Economic and Social Council

Distr.: General
27 February 2017

Original: English

Commission on Science and Technology for Development
Twentieth session
Geneva, 8–12 May 2017
Item 3 (a) of the provisional agenda

New innovation approaches to support the implementation of the Sustainable Development Goals

Report of the Secretary-General

Executive summary

Achieving the Sustainable Development Goals by 2030 will require new approaches to development and innovation, as well as a significant scaling up of funding and resources. This report examines new approaches to innovation, including the following: mission-oriented; pro-poor and inclusive; grass roots; social; and digitally enabled open and collaborative. The report emphasizes the need for greater attention to be paid to the role of grass-roots and marginalized communities in the innovation process. It stresses the importance of strengthening the framework conditions for science, technology and innovation, highlights the critical role of capabilities for effective innovation and notes the importance of multi-stakeholder collaboration in building capabilities. Finally, the report underscores the importance of engaging the financial community to mobilize and scale up resources for innovation and development.

Please recycle

Introduction

1.   At its nineteenth session in May 2016, held in Geneva, Switzerland, the Commission on Science and Technology for Development selected as one of its priority themes for the 2016–2017 intersessional period, "New innovation approaches to support the implementation of the Sustainable Development Goals".

2.   The Commission secretariat convened an intersessional panel from 23 to 25 January 2017 in Geneva, to contribute to a better understanding of this theme and to assist the Commission in its deliberations at its twentieth session. This report is based on the issues paper prepared by the Commission secretariat,[1] the findings of the panel, country case studies contributed by Commission members, relevant literature and other sources.

3.   The report has been prepared in response to the request by the Economic and Social Council for the Commission to raise awareness among policymakers of the process of innovation and to identify particular opportunities for developing countries to benefit from innovation, with special attention placed on new trends in innovation that can offer novel possibilities for developing countries. Chapter I introduces reasons explaining the need for new innovation approaches to help achieve the Sustainable Development Goals. Chapter II highlights the following five new approaches to innovation: mission-oriented; pro-poor and inclusive; grass roots; social; and digitally enabled open and collaborative. Chapter III proposes concrete policy considerations for Governments and other stakeholders, to strengthen capabilities for harnessing such new innovation approaches for sustainable development. Chapter IV concludes with a summary of the findings and suggestions.

I.   Reasons for the need for new innovation approaches

A.   Innovation as a cross-cutting issue for global goals

4.   The 2030 Agenda for Sustainable Development puts forward a broad and ambitious agenda for global action on sustainable development. Innovation, understood as new forms of social practice and organization, as well as new or improved technological products and processes, is not only an explicit focus of Goal 9 (build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation) but also a key enabler of most, if not all, of the Goals. The ambitious nature of the 2030 Agenda requires fundamental changes in the ways in which energy, food, water, housing, welfare, mobility and other goods and services are delivered, distributed and consumed.

5.   Until the late 1980s, innovation was widely conceived as the commercialization of scientific discovery, mainly by large corporations capable of exploiting new knowledge.[2] This linear conceptualization of innovation (from science to research and development to commercialization) has given way to a more sophisticated innovation systems approach. Public policy to support innovation has broadened over the last 30 years, from a focus on support for centralized research and development programmes and the provision of incentives to large firms (for example, in the form of research and development subsidies

---

[1] The issues paper and all presentations and contributions to the intersessional panel cited in this report are available at http://unctad.org/en/pages/MeetingDetails.aspx?meetingid=1235.

[2] J Schot and E Steinmueller, 2016, Framing innovation policy for transformative change: Innovation policy 3.0, Science Policy Research Unit Working Paper, University of Sussex.

and strong intellectual property rules) to one that also encourages human capital formation and capability development across a wide range of firms and that facilitates interactions and linkages between firms, science and technology institutions, users and other actors.

B. Challenges and constraints of recent innovation trends in the context of the Sustainable Development Goals

6. The achievement of the Goals by 2030 requires addressing a range of resource constraints. Research by the United Nations Conference on Trade and Development (UNCTAD) shows that it requires a step change in both public and private investment in developing countries, if an estimated annual $2.5 trillion funding gap is to be filled. Public sector action is indispensable, but on its own will be insufficient to meet demands across all Goals-related sectors. Private-sector contributions – through both good governance in business practices and investment in sustainable development – are therefore critical to the realization of the Goals.[3]

7. At the same time, harnessing the positive potential of innovation to address the Goals requires recognizing that some forms of contemporary innovation also contribute to environmental degradation, are disruptive of livelihoods and exacerbate inequalities. Viewed from a global development perspective, the central problem that has usually been highlighted in relation to contemporary innovation processes is that many developing countries have struggled to develop necessary firm and industry-level and system-wide innovation capabilities and to create the appropriate forms of demand that enable a process of catching up to more advanced countries operating at the technological frontier.

8. In the context of the Goals, there are two additional problems. First, economic growth over the last two decades has occurred in many countries alongside significant increases in both absolute poverty and inequality. Some researchers suggest that this phenomenon – an uncoupling of economic growth and social and economic development – is partly associated with the kinds of technological change that characterize contemporary innovation processes (that is, their reliance on skilled labour, capital-intensive nature, product portfolio, scale intensity and dependence on high-quality networked infrastructure).[4]

9. Second, some innovation processes in past decades were highly detrimental to critical environmental services, the adverse effects of which disproportionately affected poorer countries and communities. It is widely recognized that this problem is unlikely to be resolved solely by developing incrementally more efficient techniques. More fundamental changes to systems of production and consumption, in fields such as energy, transport and food and agriculture, are likely to be required to avoid catastrophic changes to the environment, biodiversity and the climate.

10. These three core problems point not only to the longstanding need to continue to develop innovation capabilities in developing countries, but also to re-orientate and redirect innovation trajectories in ways that enable more inclusive, socially just and environmentally benign patterns of socioeconomic development.

