainable development will not be achieved without effective disaster risk reduction and adaptation to climate change. It is therefore essential to act on the interlinkages between the 2030 Agenda and the SDGs, the Paris Agreement and the provisions of the Sendai Framework for Disaster Risk Reduction.

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