Background Paper No. 3

Landscape of Science, Technology and Innovation initiatives for the SDGs

Inter-Agency Task Team for Science, Technology and Innovation for SDG (IATT-STI)[1]

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1. Introduction

With the adoption of the 2030 Agenda[i] at the United Nations Sustainable Development Summit in September 2015, the UN Technology Facilitation Mechanism (TFM) was launched and the Inter-agency Task Team on Science, Technology and Innovation for the SDGs (IATT) was formalized. One of initial streams of work of the task team has been to take stock of the existing science, technology and innovation (STI) landscape across the UN System and beyond, to inform well-grounded discussions on how STI, as key means of implementation, can best contribute to the achievement of the SDGs.

1.1 Objectives

The primary purpose of this paper is to broaden and deepen the understanding of existing initiatives focusing on science, technology and innovation where they contribute to the SDGs. For this purpose, the next section of the paper takes stock of the **UN System's STI initiatives** based on submissions received from UN agencies and characterizes them in terms of their inputs, activities, outputs, and intended outcomes. It also serves as a complement to the mapping of climate technology development and transfer activities[ii] recently conducted in the context of the United Nations Framework Convention on Climate Change (UNFCCC).

Toward its purpose, this paper contributes technical inputs to inform and enrich discussions both within the IATT as well as among Member States and other stakeholders at the annual Multi-stakeholder Forum on Science, Technology and Innovation for the SDGs (STI Forum). Responding to the first STI Forum in 2016, the subsequent section proposes an initial framework to identify and examine STI needs and gaps, considering **non-UN STI initiatives** at an aggregate level (not at country or thematic level).

Compared to IATT's initial, limited landscaping[iii] conducted in early 2015 and UNFCCC's mapping mentioned above, this mapping looks more broadly at STI as compared to focusing on technology. It attempted to compile a more comprehensive overview of UN initiatives and, to a lesser extent, consider non-UN initiatives with the aim to map the landscape of efforts and identify potential gaps.

1.2 Approach and Methodologies

Defining science, technology and innovation in the context of the SDGs: One major difficulty facing any mapping attempts is the definition of STI initiatives, given the broad variety of mandates and approaches throughout the UN Agencies and the absence of a commonly agreed framework. For this mapping, the initiatives taken into consideration were characterised by relating to one or more of the 23 STI-related commitments enshrined in the Addis Ababa Action Agenda (AAAA)[iv] in paragraphs 114 to 124. Member States therein agreed on 16 commitments for national actions, including a) five relating to *scientific research and education*; b) five relating to *industry and innovation systems*; and c) six relating to *technologies for specific development outcomes*. In addition, the AAAA includes two commitments on national policy frameworks and five on supportive international arrangements across STI (see Annex 3).

Different levels of engagement and instruments: The science, technology and innovation initiatives represent a complex and highly diverse landscape that spans different levels of engagement, with varying approaches, content focuses, target groups, and working methods. While recognizing overlaps and

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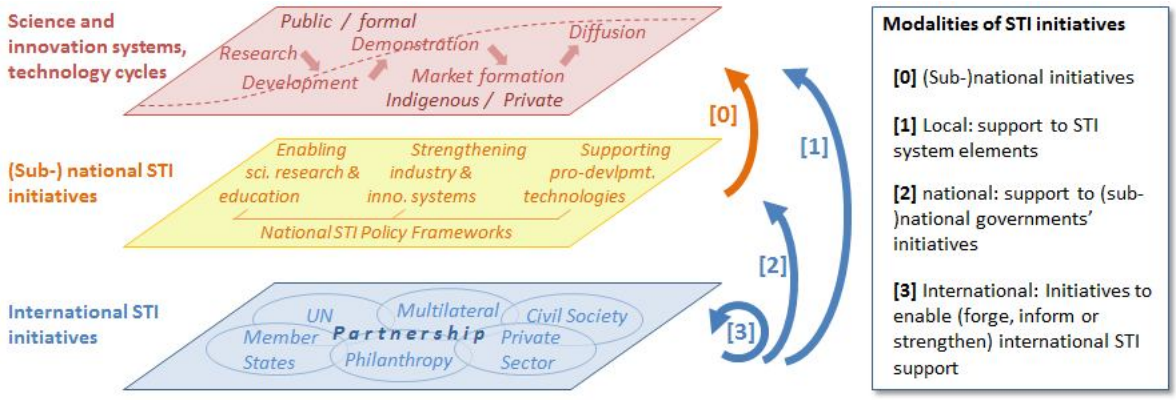
interdependencies in this regard, the mapping tried to identify at which of the following three levels UN initiatives aimed predominantly. This enabled comparability and general characterization at a possible expense of accuracy and nuances (see Figure 1):

1. Local: directly supporting participants in science, technology and innovation ecosystems.
2. National: supporting (sub-)national governments' STI-related activities. Note that this labelling does not necessarily limit geographical scope of the initiatives (for example, regional projects supporting multiple national governments can be grouped here).
3. International: global or regional efforts aiming to forge, inform or strengthen support for or exchanges on science, technology and innovation, across governments and stakeholders.

Figure 1: Levels of STI engagement



Initiatives with a primary focus on STI: Science, technology and innovation are such a key cross-cutting means of implementation for many sustainable development outcomes and can be smaller elements of larger initiatives or indirect enablers. Therefore the mapping further delineated the scope of the analysis by differentiating "primary" and "secondary" initiatives per extent to which respective initiatives are dedicated to STI. "Primary" STI initiatives are those with objectives to directly contribute to STI outcomes as explicit in SDG targets or the 23 STI-related commitments in the AAAA, or those using STI as their most significant instruments of intervention and/or with dominant resources allocated for STI to achieve any SDG targets. Initiatives more indirectly contributing to STI for SDGs were labelled "secondary." This is not to imply less importance or relevance but to facilitate the main, in-depth analyses to focus on the identified "primary" initiatives, while taking "secondary" initiatives into consideration where useful (for elaboration, see Box 1).

1.3 Data and Limitations

Based on the outlined definitions, all members of the IATT and select UN entities beyond the IATT likely to have STI-related initiatives in their portfolio had been solicited to submit the following information:

i) At the input level estimates of the resources at the disposal of the initiatives, such as budget and full-time staff equivalent (as a proxy for level of efforts) and resource for external recipients (as a proxy for significance to beneficiaries including Member States), where available;

ii) The level of engagement, the instruments used, and other qualitative characteristics; and

iii) To which SDGs the initiatives contribute to.