11. Given such constraints and challenges, the kinds of innovation approaches that can help countries achieve the Goals must be considered. In recent years, a great deal of

---

[3] UNCTAD, 2014, *World Investment Report* (United Nations publication, Sales No. E.14.II.D.1, Geneva and New York).

[4] J Chataway, R Hanlin and R Kaplinsky, 2014, Inclusive innovation: An architecture for policy development, *Innovation and Development*, 4(1):33–54.

scholarly and policy attention has been given to both novel and older but hitherto relatively overlooked approaches to guiding, organizing, thinking about and incentivizing innovation. Such approaches involve highly valuable innovation spaces, in which attempts are made to reconcile and advance the ambitions of delivering both more inclusive and greener forms of social and economic development. In doing so, the actors and institutions involved in new approaches often enjoy a degree of freedom to innovate that is not available to incumbents locked in by prior investments, business models and other commercial and institutional commitments to existing, unsustainable innovation trajectories.

12. The ambitious agenda of the Goals presents an opportunity to foster, support the emergence of and experiment with new forms of innovation with regard to sustainable development. There is considerable scope to recombine elements of new approaches with those that are more mainstream, to generate "hybrid pathways to sustainability".[5] Many such processes may be further facilitated by increasing digitization, providing important new opportunities for innovation.

II. New approaches to innovation

13. Some of the approaches presented in this report are new, while others are older but have been relatively overlooked. Recognizing their complementarity, the limitations in categorization of distinct innovation approaches and the complications arising from the ambiguous use of terms, the innovation approaches addressed are discussed on the basis of broad themes and not compartmentalized into falsely distinct models.

A. Directing innovative activities: Mission-oriented innovation

14. The approach of directing innovative activities to the achievement of specific technological and social goals is by no means novel. Mission-oriented innovation programmes typically seek solutions that are considered undersupplied by markets. Such programmes work through networks at national or international levels, as well as through incentive structures. The Manhattan and Apollo projects, for instance, are examples of the wide range of post-Second World War publicly funded mission-oriented research programmes in the fields of defence, agriculture, energy and health, in particular.[6]

15. The rationale for mission-oriented innovation fell out of favour in the 1980s and 1990s, reflecting concerns about the inability to pick winners and the view that Governments should only respond to market failure.[7] More recently, however, attention to, and a wide range of investments in, mission-oriented innovation reflects a weakening of traditional market-oriented principles and a focus on what are known as grand societal challenges (such as climate change, ageing, inequality and chronic and infectious diseases). Some such challenges require the transformation of entire technological systems, beyond pushing for private sector-oriented ideas of innovation as a means of addressing social problems. In addition, new mission-oriented initiatives typically seek to involve, and provide incentives to, a more diverse range of innovators than researchers alone, across

[5] A Ely, A Smith, A Stirling, M Leach and I Scoones, 2013, Innovation politics post-Rio [plus] 20: Hybrid pathways to sustainability? *Environment and Planning C: Politics and Space*, 31(6):1063–1081.

[6] D Foray, DC Mowery and RR Nelson, 2012, Public [research and development] and social challenges: What lessons from mission [research and development programmes]? *Research Policy*, 41(10):1697–1702.

[7] M Mazzucato, 2013, *The Entrepreneurial State: Debunking Public vs. Private Sector Myths* (Anthem Press, London).

public, private and civil society sectors, and outside of the national borders in which funding programmes reside.

16. Forms of mission-oriented innovation include the following:

(a) State-funded programmes, such as the Grand Challenges for Development of the United States of America Agency for International Development (see box 1), Grand Challenges Canada, the Longitude Prize of the United Kingdom of Great Britain and Northern Ireland, to reward the development of a cost-effective, accurate and easy-to-use test for bacterial infections (http://longitudeprize.org/), the Thailand National Science and Technology Development Agency Folk Innovation Award in Agriculture and the forthcoming Grand Challenges Thailand[8].

(b) Initiatives led by philanthropic organizations, such as the grand challenges programme of the Bill and Melinda Gates Foundation.

(c) State investment bank mission-oriented finance programmes that create demand for new technologies, in countries such as Brazil, China and Germany.

(d) Public–private initiatives such as the Global Alliance for Vaccines and Immunization.

Box 1. Mission-oriented innovation: Case study

As a response to the outbreak of Ebola virus disease in 2014 in West Africa, the United States Agency for International Development launched "Fighting Ebola: A Grand Challenge for Development", to connect with traditional and non-traditional partners worldwide to identify ideas to improve infection treatment and control. In two months, innovators from around the world submitted over 1,500 ideas focused on helping front-line health-care workers to provide better, more timely care and to contain the virus. Of the submissions, 14 innovations were identified for their potential to reinforce the response to the current outbreak and future outbreaks, and some of these are already reaching users in the field.

Source: United States Agency for International Development Press Office, 2014, United States announces results of grand challenge to fight Ebola, available at http://www.usaid.gov/news-information/press-releases/dec-12-2014-united-states-announces-results-grand-challenge-fight-ebola (accessed on 30 January 2017).

---

17. The following are examples of initiatives that promote innovation in specific sectors relevant to the achievement of the Sustainable Development Goals:[9]

(a) Initiatives in Switzerland aimed at exploiting the potential of waste as a resource and promoting the production of goods in a resource-efficient, socially and environmentally friendly way.

(b) Programmes and centres in the Islamic Republic of Iran to solve challenges in areas such as energy and water and urban issues, for example, urban innovation centres and energy saving through mobile applications in Tehran.

(c) Measures in Bulgaria aimed at the promotion of environmental protection, energy production and energy efficiency.

18. As such examples illustrate, mission-oriented innovation initiatives can contribute to achieving many of the Goals. Despite the potential for supporting innovation capabilities,

---

[8] Contributions from the Governments of Canada and Thailand.
[9] Contributions from the Governments of Bulgaria, the Islamic Republic of Iran and Switzerland.

mission-oriented innovation presents many challenges for policymakers, including in setting priorities, identifying and defining appropriate missions, creating incentive structures, resolving governance issues, ensuring the long-term collaboration of many different actors and users, coping with resource problems and extending programmes beyond national boundaries, as well as in the need to replace incumbent technological practices with new practices.[10] Among others, this means that mission-oriented innovation to address grand challenges requires long-term commitments from a range of both public and private actors.

B. Extending beneficiaries: Pro-poor and inclusive innovation

19.   Approaches to innovation that are concerned with extending the number of beneficiaries, also referred to as pro-poor or inclusive innovation, aim to actively include and involve poor people in mainstream processes of technology-related development, either as consumers in new product and service markets or, more ambitiously, as participants in innovation processes themselves. This approach focuses on how to extend the number of beneficiaries of innovation, building on innovation ideas for the bottom of the pyramid.[11] With new concepts, low-cost labour and materials and large scales of production, this approach can serve markets previously ignored by traditional innovation. It also includes innovations by marginalized groups, introduced under conditions of resource constraints.

20.   If an innovation is for marginalized groups, the focus is on innovating with low-cost products that can serve untapped markets with new commercialization and distribution strategies. If an innovation is by marginalized groups, it is often associated with ideas of frugal innovation, which focuses on informal forms of innovation in contexts of scarcity. Both innovation for and innovation by, and with, marginalized groups have the potential to address many of the Sustainable Development Goals. The former in particular may take advantage of existing resources and capabilities within firms to develop simple, down-to-earth solutions, thereby making available services and products that would otherwise be unaffordable. Examples of pro-poor and inclusive innovation are discussed in box 2.

Box 2. Pro-poor and inclusive innovation: Case studies

The United Nations Entity for Gender Equality and the Empowerment of Women has developed Buy from Women, a mobile-enabled supply chain enterprise platform for cooperatives, connecting women to information, finance and markets. The platform connects men and women smallholders to the agricultural supply and value chain, and provides critical information on weather, market prices and incoming opportunities via text messages. Through the platform, farmers can determine the exact size of their land and forecast production.

The Government of Germany and Bosch are working on a locally developed eye-care solution in India, to screen and detect diseases of the eye. The system, composed of both hardware and software, is more affordable for individual practices and health suppliers than those of competitors. The provision of such a product can have an impact on a significant number of lives, as an estimated 80 per cent of vision loss cases in India are preventable if detected early.

By the 1990s, General Electric technology in ultrasound imaging had a strong position in the developed world market, but struggled in developing countries. In 2002, the

---

[10] D Foray et al., 2012.

[11] CK Prahalad, 2004, *The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits* (Wharton School Publishing, Upper Saddle River, New Jersey, United States).

company developed a less costly version of the technology that could be connected to a laptop computer and, in 2007, introduced an even lower priced version, sold at US$15,000, and sales grew dramatically, gaining a market of around US$280 million.

An example of frugal innovation is Mitti Cool, a low-cost refrigerator made of sustainable materials that works without electricity and uses built-in clay and water evaporation as a cooler. It can be easily built, at a cost of around US$30–US$50, and can keep food fresh for 2–3 days. Mitti Cool has been supported by the National Innovation Foundation of India.

The Unilever Shakti initiative incorporated an alliance between Unilever and the Cooperative for Assistance and Relief Everywhere (CARE), a nongovernmental organization with a history in capacity-building and women's empowerment in poor communities. Unilever aimed at developing new distribution channels to reach poorer consumers in small communities in India with low-cost products, such as shampoo and cream. CARE provided a platform for women's training in the rural sector, while Unilever funded courses in health, sanitation, infant care and entrepreneurship. Additionally, Unilever provided microfunding for business development. In 2012, the project reached more than 3 million households, creating employment opportunities for around 50,000 women that distribute its products.

Sources: Contributions from the Government of Germany and the United Nations Entity for Gender Equality and the Empowerment of Women; JR Immelt, V Govindarajan and C Trimble, 2009, How [General Electric] is disrupting itself, *Harvard Business Review*, 87(10):56–65; National Innovation Foundation, India, 2009, Mitti Cool refrigerator, available at http://nif.org.in/innovation/mitti-cool-refrigerator/751 (accessed on 30 January 2017); *The Economist*, 2012, Fighting for the next billion shoppers, available at http://www.economist.com/node/21557815 (accessed on 30 January 2017).

21.   The examples in box 2 show that the development of new and more affordable devices based on existing technologies can reach new markets and serve unmet needs in poorer populations, while providing high-value products and services. In order to create new markets in areas with a lack of infrastructure or a lack of experience in logistics and distribution, this approach can take advantage of new methods, such as the use of online tools and social networks. [12] The provision of new products and technologies to marginalized groups can also be an important enabler, fostering familiarity with new technologies and allowing the development of new capabilities. [13] There may be greater potential to address the Goals with initiatives that seek to directly involve and include poorer people in innovation processes. The orientation in such initiatives is towards using existing resources and drawing on existing knowledge in poor communities, in order to foster creativity in conditions of scarcity, thus allowing for the creation of potentially more resilient solutions to people's problems.

C.   Broadening innovation processes to include grass-roots actors

22.   Approaches that broaden innovation processes can involve grass-roots actors, such as social movements and networks of academics, activists and practitioners experimenting with alternative forms of knowledge creation and innovation. Such initiatives seek to practise innovation, in both technology and service provision, in ways that are socially inclusive towards local communities in terms of the knowledge, processes and outcomes involved. In contrast to mainstream innovation processes, led by firms operating in formal

---

[12]   CK Prahalad, 2004.