The collected information expands on what was known beforehand, highlighting general trends to inform initial discussion of key questions relating to STI support to the SDGs. Important **caveats** need to be noted, however, due to institutional challenges resulting in the analyses prone to three sources of inaccuracy:

1. Identification: The number of STI initiatives is likely understated, given that the diversity of the organizational, administrative, accounting, and reporting systems used by UN entities were not conducive to comprehensively identify all STI initiatives. This is compounded by the lack of submissions of a few agencies with strong STI presence, such as UNDP, UNICEF and WHO.
2. Estimation of resource inputs: In a context of increasing workload and demands on agencies to be carried out in addition to regular work, not all agencies contacted had the capacity to submit detailed

inputs, and therefore the quality of submitted data varied substantially. In trying to harmonize data across agencies and assuring comparability, some estimations were necessary.

3. Interpretation: The above typologies - levels of engagement and science, technology or innovation domains - are often not mutually exclusive, and prone to subjective interpretations.

2. Landscape of UN STI Initiatives

2.1 Overall landscape

Based on received inputs, the mapping examined around **1,600 activities** across 20 UN agencies that relate to science, technology and innovation, encompassing an estimate of around **2,600 full-time staff equivalents, around $1 billion annual budget and approximately $120 billion stock of resources for recipients** ($50b grants and trust funds and $70b loans and credits).

Half of these activities are dedicated to achieving, facilitating, and/or measuring one or more targets under the 17 SDGs through science, technology and innovation in line with the relevant AAAA commitments, and thus considered **"primary"** STI initiatives. These primary initiatives are estimated to encompass around 1,000 staff, $400 million annual budget and $40 billion resources for recipients ($10bn grants and trust funds and $30bn loans and credits). These initiatives are a sub-set of the above broader initiatives and represent the UN system's dedicated efforts most clearly identifiable with STI as means of implementation of the SDGs.

The other half have a broader focus in which science, technology or innovation is a smaller component or have indirect effects, and are thus considered "secondary" STI initiatives. For illustration of inclusion to this group, see Box 1**:** . The following analyses will differentiate these two groups of the initiatives, examining the "primary" more granularly (e.g. qualitative characterization by agencies) while referring to the "secondary" where useful (e.g. comparing UN Systems' overall level of efforts across SDGs).

Seven agencies host most primary STI initiatives submitted through this study: the **World Bank**, **FAO, ITU, WIPO, UN Environment, UNESCO and UNIDO** (in descending order of per budget for primary STI initiatives). They represent the major portion of the estimated budget and recipient resources for "primary" STI initiatives. STI initiatives (including "secondary") in aggregate represent around **15% of staff and budget, and close to 30% of recipient resources** at these agencies.

Other agencies, such as UNCTAD, UNICEF, WFP, WHO, and UNOSSC, have STI activities with specialized domain focus and of smaller size (partially due to limited data submitted). Regional Commissions are also known to have STI activities. For summary data of all agencies studied, see Annex 1-1.

Box 1: What STI initiatives were considered in this mapping?

It often helps clarifying definitions and inclusion criteria by explaining what was *not* included:

- **Neither "primary" nor "secondary" initiatives** are those with only tangential or very indirect contributions to the SDGs through STI. For example, broad economic policies (e.g. addressing investment climate, trade barriers, tax regimes, etc.) across WB, UNIDO, WTO, ITC and UNCTAD, despite their effects to increase productivity through technological upgrading, were excluded from the analysis. Technical harmonization infrastructure (e.g. ITU's work on space systems, earth stations, radio spectrum regulations) and initiatives with a very small technology component (e.g. broad capacity building with funding for purchase of personal computers) were excluded for similar reasons.
- **"Secondary" but not "primary" initiatives** are those with a visible but not dominant STI component, where inputs for such a visible STI component is hard to isolate from the rest. For example, GEF (Global Environment Facility), with $23 million budget, $17 billion grants and including substantive work on environmentally sound technologies, is "secondary" as technologies do not represent more than half of the use of these resources. Some of the individual GEF-funded projects by its implementing agencies (e.g. WB, UN Environment, UNIDO) are "primary" and characterized as implementation of international protocols through STI, as in the below instrument section. In contrast, some protocols or partnership facilities with clear STI focus (e.g. CGIAR, Clean Technology Fund) are "primary" STI initiatives at agencies hosting their secretariats.

The "primary" initiatives received through this mapping are deemed to be indicative enough of trends and patterns, except for a few agencies (see Annex 2 for agency-specific limitations). The volume of "secondary" initiatives, on the other hand, is likely underestimated. For example, UNESCO data covers natural science and STEM part of education, but not programs addressing cultural heritage, which may be of secondary relevance to indigenous knowledge as included in the AAAA commitment (§117). WB's initiatives, due to their volume, were cut down to around half in number from the original submissions through screening of similar-and-recent enough projects and size of input resources, largely from "secondary." Moreover, World Bank Group's work directly with private sector, such as venture capital fund of funds and disruptive technologies

(through IFC: International Finance Corporation), is not included.

Given the limitations of data and methodology, quantitative **analyses presented in this paper should be interpreted as only indicative**. In particular, analyses including "secondary" initiatives may underestimate the UN System's overall level of efforts associated with STI, while overestimating the effective STI substance only as a part of such initiatives.

2.2 Activities – STI Domains

For the "primary" STI initiatives, the mapping tried to categorize them with respect to two dimensions: per STI domain and per level of engagement.

With regard to **STI domains – science, technology or innovation –** the mapping tried to identify the most visible focus of the initiatives across the three domains while recognizing the cross-cutting nature of some of the initiatives. When looked through the distribution of inputs, **technology is the largest** (**50-60%** of budget, staff and recipient resource for "primary" initiatives), **followed by science (25-35%) and innovation (10-20%)**. A small fraction of initiatives has a cross-cutting focus on STI policy frameworks (2-3%; See Box 4**: UN work on STI policy frameworks**for more details).

To illustrate the mix of activities, initiatives were further grouped under technology, science and innovation domains, per commonalities identified through bottom-up examination of individual initiatives.

Table 1: Distribution of estimated UN efforts, by STI domains

STI Domains	Budget ($m)	Grant ($b)	Loan ($b)	Agencies (with $1+m budget)
Technology	**210**	**6**	**18**	
Technology-intensive infrastructure	60	0.1	9.5	ITU, WB, UN Environment
Industry-scale technologies	70	2.8	3.7	UN Environment, WIPO, UNIDO, FAO, WB, ITU, UNESCO
Small-scale technologies	40	0.1	3.8	WB, UN Environemnt, FAO, ITU, UNIDO
Scale-agnostic technology mechanism	20	2.7	-	WIPO, ITU, WB, UN Environment
eGovernment, ICT in public administration	10	-	0.9	WB, ITU, FAO
Science and STI Education	**120**	**5**	**5**	
Science stat, landscaping, access to publications	50	-	-	FAO, UNESCO, ITU, WB
Support to scientists or R&D activities	40	5.4	1.2	UNESCO, WB, WIPO, UN Environment
STEM Education and TVET	20	-	3.7	UNESCO, WB
Science diplomacy and science-policy interface	10	-	-	UN Environment, UNESCO
Innovation	**80**	**0.2**	**4**	
Innovation policy, and ecosystem	50	0.2	1.9	WB, WIPO, UNIDO
Sector specific innovation support systems	20	-	1.3	WB, FAO, ITU, UN Environment, UNIDO
Social or inclusive innovation	10	-	0.4	WB, FAO
STI Policy Framework	**10**	**-**	**1**	WB, UNESCO, UNIDO, UNCTAD

Technology is grouped by scale of adoption.