[13]   RK Hanlin and R Kaplinsky, 2016, South–South trade in capital goods: The market-driven diffusion of appropriate technology, *The European Journal of Development Research*, 28(3):361–378.

markets, grass-roots initiatives operate in civil society arenas, typically within communities and involving voluntary activities and social enterprises, rather than the formal business sector.

23. Grass-roots movements are different from mainstream innovation processes in the ways in which activists and practitioners mobilize people around innovation and technological design. They may be characterized by three main features. First, they are based on collective action and solidarity and experimenting with different forms of bottom-up organization that combine local spaces with wider regional or international networks. Second, they encourage participation in technological development as a means of increasing democracy through gaining a voice in wider debates on technology and the directions of development. Third, by attempting to encourage participation and solidarity, grass-roots innovation movements devise many mechanisms to foster the collective sharing of, and collective learning about, technology.[14]

24. For example, the maker movement, a popular contemporary innovation movement, has become a global driver of informal experimentation with technologies such as software, microelectronics, robotics and digital fabrication. The main aim of maker culture is to experiment with artefacts, modify them for novel purposes and create unrestricted access to technology. Another example is a fab lab, which evolved from an initiative in 2001 at the Centre for Bits and Atoms of the Massachusetts Institute of Technology. Fab labs provide computers and computer-controlled tools that allow community members to develop software code and technology-enabled products. They have received considerable interest and been replicated around the world.

25. From the perspective of the Goals, grass-roots innovation can occur in sectors as diverse as water and sanitation, housing, food and agriculture, energy, mobility, manufacturing, health and education, with applications such as community-based renewable energy initiatives, low-cost and low-impact self-build housing developments, farmer-led irrigation systems, small-scale agricultural machinery development, urban food production schemes, community recycling, community sanitation and water projects, local remanufacturing, home-based nurse training schemes and farmers' markets. One notable example is discussed in box 3.

Box 3. Grass-roots innovation: Case study

The One Million Cisterns project aims to provide a significant number of water cisterns in a large semi-arid region in north-eastern Brazil. The project was originally devised by the Semi-Arid Association, a network of more than 700 nongovernmental organizations, institutions, social movements and farmers' groups. It was adopted by the Ministry of Social Development in 2003. Since then, nearly 600,000 water cisterns have been built by local inhabitants with the support of the Ministry and the Social Technology Network.

Source: M Fressoli and R Dias, 2014, The Social Technology Network: A hybrid experiment in grass-roots innovation, Working Paper No. 67, Social, Technological and Environmental Pathways to Sustainability Centre.

---

26. Development agencies and mainstream science and technology institutions have historically shown interest in alternative models of technological change and social development originating in grass-roots innovation movements. However, grass-roots innovation often thrives due to its independence from bureaucratic procedures and

---

[14] A Smith, M Fressoli, D Abrol, E Arond and A Ely, 2016, *Grass-roots Innovation Movements* (Routledge, London).

institutional traditions. It is therefore important for mainstream institutions to be careful not to impose their own objectives when providing support for grass-roots innovation.

D.   From technological to social innovation

27.   Social innovation refers to innovations in social relationships, practices and structures (such as business models, production practices, finances and public services delivery) primarily aimed at addressing social needs and improving human well-being.[15] Most social innovations are initiated from the bottom up, through entrepreneurial activities by organizations and actors with roots in civil society and the third sector (such as cooperatives, associations and foundations).

28.   For example, global fair-trade production models link social movements, producers, mainstream firms and their associated norms in novel ways. Social enterprises and initiatives such as time banks provide innovative business models to address societal needs. Novel means of fundraising and finance provision typically occupy a hybrid space between the State, the private sector and civil society. One consequence of such hybridization is that it lends itself to experimentation with different organizational forms and practices.[16] For example, the Swiss Agency for Development and Cooperation, together with an advisory firm, has recently created Social Impact Incentives, a new finance model enabling high-impact social enterprises to improve profitability and achieve scale by paying for proven results.[17] Other examples are discussed in box 4.

Box 4. Social innovation: Case studies

Thailand has several successful social enterprises, such as Grass-roots Innovation Company, which promotes integrated organic farming by smallholders in rural areas, and Change Ventures, which raises funds from social investors and social investment funds to support other social enterprises.

An example of a time bank is the social enterprise Give and Take Care, founded in the United Kingdom in 2016, which works together with a charity for the elderly to match the skills of caregivers with the needs of the elderly. Every hour of volunteer work may be logged in the time bank and exchanged for care later in life. The Government of the United Kingdom recently awarded £1 million to the organization to support its activities.

Sources: Contributions from the Governments of Thailand and the United Kingdom.

---

29.   In recent years, substantial technological changes have reshaped the economy and global financial system. Innovations in credit and payment (for example, mobile payment systems such as M Pesa) are not only transforming mechanisms of transactions and finance, but also have the potential to reach and meet the needs of millions of people without access to formal capital. Crowdfunding, peer-to-peer lending and social impact bonds are new ways to access capital, creating alternative sources of finance and contributing to business and community initiatives that might not be able to obtain funds through traditional credit markets. For example, blockchain, a distributed ledger technology that records information shared by a peer-to-peer network using state-of-the-art cryptography, is a component of

---

[15] R Van der Have and L Rubalcaba, 2016, Social innovation research: An emerging area of innovation studies? *Research Policy* 45(9):1923–1935.

[16] B Pel, P Weaver, T Strasser, R Kemp, F Avelino and L Becerra, 2015, Governance: Co-productions challenges in transformative social innovation, Transit Brief No. 2, available at http://www.transitsocialinnovation.eu/briefs (accessed on 30 January 2017).

[17] Contribution from the Government of Switzerland.

bitcoin and other digital currencies that do not rely on traditional banking structures. While some such services may have the potential to reduce the financial dimensions of the digital divide, they may also reinforce or create new ones. Blockchain services, in particular, are still at an early stage, and a number of technological and regulatory issues hinder their wider proliferation.