- *Technology-intensive infrastructure* includes telecommunications, transport and energy utilities. ITU's regulatory frameworks and normative work forms the largest part of this group, followed by WB's investment lending (e.g. for broadband connectivity, transport control/road safety, energy efficient power plant or smart grids).
- *Industry scale* technologies largely mitigate pollution or promote efficiency at establishment level. UN Environment's work on climate technologies, hazardous chemicals as well as sustainable production and consumption are largest, followed by WIPO, UNIDO and FAO working on matchmaking and exchanges for industry actors, and ITU on digitization of value chains. Grant elements in this group are largely represented through the Montreal Protocol (Ozone) and GEF. WB lending includes financial intermediaries for energy efficiency.
- *Small-scale technologies* are for households, farmers or communities, such as off-grid renewable energy, efficient lighting, cook stoves, irrigation, mobile payment or water purification. Initiatives span across

WB lending, UN Environment's GEF-funded projects, FAO and others' policy guides/toolkits as well as community engagements.

- *Scale-agnostic* technology mechanisms is a separate category, such as any technology needs assessments and WIPO's dispute resolution mechanism and grants through WB's Clean Technology Fund, for technology transfers not focusing on specific scale of technologies.
- *e-Government* is another separate category, encompassing digitization of government services (such as business registration, customs processes, land administration and agricultural policy decision making) and includes initiatives on open data, citizens identification and social accountability.

Science is grouped by contents.

- *Science statistics, landscaping and access to publication* encompass the aggregation and analysis of scientific information in an accessible manner. FAO's information systems, such as on soil, forests, crop or livestock diversities and aquaculture, are predominant in this group. A few agencies publish scientific landscaping and maintain online portals for access to scientific studies.
- *Support to scientists or R&D activities* are provided through research grants or networking support. UNESCO provides largest programs through basic scientific capacity building and inter-university networks, followed by UN Environment's work on waste management and climate technology research. Grants in this category are CGIAR (Consultative Group of International Agricultural Research) and WB's tropical disease research fund as well as a partnership fund for scholarship and research.
- *STEM (Science, Technology, Engineering and Mathematics) Education and TVET (Technical Vocational Education and Training)* are largely UNESCO's capacity building, including with gender focus, and WB's lending for tertiary/higher education on STEM-focused quality improvement and skills for jobs programs.
- *Science diplomacy and science-policy interface* is conducted by UN Environment and UNESCO through publications and convening.

Innovation is grouped by emphasized outcome.

- *Innovation policy and support to innovation ecosystems* covers intellectual property regimes, academia-industry collaboration, firm incubation, early stage financing, and strengthening of innovation/entrepreneurship promotion agency, for productivity growth and job creation. WB provides the largest support through investment lending and policy lending as well as grant-funded technology centers, followed by WIPO and UNIDO through technical assistance and capacity building.
- *Sector-specific innovation* encompasses sector-specific outcomes such as on food production, emission reduction, etc., through strengthening of national agricultural innovation systems, domestic R&D capacity for clean technologies, through lending, technical assistance as well as accumulation and dissemination of good practice knowledge through publication and convening.
- *Social or inclusive innovation* has an explicit emphasis on the poor and the vulnerable, including women, through targeted innovation funds, entrepreneur networking, challenge programs, and learning centers.

The mix of STI domains covers the full technology cycle, from upstream research to downstream technology transfer and dissemination. The wealth of expertise, across agencies and domains, warrants promising synergies. On Technology, given the highest level of effort and volume of recipient resource, opportunities for further scale and value for money may lie in the intersection with Financing for Development (such as public-private partnerships for infrastructure; commercial financing for industry scale technologies; or blended finance for diffusion of small scale technologies). Science may represent a trade-off between assembling more scientific information, strengthening the science-policy interface ("meta science") or providing more direct support to scientists ("science contents"), including through leveraging and synergizing with non-UN capabilities and funding for scientific efforts. On innovation, the smallest volume of efforts in this category may represent a "valley of death[2]" or a gap from upstream to downstream activities.

[2] The same pattern was observed through the previous, limited sample-based mapping, as referenced in endnote iii.

2.3 Outputs – Levels of Engagement and Instruments

On levels of engagements, **international engagement is largest**, with half of budget and staff and, some (24%) of recipient resources. **National engagement is second-largest**, with around a third of the budget and staff while channeling the majority (75%) of recipient resources. The **smallest is local engagements**, with around 20% of the budget and staff.

Similarly to the grouping under STI domains, all "primary" initiatives were further grouped by instruments[3] below the three levels of engagement, through commonalities identified through bottom-up examination.

Table 2: Distribution of estimated UN efforts, by levels of engagement and instruments

	Budget ($m)	Grant ($b)	Loan ($b)	Agencies (with $1+m budget)
International engagement	**190**	**9**	**-**	
Research, knowledge production	60	-	-	WB, FAO, ITU, UNESCO, UN Environment
Statistics, databases, monitoring services and open/big data initiatives	40	-	-	FAO, WIPO, UNESCO, ITU, WB
Norm setting, policy guidelines, standards and tools	40	-	-	ITU, FAO, UN Environment, UNESCO, UNCTAD
Convening forums	30	-	-	ITU, UNESCO, UN Environment, FAO, UNCTAD, Reg. Commissions
Secretariats for funds/protocols	15	9	-	WB, UN Environment, FAO
National engagement	**130**	**2**	**27**	
Technical assistance, knowledge/experience exchanges	80	0.1	-	WB, WIPO, UN Environment, ITU, UNESCO, UNIDO, FAO, Regional Commissions
Lending	50	-	27	WB
Country diagnostics	10	-	-	UN Environment, WB, UNESCO, UNCTAD
Implementation of international protocols for technology transfers	10	1.5	-	WB, UN Environment
Local engagement	**70**	**0.5**	**-**	
Tech/research centers, innovation ecosystem support	30	0.1	-	UN Enviornment, UNIDO, WB, ITU, UNESCO
Training programs	25	-	-	WIPO, UNESCO, FAO, ITU, WB, UNIDO
Incubation or challenge/competition programs	10	0.2	-	WB, ITU, UNIDO
Matchmaking, transfer, installation programs	10	0.1	-	WIPO, UNOSSC, WB, UNIDO

International engagement was grouped by type of products.