30.   Social innovation may address aspects of the Sustainable Development Goals that emphasize inclusion and greater equity, especially in areas such as education, health, work and poverty reduction. As most social innovations seek to address problems and issues that both States and markets may not address, or may fail to adequately cope with, they often constitute challenges to existing business models and systems of production and consumption or to incumbent models of social and welfare provision. They may therefore usefully be thought of as forms of experimentation with novel, potentially transformative, institutional and societal changes.[18] This is highly relevant to the Goals, as attaining many of the Goals arguably requires transformative, rather than incremental, social and technological change.[19] However, many social innovation initiatives struggle to remain viable with limited resources, of staff, time and equipment, as well as funding.[20]

E.   Digitally enabled open and collaborative innovation

31.   Collaborative innovation enables knowledge and technology to be produced across a multiplicity of actors and institutions, drawing from a large pool of both formal and informal knowledge. There are two key requirements for enabling collaborative innovation, namely open access to knowledge and wide participation in the process of developing ideas, products and technologies. What is novel in collaborative innovation is the greater use of the Internet, digital technologies and social networks to foster learning, enable the co-creation of knowledge and provide widespread access to tools, data and resources. The combination of open access to resources with new modes of online engagement allows digital open collaboration to solve certain types of problems at a much faster pace than is possible in more traditional, closed, institutional arrangements for organizing innovation.[21] Some example are provided in box 5.

> **Box 5. Digitally enabled open and collaborative innovation: Case studies**
>
> Open science allows scientists to collaborate at different stages of a research process with scientists from other disciplines and in other parts of the world. In some cases, open science also calls for collaboration by the public in citizen-science projects, such as e-Bird and Galaxy Zoo. Open science practices seek to share the data, tools, problems, outcomes and efforts of producing relevant knowledge.
>
> Hackathons are co-design marathons that originated in hacker culture to speed up the creation of solutions to certain problems. They are typically held over 1–5 days and

---

[18] R Kemp, L Zuijderwijk, P Weaver, G Seyfang, F Avelino, T Strasser, L Becerra, J Backhaus and S Ruijsink, 2015, Doing things differently: Exploring transformative social innovation and its practical challenges, Transit Brief No. 1, available at http://www.transitsocialinnovation.eu/briefs (accessed on 30 January 2017).

[19] J Schot and E Steinmueller, 2016.

[20] B Pel et al., 2015.

[21] M Nielsen, 2012, *Reinventing Discovery: The New Era of Networked Scien*ce (Princeton University Press, Princeton, New Jersey, United States); Y Benkler, A Shaw and BM Hill, 2015, Peer production: A modality of collective intelligence, in *Handbook of Collective Intelligence*, T Malone and M Bernstein, eds. (Massachusetts Institute of Technology Press, Cambridge, Massachusetts, United States):1–27, available at http://mako.cc/academic/benkler_shaw_hill-peer_production_ci.pdf (accessed on 30 January 2017).

organized around specified challenges. For example, the medical technology hackathons of the Consortium for Affordable Medical Technologies in Uganda are 48-hour events that bring together clinicians, engineers, entrepreneurs, industry experts and end users to co-create and crowdsource innovations for pressing clinical needs and barriers to care in Uganda.

Civic innovation labs are spaces supported by local and national governments focused on generating innovations to improve governance, public service management and citizen participation. They are usually based on participatory design techniques, often open to the public and may be characterized by collaboration between citizens and public officials, sharing public knowledge and experimentation or prototyping new solutions to urban and regional problems. For example, the Open Source Ecology global village construction set is an initiative to create 50 tools with open-source blueprints and instructions that a farm needs to be sustainable and autonomous.

Citizen-driven data practices use available data or produce new data to make hidden problems and processes visible and create reliable information in relation to issues such as climate change, environmental pollution and inclusive development. For example, the Technology-Enabled Girl Ambassadors project trains girls and offers the opportunity to collect data on their everyday experiences. The project is operational in northern Nigeria and plans to launch in Ethiopia, India, Indonesia and Rwanda, with potential contributions to Goal 5 through the analysis of gender-specific data and provision of digital skills that can enhance girls' employment and other opportunities.

Sources: Contribution from the Government of Uganda; Open Source Ecology, 2017, About, available at http://opensourceecology.org/about-overview/ (accessed on 30 January 2017); Technology-Enabled Girl Ambassadors, 2017, What we do, available at http://www.girleffect.org/what-we-do/tega/ (accessed on 30 January 2017).

32.   Collaborative innovation may be regarded as a paradigm shift in knowledge production that includes open government, open science, open software and new networks of collaboration and experimentation, such as the maker movement and fab labs. Although such approaches and fields share many characteristics and tools, they are not necessarily connected, and their communities of practice are often independent of one another.

33.   Many forms of open and collaborative production have already been heralded as practices that can help to tackle Goals-related challenges. Given the intractability of many of the problems that need to be resolved in order to address the Goals, the use of open and collaborative practices is helpful as they can diminish barriers to innovation, accelerate the pace of innovation and help foster a more democratic approach to resolving complex and contested issues.[22]

III. Key policy considerations and challenges

34.   In comparison with traditional, linear models of innovation or conventional innovation systems approaches, some characteristics of new approaches to innovation can enable them to better address the needs, interests and perspectives of poorer, marginalized communities, and better serve social and environmental goals. This is particularly important given the resource constraints faced by many developing countries, the current levels of innovation capabilities and the transformative changes necessary to realize the Sustainable

---

[22] M Nielsen, 2012; H Masum and R Harris, 2011, Open source for neglected diseases: Magic bullet or mirage? Results for Development Institute.

Development Goals. For such approaches to contribute to meeting the Goals, diverse new organizational forms and policy mixes are required, suited to the different historical, environmental and cultural contexts in developing countries and the least developed countries, with varying levels of capabilities.