- *Research, knowledge production* ranges from actual research, or facilitation of processes that form consensus on scientific or technological issues, to flagship publications on policy and technical analyses.
- *Statistics, databases, monitoring services and open/big data initiatives* collate information through regular monitoring for open use; make data and information publicly accessible; and/or explore and experiment with new ways of capitalizing on open data or big data (e.g. FAO's Aquastat, WIPO's Patent Information Service, UNESCO's STI Global Assessment Programme, ITU's Blue Number Initiative).
- *Norm setting, policy guidelines, standards and tools* works towards establishment (or management if internationally recognized) of norms and standards, guidelines for policy formulation as well as concrete toolboxes for designing policies and regulation and their implementation.
- *Convening forums* ranges from large and policy-focused summits like World Summit on the Information Society (WSIS), intergovernmental bodies like the Commission on Science and Technology for Development (CSTD), to global networks and alliances that facilitate ongoing exchange among diverse stakeholders, to expert dialogue/workshop series on technical issues.

[3] Note that the instrument categories are by nature not mutually exclusive. For example, norm setting may be achieved through convening forums; convening or research activities are often undertaken by fund / protocol secretariats; training is often provided at technology centers; diagnostics, technical assistance and capacity building are embedded in most lending. Therefore, budget size distribution of these categories is meant to be only indicative, while characterizing representative scope of work by respective agencies and facilitating comparisons within comparable categories.

- *Secretariats for funds or protocols* support a range of international arrangements, such as the Montreal Protocol (Ozone), the Nagoya Protocol (biological diversity), the Climate Technology Fund, CGIAR (agricultural research), and the BRS Conventions (chemicals and waste). The $9 billion grant element is entrusted for these programs with "primary" STI focus, yet to be distributed to countries or activities level by implementing agencies through government or local support below. Several "secondary" programs, such as GEF (Global Environment Facility), are not considered as part of this group, while some of individual projects with "primary" STI focus, funded through such facilities, are part of the below grouping.

National engagement was grouped by formats of delivery.

- *Technical assistance, knowledge/experience exchanges*: All country-specific assistance and support provided by the UN system to governments with respect to policy and technical work, capacity building and implementation of government programs. Also includes support to the facilitation of knowledge and experience exchange among national stakeholders convened by governments or UN agencies.
- *Lending* includes WB's investment lending (such as for infrastructure), policy lending (economic and other policy reforms), and program-for-results lending (funding not earmarked to expenditure lines but disbursed against achievement of results). This category by nature overlaps with (or encompasses "embedded") other instrument types, as design and implementation of the investments and programs largely involve diagnostics, technical assistance, institution building and financing mechanisms for scientific research, innovation ecosystem strengthening or early stage start-up financing.
- *Country diagnostics* includes cross-country studies and reviews, such as ECE's innovation performance reviews, UNCTAD's national STI and ICT policy reviews, UNESCO's GO-SPIN on national STI policies as well as individual studies focusing on technical analysis at country level.
- *Implementation of protocols*: All activities and initiatives that serve the implementation of a specific protocol. The $1.5b grant includes funding through GEF, carbon purchases through CDM, technology installation through the Montreal Protocol. Note that these protocols or mechanisms also fund activities grouped at local level, therefore this grouping under government level represent those activities with broader STI scope or larger scale of technology adoption (such as at national infrastructure or industry level adoption) than those grouping identified at local level.

Local engagement was grouped by scope of support.

- *Technology/research centers and ecosystem support* includes individual or networks of centers, or programs not necessarily delivered through physical centers, directly engaging in the (sub-)national STI ecosystems, including through conducting applied research, promoting technology adoption and investments, providing training and facilitating linkages and innovation processes in local economic clusters.
- *Training programs* is a category for initiatives with narrower scope than the above, oftentimes with very specific thematic focus for either individuals, firms or government officials, but broader coverage of countries or locations (or delivered online).
- *Incubation or challenge/competition programs* is also a category for initiatives with scope narrower than ecosystem support, to identify, surface and support entrepreneurs and innovations through funding, networking and mentoring. Thematic areas for these programs range from climate technologies, digital entrepreneurship to social enterprises or humanitarian innovations.
- *Matchmaking, transfer, installation* facilitates demand and supply of technologies and related good practice knowledge, transfer of specific technologies or the physical installation. Examples include the South-South Global Assets and Technology Exchange or WIPO Green.

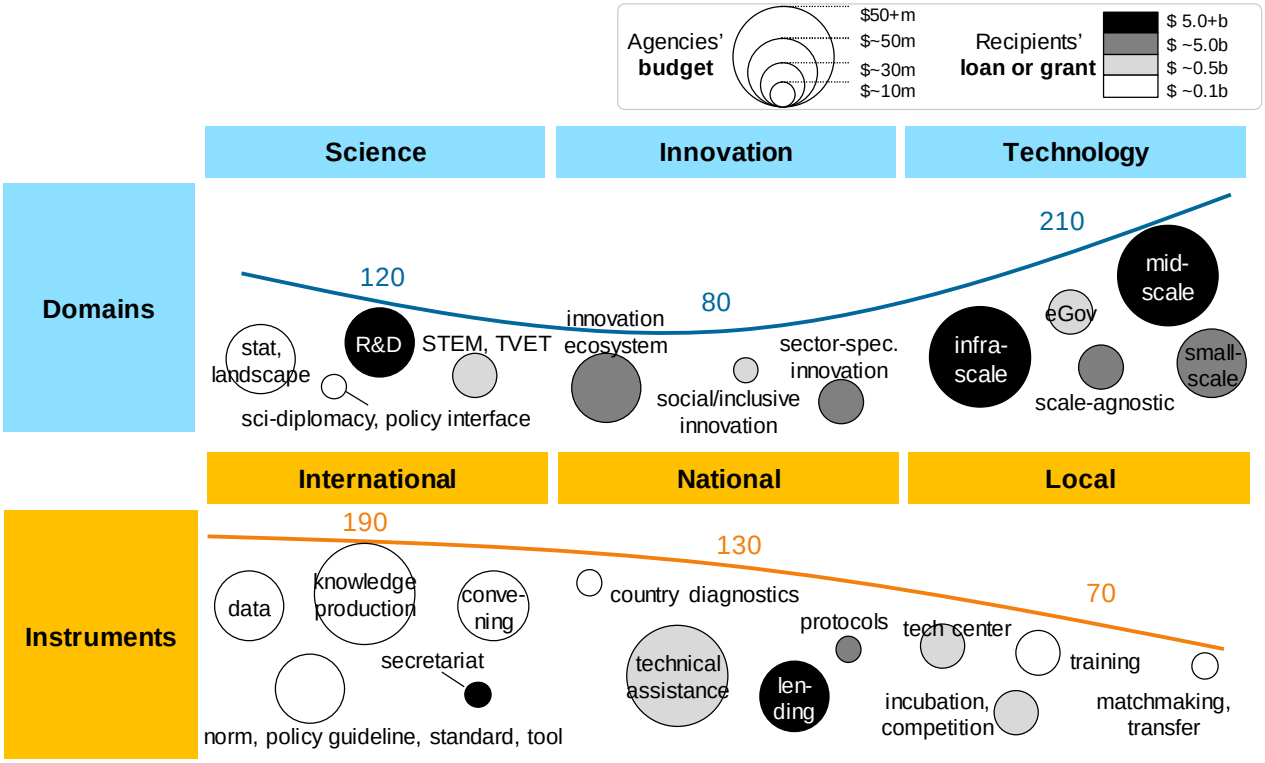
Mix of instruments facilitates global to local linkages. Overall the UN system offers a microcosm of varied services that bring value to Member States, with instruments at different levels of engagement mutually reinforcing and constituting important learning systems. Greater coordination can be beneficial in many ways. Global consensus can be facilitated based on scientific knowledge, statistical infrastructure, science-policy interfaces and forums for evidence-based norm and standard setting at the international level. Informed by such policy deliberations, protocol secretariats and WB lending channel funding for investments, provide technical assistance and develop domestic capabilities to adapt and implement policy guidelines and appropriate technologies at the country level. Local centers and matchmaking activities can help to inform national country diagnostics and feed back into the knowledge pool at international level.

2.4 Summary for Discussions

Overall, a big picture view of diversity and distribution of the STI initiatives can inform broad discussions on improving UN's fit for purpose in orchestrating achievement of the SDGs. Figure 2: Distribution of estimated UN Efforts, by domains and instruments illustrates the two dimensions characterized in this section.

- Across science, technology and innovation domains, how can the speed, probability and scale be improved with which new knowledge and insights turn into effective development solutions?
- From international to local instruments, how can the policies and practices be more agile and adaptive, to advance global agenda and local actions to eventually leave no one behind by 2030?
- Is the distribution of efforts optimal – and if additional public resources are difficult to mobilize under the fiscally constrained environment, what choice are we asked to make?

Figure 2: Distribution of estimated UN Efforts, by domains and instruments (primary only)



While not easy to answer in generic terms, these questions should guide further, granular examination of the STI efforts by SDGs, countries and agencies, with a view to fully leverage the UN System's comparative advantages. The UN System is equipped with political, intellectual, technical and financial capabilities, to be deployed from normative agendas to operational delivery, serving a range of countries and circumstances facing the breadth of challenges to tackle through the SDGs.

Business as usual is not an option and complexities cannot be used as an excuse – especially so in maximizing contributions of STI and accelerating the progress toward the time-bound SDGs, provided that technological progress may be outpacing absorption in the global development context (see Box 2**: Pace of technology adoption**[4]). Concerted efforts are required to fully unlock STI potentials to achieve all the SDGs everywhere.

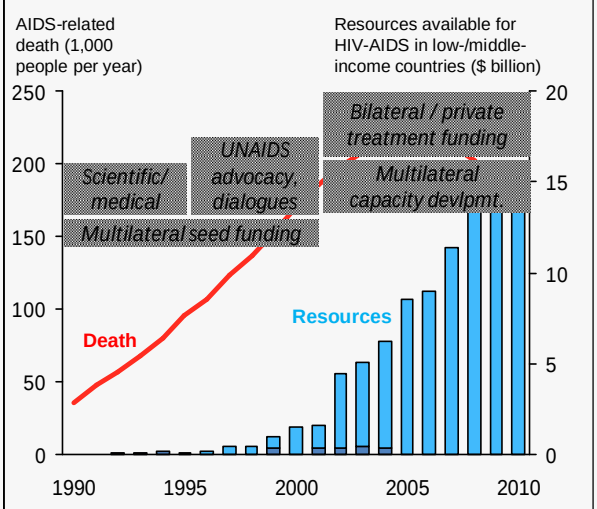
[4] Analysis partially adopted from Box 2 of the previous mapping paper (referenced in endnote iii), on technology and local capacity examining historical examples of the global-local linkages in the case of the fight against HIV and the case of not fully leveraging Asian Green Revolution experience in boosting agricultural yield in Africa.

Box 2: Pace of technology adoption

Historically, the pace of technology adoption has dramatically accelerated in advanced economies. In the United States, the time from invention to universal adoption has fallen from 50-60 years in the early 20th century to around 10 years at the end of the century. Technologies essential for development in less developed economies, however, have mixed trajectories. Such as for example, in the case of crop yield in Africa, which has stagnated, with only 6% of total cultivated area being irrigated (as opposed to 14% in Latin America and 37% in Asia), and mechanization being the lowest of all regions. Similarly, two-thirds of the global economic potential of energy efficiency remained untapped in 2016. And climate-resilient infrastructure and agricultural practices are yet under exploration or piloting where they are needed the most.

It is well recognized that such adoption often represents economic, political, institutional, and behavioral challenges, rather than technological ones. Combating HIV/AIDs is a case in point. Since the late 1970s, African doctors observed opportunistic infections, followed by the first HIV clinical case identified in the United States in 1981. Progress was limited for 15 years, with communities and national authorities facing devastating denial and stigma attached to the unfamiliar disease. When anti-retroviral therapy was shown to be effective in 1996, critical developments coincided – the creation of UNAIDS (promoting international dialogues and resource mobilization) and publication of instrumental researches (e.g. World Development Report convincing Bill Gates to create his foundation). As non-UN efforts (e.g. Global Fund, U.S. PEPFAR) started to fill financing gaps, multilateral agencies shifted focus to strengthen capacities across relevant ministries and agencies to plan and implement national programs across countries, toward 2005 when the increase of HIV-related death was reverted.

World Responses to HIV/AIDS
– political will, knowledge, and finance



Source: Author's elaboration on Global Fund-World Bank HIV/AIDS Programs Study (2006); and UNAIDS Global HIV/AIDS Report (2010)

Responses by UN agencies across instruments (such as field-based technical assistance, knowledge production, resource mobilization) and STI domains (for example, medical research, surveillance, immunization for complications) are deemed to have played important roles respectively. It took the international community, however, more than 30 years to contain (not yet eradicate) the deaths from HIV/AIDS – including 10 years since the medical discovery. Approximately over the same period, cellphone spread from 10% to virtually everyone in the United States.