A. Policies to facilitate new and hybrid innovation approaches

35. Each of the new approaches described in chapter II can make important contributions to the Goals. However, many of the most marked impacts will come from hybrids of new approaches and more conventional approaches.[23] Hybridization can occur when initiatives created at the grass-roots level, or through pro-poor innovation processes, for example, subsequently receive support from more conventional science and technology institutions. Attention to hybrid innovation approaches involves widening the policy focus of innovation systems, both in terms of the actors involved and their means of interaction and collaboration. An example of the formulation of such a hybrid policy is the Austrian Open Innovation Strategy, which mobilizes actors in government, science, business and civil society to collaborate and innovate, spanning the boundaries of disciplines, sectors, regions and countries.[24] The concrete implications of this new approach for policy are poorly understood and deserve further research.

1. Facilitate infrastructures and networks for innovation

36. Collaborative innovation requires both digital and material infrastructure to permit face-to-face encounters between innovation actors, such as through hackathons or other spaces for open collaboration.[25] Such forms of infrastructure can act in a similar way to traditional incubators, yet reach broader groups. Institutional support to build bridges between formal and grass-roots innovation, other forms of infrastructure such as repositories and innovation platforms, and mechanisms for international network facilitation can further strengthen such hybrid activities.

2. Consider alternative options for financing innovation and incentivize desirable innovation

37. In recent years, there have been changes in the characteristics of financing for development. Institutional and other private-sector investors, as well as philanthropists, are playing a larger role. Nevertheless, there is a need to further mobilize such sources for additional investment in activities that support the Goals. This may require revisiting the current incentive structure. Financing research and innovation based on specific missions can act as an important incentive for hybrid approaches to innovation and incentivize collaboration among different stakeholders. At the same time, enablers and barriers to such approaches are not only financial but also often linked to other motivations, such as ideological motivations. It is important for policymakers to understand underlying monetary and non-monetary motivations driving innovators and to design incentives that consider such motivations. Key policy considerations in this area are the choice of economic instruments used (for example, prizes or advance market commitments) and their design; the combination of vertical and horizontal mechanisms for funding; opportunities

---

[23] A Smith, 2015, Mind your (innovation) language, available at http://steps-centre.org/2015/blog/mind-your-innovation-language/ (accessed on 30 January 2017).

[24] Contribution from the Government of Austria.

[25] A Smith and A Stirling, 2016, Grass-roots innovation and innovation democracy, Working Paper No. 89, Social, Technological and Environmental Pathways to Sustainability Centre.

for combining financing from all sources (including government and private sector sources and national and international sources); and the process used for identifying priorities.

3. Promote innovation through regulation

38.   Regulatory instruments can help shift the direction of innovation towards Goals-related targets, support some emerging approaches or help stop industrial activities that are inconsistent with the Goals. Command and control policies or economic instruments have long been used to induce innovation towards improved environmental performance.

Such approaches have been practised for many years alongside policies to support innovation systems. The distributed, multi-stakeholder nature of many new approaches to innovation necessitates new, additional forms of regulation, providing the conditions that will enable them to flourish. Public procurement regulations that promote specific open or mission-oriented initiatives can act as demand-pull measures to support innovation with regard to the Goals. In science systems, regulating for open access online publications and regulating against the appropriation of open data or knowledge can enhance collaboration. New regulatory approaches may be beneficial, and old and outdated regulations, such as inappropriate intellectual property rights frameworks, may be reformed. Public sector organizations should be willing to experiment with and directly involve beneficiaries, requiring changes in organizational culture, as well as in bureaucratic systems.

4. Strengthen innovation capabilities

39.   Innovation capabilities are central for effective innovation, but are unevenly distributed among countries. While new approaches largely rely on capabilities similar to those required by traditional forms of innovation, some, in particular digitally enabled open and collaborative innovation, require new skills and infrastructures. Capabilities involve not only scientific and technological capacity, but often, especially in the context of developing countries, basic education and engineering, design, management and entrepreneurial skills. Examples from the Dominican Republic, Kenya and Nigeria show how public policy can strengthen education systems to build science, technology and innovation capabilities.[26] Digitally enabled open and collaborative innovation, for example, requires basic education and scientific and technological literacy. Information and communications technology is a cross-cutting area for policy support and its infrastructure is a key consideration for developing countries. Previous intersessional panels of the Commission on Science and Technology for Development addressed in detail the priority themes of Internet broadband for an inclusive digital society and digital development.[27] The increasing role of smartphones in online digital collaboration also deserves further consideration. Open connectivity beyond, as well as within, national boundaries is an additional requirement if a country's innovators are to effectively connect with collaborators.

5. Include multiple stakeholders in setting priorities

40.   Prior to the formation of a mix of policy instruments, a key governance challenge is agenda-setting and the identification of national priorities. Broadening inputs for priority-setting by including multiple actors in the appraisal of sustainability options can lead to more empowering and robust policy approaches. Technology assessment and technology

---

[26] Contributions from the Governments of the Dominican Republic, Kenya and Nigeria.

[27] UNCTAD, 2013, Internet broadband for an inclusive digital society, available at http://unctad.org/ meetings/en/SessionalDocuments/cstd2013_IssuesPaper2.pdf; UNCTAD, 2014, Digital development, available at http://unctad.org/meetings/en/SessionalDocuments/CSTD_2014_Issuespaper_Theme2_ DigitalDev_en.pdf (accessed on 30 January 2017).

foresight may be useful tools to identify priorities in science, technology and innovation, while more networked and open approaches can provide opportunities to simultaneously link actors in extended innovation systems, at both national and international levels. While mission-oriented approaches require a degree of top-down management, other emerging approaches to innovation, in particular when enabled through digital open collaboration, often require Governments to provide a platform through which other stakeholders can contribute. Broadening can also be hardwired into funding mechanisms. The Longitude Prize, for example, allows the public to choose the project to be funded, introducing a democratic component to prioritization and mission definition. Providing funds through mission-oriented approaches, especially if larger investments than usual are involved, may lead to additional scrutiny from users of social media and a more networked citizenry. The appropriate response is to embrace such openness rather than to attempt to constrain the flow of information or debate. However, this raises serious political and technical challenges for many developing countries.