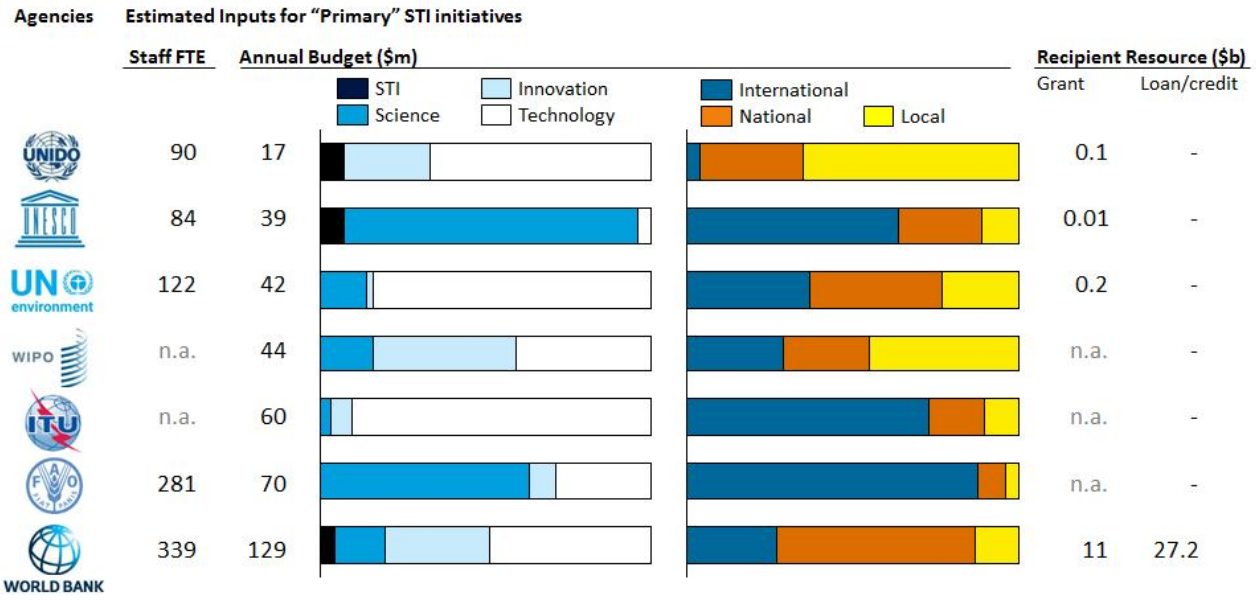
With the SDGs as a set of time-bound targets, time is of the essence – how many lives could have been saved if efforts on HIV/AIDS had moved 10 years faster? What would it take to have technologies reach those who need them the most, not over decades but within 15 years? How can the UN System's substantial efforts, with breadth of STI domain coverage and a wide array of instruments, be sequenced and coordinated, from global to local and from science to technologies, to accelerate progress?

3. Analysis of the UN STI initiatives

3.1 Agencies STI efforts across the SDGs

Characteristics of STI efforts vary widely across agencies and the SDGs. Figure 3: Estimated STI inputs and distribution per output types, by major STI agencies (primary only) summarizes (and Annex 1-2 elaborates on) the distribution of the "primary" initiatives across the seven agencies identified as most STI-intensive through the mapping. UNIDO's work on industrial innovation and technology transfers is largely at the local level, supporting institutions, firms, and individuals, while FAO and UNESCO seem to devote more efforts on science through global partnerships and knowledge production. ITU and UN Environment focus a large part of their efforts on technology, at different levels (ITU at global level on standard and norm setting, UN Environment more technical assistance at national and local levels). WIPO and the World Bank are in middle of this spectrum. In its role as a multilateral development bank, WB channels large share of recipient resources, including through trust funds implemented across agencies[5].

Figure 3: Estimated STI inputs and distribution per output types, by major STI agencies (primary only)

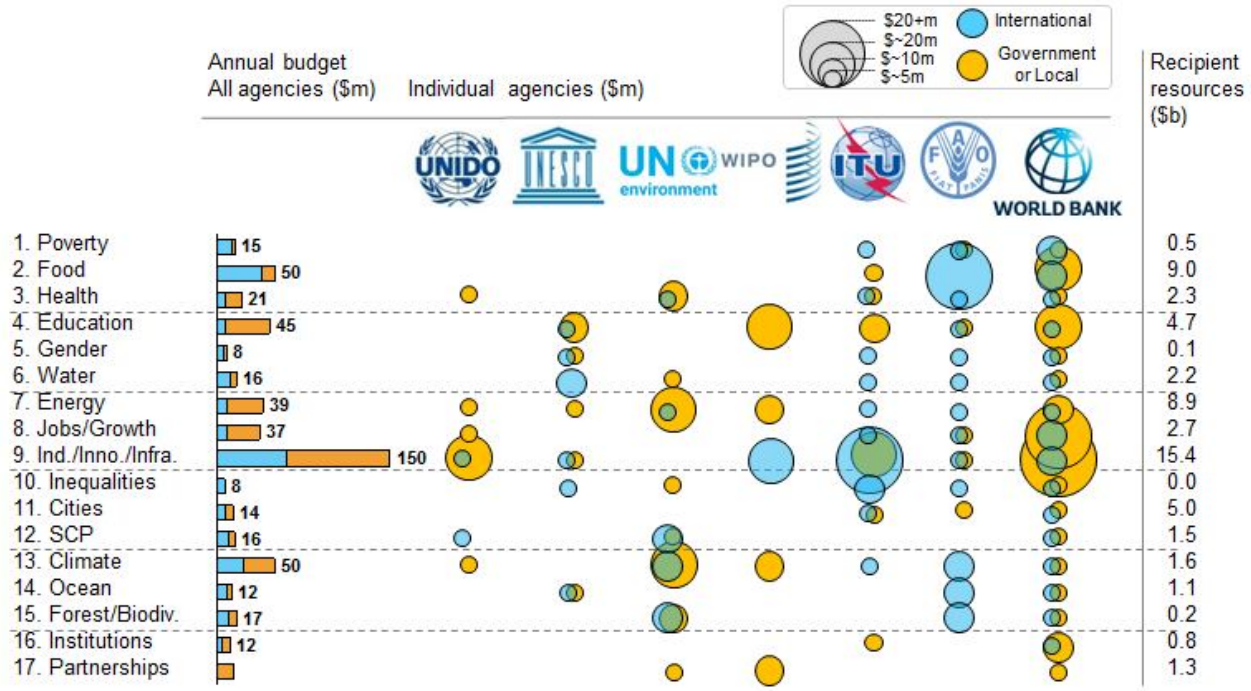


When looked through the distribution of efforts across the SDGs, it seems that **UN STI initiatives concentrate to a handful of SDGs (Goal 2, 4, 9, 13) while some SDGs receive little STI support (Goal 1, 5, 10, 16)**, as Figure 4 summarizes (and Annex 1-3 elaborates upon, including on "secondary"). More efforts are devoted for international than national/local STI activities for Goals 1, 2, 6, 11, 12, 14 and 15 (focusing on data/research, convening forums, protocol secretariats), while vice versa for Goals 3, 7, 8, 9 and 13 (focusing on TAs, centers, policy reforms and investments, with recipient resources). Inputs for "secondary" STI activities exceed "primary" initiatives, therefore making STI contribution more indirect, in the case of SDGs 1, 4, 8 at national level, and SDGs 14 and 15 at international level.

Agencies vary in their specialization through different coverage of the SDGs, instruments, and STI domains. UNIDO and WIPO focus on a handful of Goals locally. ITU and FAO cover the SDGs broadly, with a core focus on their respective mandates, largely at the international level. UN Environment and WB cover broad goals combining local and international initiatives. The following section examine international (blue) and national/local level (yellow) initiatives.