6. Embrace digitization as an enabler of innovation

41.   The digitization of data is an enabler for new innovation approaches, yet digital development is not enough. While increasing digitization is relevant to information flow and access, it is important not to lose sight of more traditional capabilities. Digitization can be most powerful when it allows the aggregation and disaggregation of data in order that data may be applied by various stakeholders addressing different goals, to ensure that no one is left behind.[28] However, beyond raw data and access, digitization requires protocols for sharing and arrangements by which ownership and openness are governed. This may include licences and other ways of ensuring that there are no free-riders that extract and appropriate the shared knowledge that is generated. Artificial intelligence and machine learning offer further opportunities to enhance the efficiency of sharing and collaborating across databases. Digital collaboration thus has huge potential, but also has limits. Much of the knowledge most relevant to the focus of the Goals on basic needs (whether associated with food security, gender equality or peace) is tacit and cultural and cannot be digitized.

B.   Challenges and focal areas for research

42.   While the Goals are universal, specific priorities are set at local, national and regional levels. Coordinating efforts across the Goals, and recognizing interactions between them, is a key challenge. Skills for policy development and implementation (of both specialist and non-specialist policymakers) are lacking in many developing countries. This is important, as priorities and contexts differ in each country, and policy instrument and design choices cannot be easily transferred. At the level of innovation systems, agenda-setting, financing, monitoring, evaluating and accountability are all key considerations. Beyond innovation systems, complementary policies and regulations are required to steer innovation in directions that serve social inclusion and environmental sustainability.

43.   Encounters between new approaches and formal research and innovation systems are difficult to govern, yet policy should aim to enhance a synergistic dynamic of mutual mobilization, rather than focusing on inserting and appropriating new approaches into formal structures. In many cases, this requires national Governments or intergovernmental organizations to support more pro-poor, inclusive and collaborative components of hybrids, in order to achieve the Goals. Preventing free-riding, appropriation and de-skilling (for example, through displacing labour and productive employment) due to such

---

[28] See, for example, work by the Data Revolution Group, available at http://www.undatarevolution.org/wp-content/uploads/2014/11/A-World-That-Counts.pdf (accessed on 30 January 2017).

innovation approaches requires clear but flexible measures that are driven democratically, rather than purely by markets. During such processes, all stakeholders have a key role in holding to account those who have influence over innovation policies.

44. There have been several initiatives within the United Nations system to better understand the relation between innovation and sustainable development and to promote new approaches to innovation.[29] The United Nations Economic, Scientific and Cultural Organization and regional commissions, such as the Economic and Social Commission for Asia and the Pacific and Economic and Social Commission for Western Asia, support Member States through studies and workshops on harnessing science, technology and innovation for inclusive and sustainable development. The International Telecommunication Union has developed an information and communications technology-centric innovation framework and brought together financial and telecommunications regulators, as well as experts and private-sector stakeholders, to address the regulation and supervision challenges of digital financial services. UNCTAD and the United Nations Economic, Scientific and Cultural Organization support the development of national innovation policy frameworks, the former through its science, technology and innovation policy reviews and the latter by promoting firm-based innovation through science parks and incubators and by promoting grass-roots innovation through a network of actors involved in bottom-up solutions. The United Nations Framework Convention on Climate Change has established a platform for bottom-up climate action with indigenous peoples taking a central role. In addition, the United Nations Major Group for Children and Youth has established a Youth Science Policy Interface Platform contributing to enhancing the science–policy interface within the United Nations.

45. The implications of new innovation approaches are far from well understood, and more research is needed. As such initiatives mature, efforts to improve the knowledge base are warranted to inform national and international policy. Internationally linked research-based organizations such as the Transformative Innovation Policy Consortium are efforts in this direction (http://www.transformative-innovation-policy.net).

46. Achieving the 2030 Agenda for Sustainable Development will require strong collaboration and partnership among all stakeholders. Organizing innovation transnationally requires a move towards global sustainability oriented innovation systems and transformative change. A range of international actors and United Nations initiatives, including the Commission on Science and Technology for Development and the Technology Facilitation Mechanism, provide platforms to build such systems. The role of national Governments, however, remains paramount.

IV. Findings and suggestions

47. The following findings and suggestions were highlighted by the intersessional panel and put forward for consideration by the Commission at its twentieth session.

---

[29] Inputs from the Economic and Social Commission for Asia and the Pacific, Economic and Social Commission for Western Asia, International Telecommunication Union, United Nations Economic, Scientific and Cultural Organization, United Nations Framework Convention on Climate Change and United Nations Major Group for Children and Youth.

A. Harnessing innovation for development key to achieving the Sustainable Development Goals

48.   The scale and ambition of the Goals require innovation in development and innovation for development. To achieve the Goals by 2030, new modalities for development are required, including bringing innovation into the foreground of development projects. The key questions concern not how to encourage more innovation in more places, but which kinds of innovation need to be encouraged while at the same time discouraging harmful innovation. This entails re-orientating innovation trajectories to enable inclusive, socially just and environmentally benign patterns of socioeconomic development; encourage experimentation with different ways of solving problems; and involve various actors, processes and types of governance, along with unprecedented forms of collaboration and cooperation across stakeholders, sectors and regions.

B. Plurality of innovation sources from the global North and South

49.   The last decade witnessed a changing geography of innovation.[30] There is growing recognition of the richness of dynamic experimentation with different ways of problem solving in the global South. Some of the new innovation approaches outlined in this report, such as pro-poor and grass-roots innovation, originate in developing countries. Such innovation approaches recognize the needs of poor, grass-roots and marginalized communities and involve them in innovation processes. Those at the bottom of the pyramid (the poorest in society) represent a huge untapped market for small-scale entrepreneurs as well as large multinational enterprises. The challenge in inclusive innovation is that small organizations are inherently frugal and agile but lack resources to achieve scale, while large organizations have the resources to achieve scale but are often slow to act. Partnerships between small and large, local and global, firms are needed.

C. Capabilities are central but unevenly distributed

50.   Capabilities are central for effective innovation, but are unevenly distributed across countries. Efforts should be made to identify and strengthen the required capabilities to innovate and to create enabling environments for innovation. Global initiatives aimed at providing technical assistance and sharing good practices in capacity-building are highly relevant. The Commission on Science and Technology for Development is well placed to serve as a platform for promoting such initiatives. Country contexts, cultures and local needs are diverse when it comes to capacity-building for science, technology and innovation. Therefore, there is a need for Governments and various non-State actors to network and to create the capacity to adapt innovations to local contexts and cultures. For instance, developing countries, including the least developed countries, are characterized by a large informal sector and a high incidence of informal sector innovation, much of which is incremental in nature. Science, technology and innovation capacity-building in this context means supporting the large-scale deployment of existing technologies already in widespread use elsewhere, as well as experimenting with new innovation approaches.

---

[30]   See GM Marcelle, 2016, Redefining innovation in the global South: Critical imperatives, available at http://unctad.org/meetings/en/Presentation/CSTD_2015_ppt15_Marcelle_en.pdf (accessed on 30 January 2017).

D. Financing innovation for development requires more attention

51.   Achieving the Goals requires addressing a range of resource constraints, including financial, technological and skills-related, as well as in other areas. Financial resources for the implementation of the Goals remain inadequate. Therefore, there is a need to mobilize and scale up development finance allocated to investment that considers social and environmental objectives in support of the Goals. There has been significant attention paid to the linkages and relationships between Governments, universities and industry in science, technology and innovation policymaking. However, the importance of also fostering linkages with investors in relation to financing innovation has not been adequately recognized, especially in developing countries. To change the current allocation of investment, including foreign direct investment, it is necessary to change the mindset of investors, to help overcome financing constraints for innovation and the Goals. Partnerships between Governments, the private sector and academia should also include the financial sector. Efforts in this area should increase access to financial resources and improve their allocation.

E. Science, technology and innovation policy implications: Direction, context, coherence and coordination

52.   Science, technology and innovation policies related to the Goals must consider the direction, distribution and diversity of innovation pathways. They should also take into account the linkages and relationships between the different actors, as well as the skills and other framework conditions required for innovation. The 2030 Agenda for Sustainable Development provides an opportunity for policymakers to support the emergence of, and experiment with, new forms of innovation for sustainable development. There is considerable scope for recombining elements of new approaches with more traditional ones. This underlines the importance of policy coherence across government actors in the design of policy mixes. A coordinated approach is needed, widening the policy focus of innovation systems both in terms of the actors involved and the means of interaction and collaboration.

F. Suggestions from the intersessional panel for consideration by Member States and the Commission on Science and Technology for Development at its twentieth session

53.   The intersessional panel encourages Member States to consider the following courses of action:

(a)   Adopt policy mixes across various government actors that enable hybrid forms of traditional, pro-poor, grass-roots and social innovation, while prioritizing innovation that is both socially inclusive and environmentally sustainable.

(b)   Consult and collaborate with multiple stakeholders when setting priorities for the Goals and during the design of large-scale innovation policy initiatives such as mission-oriented projects.

(c)   Ensure the inclusiveness of innovation, especially with regard to local communities, women and youth, to ensure that the scaling and diffusion of new technologies is inclusive and does not create further divides.

(d)   Recognize and support local communities and local populations' knowledge in innovation processes and support efforts to commercialize and scale up locally developed innovations.

(e)   Network across actors both nationally and internationally to adapt and deploy existing foreign innovations that can work in local cultures and contexts.

(f)   Include inputs from scientists, creating a science–policy interface, and other actors for innovation policy development, to understand incentives, identify policies that work and draw lessons from failures.

(g)   Encourage corporate social responsibility policies in the private sector that reflect inclusive and sustainable innovation to meet the Goals, and incentivize private and public investors for impact investment.

(h)   Support policies that increase financial inclusion, deepen the sources of financing and direct investments towards innovations that address the Goals.

54.   The intersessional panel encourages the international community to consider the following courses of action:

(a)   Provide networking opportunities and facilitate matchmaking between local innovative solutions and private-sector actors or policymakers who can work on scaling up and deploying new innovations.

(b)   Raise awareness for innovation in achieving the Goals and address financing challenges by sensitizing the finance community to the Goals and changing mindsets in the financial sector.

55.   The intersessional panel encourages the Commission to consider the following courses of action:

(a)   Advise the international community of the importance of new innovation approaches that provide socially inclusive and environmentally sustainable solutions to achieving the Goals.

(b)   Provide a multi-stakeholder platform for experts to exchange lessons learned, best practices and experiences in technology deployment, as well as in policymaking, to encourage new innovation approaches and enhance hybrid approaches to innovation.

(c)   Include a specific focus on the Goals, bottom-of-the-pyramid approaches, social inclusion and other emerging issues in national science, technology and innovation policy reviews.

(d)   Examine regulatory issues related to technology deployment, especially for developing countries that do not have the capacity to do so.

(e)   Examine areas of investment with a highly positive impact on the Goals and consider launching a core learning and solutions experiment with the financial community (that is, a financing innovation for development lab) to find ways to learn more about how to encourage greater investment in developmental innovation projects that contribute
to achieving the Goals.

———————————