[5] See Section 6 of the previous mapping paper (referenced in endnote iii) on current inter-linkages and coordination, through institutional arrangements and funding channels in facilitating exchange of good practices and cascading accountability for results.

Figure 4: Estimated STI inputs across SDGs, by major STI agencies (primary only)[6]



3.2 Deeper look at international and national/local level initiatives

At the international level, the **distribution of the STI initiatives provides an initial and hypothetical view on the current state of deliberation and implementation on STI across the SDGs**. For some SDGs, such as Goals 1, 10 and 14 (poverty, inequalities, oceans), initiatives are more concentrated on research publications and statistical data compilation, presumably representing steps prior to policy applications through development of guidelines, toolkits or standards. Other SDGs such as Goals 2, 7 and 15 (food, energy, forest) are more represented by policy guidelines, tools and standards. Convening accounts for a significant share for Goals 8, 9, 12 (jobs/growth, industrialization/innovation/infra, SCP), possibly indicating more active deliberations to shape the agenda and/or consensus. Annex 1-4 presents a more granular data analysis.

Experts and stakeholders may have views, in respective areas of work, on next steps to advance current efforts along the spectrum, from global debates to local actions or from scientific discovery to technological applications. For example, for areas where publications are well accumulated and statistical data is broadly available, one may explore opportunities to build on and codify the policy practices.

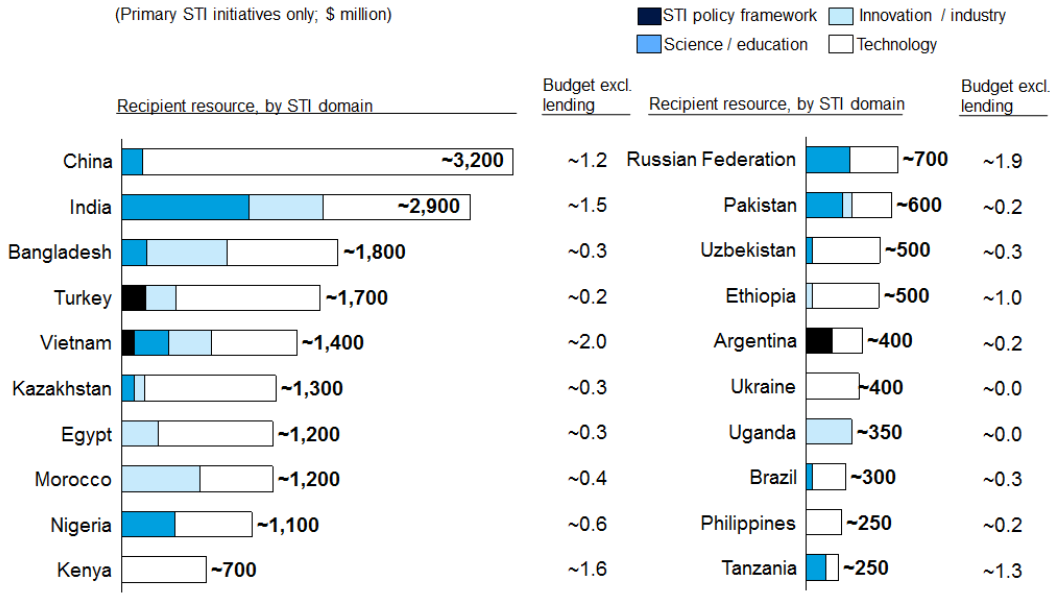
At country level, data limitations are severe and likely causing underestimation[7] of the UN System's collective efforts. Nonetheless, distribution of country and local level initiatives shows trends across SDGs as well as country groups, informing on the Member States' deliberation on their STI demands and priorities.

Firstly, **countries vary in their composition of UN system STI support received**, by loans or grants received (from a handful agencies), and by volume of country/local level STI initiatives not involving recipient resources (by most agencies studied). Initiatives in China, Kazakhstan, Uzbekistan, or Ethiopia, for example, focus predominantly on technology, while India, Bangladesh, Pakistan, and Vietnam seem to receive a more balanced composition of initiatives in all three domains. Particularly noteworthy are the visible initiatives on STI policy frameworks in Turkey, Vietnam, and Argentina. Distribution of initiatives without recipient resources (e.g. technical assistance, diagnostics) largely corresponds, while several countries receiving

[6] Total Budget per agencies is larger than in Figure 2 due to double-counting of initiatives contributing to more than 1 SDG. Contribution to Goal 17, duplicative with other substantive SDGs in many cases, is counted where only Goal 17 is relevant.
[7] The mapping lacks input on initiatives from UNDP, WHO and UNICEF whose STI activities should have a strong focus on the national level.

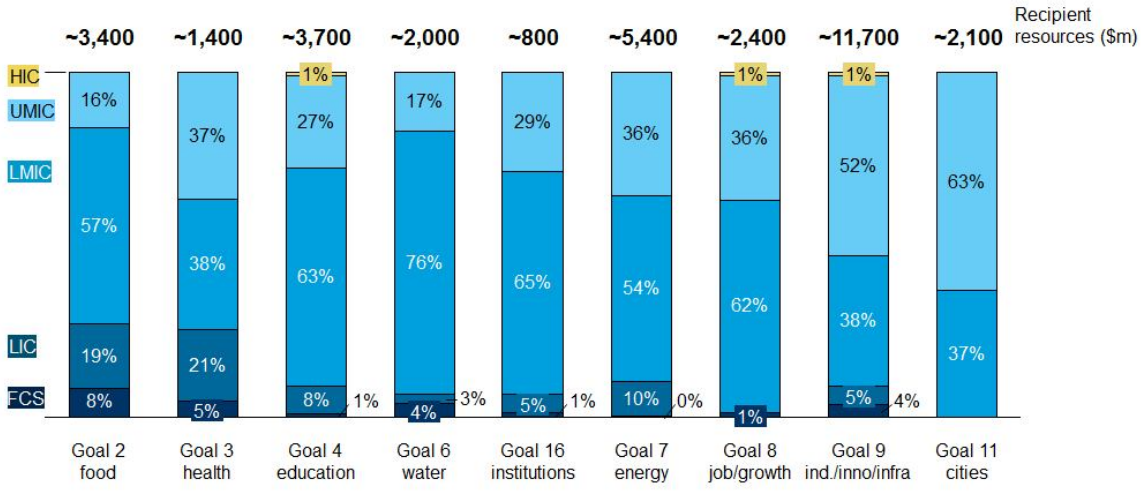
relatively more of such activities while not as much recipient resources (e.g. Vietnam, Kenya, Russia, Ethiopia, Tanzania).

Figure 4: Estimated inputs to STI initiatives with national scope by top recipient countries



Secondly, **countries' income grouping[8] shows diverging patterns of STI support across SDGs**. Low-income countries and fragile and conflict-affected states receive relatively higher support for STI for Goals 2, 3 and 4 (food, health, education), while upper-middle-income countries receive more support for STI for Goals 7, 8, 9 and 11 (energy, jobs/growth, industrialization/innovation/infrastructure, cities). Low percentages for low-income countries and fragile and conflict-affected states do not necessarily mean those who need support the most don't receive support as needed, but rather reflect variance in significance of STI support within the total assistance they receive – the **lower the income level, the lower the share of STI support**[9].

Figure 5: Distribution of initiatives with national scope, by country grouping in terms of recipient resources[10]



[8] Based on income groups per 2013 GNI p.c. calculated using the World Bank Atlas method: Low Income (LIC) $1,045 or less, lower middle income (LMIC) $1,046-4,125; upper middle income (UMIC) $4,126-12,745; and high income (HIC) $12,746 or more. Fragile and Conflict Situations (FCS) are separately defined (CPIA rating of 3.2 or less; or presence of UN and/or regional peace-keeping/building mission during the past 3 years) and include all income levels for this analysis.

[9] Using WB lending as a proxy, STI lending including "secondary" represented 40% of UMIC's, 31% of LMIC's, 23% of LIC's and 13% of FCS's total borrowing. Once limited to "primary," the ratios were 13%, 13%, 9% and 5% respectively.

[10] Total recipient resource per Goals is smaller than actuals due to multi-country projects not attributable to country groups.

Whether this variance reflects countries' priorities (i.e. choice of non-STI support over STI), or is driven by limited awareness, capacity or affordability, warrants further examination. One of apparent considerations is where and how the types of support middle-income countries tend to utilize more can be applicable and scalable for lower income countries. In such examinations, STI initiatives at international level can play useful roles, through data, research, convening, and secretariats.

Box 3: Illustrative views on country demands

The mix of lending is considered to better reflect countries' demands, given the cost of borrowing and opportunity cost of not using low-cost borrowing for other purposes (as per IDA envelope allocation and IBRD single borrower limits), than technical assistance and analytical services as free goods. Composition of lending for largest recipients are summarized as follows:

- China technology initiatives include CDM (Clean Development Mechanism) projects for large chemical plants, ODS (Ozone-Depleting Substances) phase-out in PU Foam sector through Montreal Protocol, Air Pollution Control in Jing-Jin-Ji, Kunming Urban Rail, Heilongjiang Cold Weather Smart Public Transport System, and smaller projects for climate technology needs assessment, energy efficiency, water conservation, municipal solid waste recycling, modern agricultural development and rural ICT.

- India technology initiatives include cleaning the Ganga River Basin, and retrofitting power plants in three state utilities. Innovation initiatives include MSME early stage financing and support to biotech entrepreneurs. Science/STEM education includes upgrading MSMEs manufacturing skills, improving technical engineering education quality and strengthening agricultural higher education and research.

- STI policy framework combines reforming government's research institutes; strengthening research talent development, commercial innovation ecosystems and conducive financing, industrial policies and linkages; supporting coherent policy frameworks including on results metrics and capacity development at relevant ministries and agencies. These are common in Vietnam, Argentina and Turkey, among others.

- Innovation/science projects are broader than industry, such as: agricultural technology/research and innovation systems in Vietnam and Uganda; health professional education in Vietnam; renewable energy R&D or rural electrification in Brazil, Vietnam, and Bangladesh; innovation for inclusive financial access and women entrepreneurship in Egypt and Ethiopia; capital market development for equity financing in Morocco.

Nonetheless, the mix of non-lending activities, as measured by budget excluding lending, provides additional perspectives on what countries received from the UN System:

- Upper-middle income countries with large non-lending (with relatively sufficient domestic resources and not requiring international financing support) tend to pay for advice (reimbursed advisory services), such as in Russia for venture acceleration network, IP commercialization, export diversification through innovation and TVET education.

- Lower-income countries, not yet ready for large investments or policy reforms, tend to seek ways to address policy issues through diagnostics and advisory, such as Ethiopia on National Quality Infrastructure, or through experimental direct interventions such as Climate Innovation Center, Agribusiness Innovation Center and Digital Entrepreneurship Center in Tanzania, Kenya and Ethiopia.

- While budget data is limited, and therefore not reflected in Figure 3, the contribution of UN system to these countries also include: UNIDO's South-South Industrial Cooperation Centers in China and India, industrial strategy to foster technology uptake and innovation in Vietnam and UNESCO's support to STI system reform and capacity-building in STI policy in Nigeria and Tanzania, and ECA's biomedical engineering summer school in Kenya.

3.3 Outcomes and institutional perspectives

Learning from evaluations: In general, the available knowledge about what works through the UN System's STI interventions is limited, due to the small number of rigorous evaluations. A third-party assessment by USAID/3ie[v] found that **Impact Evaluations for STI interventions are concentrated in Goals 3, 4 and 9**, largely by foundations, NGOs or bilaterals. The World Bank, among a few non-UN multilaterals (e.g. IADB), was subject to impact evaluations in the USAID/3ie assessment. In addition, UNICEF and UN Foundation were either an author or funder of some evaluations. Apart from impact evaluations, STI may also lack commonly accepted indicators and baselines even for descriptive analysis, target-setting and monitoring of progress (see Box 4**: UN work on STI policy frameworks**).

The overall performance, effectiveness and efficiency of the UN system's organizations have been assessed and monitored by Member States through multiple channels, such as MOPAN[vi] or UK MAR[vii]. Some of the lessons and recommendations contained therein (such as on greater synergies or accountability) probably are also applicable to STI initiatives.

Systematic and strategic mainstreaming of the work on STI may be an important consideration. The UN System seems to be at an initial or transitioning stage in establishing a framework to approach STI to support implementation of the SDGs, with varying degree of positioning of STI at the institutional level. Of the seven agencies hosting most of the UN System's STI initiatives identified through this mapping, only a few have a clear articulation of role of STI in the agencies' strategy documents (for example, UN Environment Mid Term Strategy 2018-2021). Agencies with STI as part of their original core mandates elaborate approaches to focused domains within their respective mandates, but tend to be limited in positioning their work on STI under the breadth of SDGs and STI's cross-cutting implications (e.g. WIPO Medium Term Strategic Plan 2010-2015, UNESCO Medium-Term Strategy 2014-2021, ITU Strategic Plan for 2016-2019). Agencies with STI initiatives covering the broadest set of SDGs and largest resource inputs have virtually no mention to STI in their strategies (FAO Strategic Objectives, World Bank Group Forward Look).

Box 4: UN work on STI policy frameworks

At Addis Ababa, countries committed to "adopt science, technology and innovation strategies as integral elements of our national sustainable development strategies." This commitment is obviously of outstanding importance due to its "upstream" function to any sector-specific STI policies. However, as noted as noted by the Inter-agency Task Force on Financing for Development's annual report (IATF)[viii], there is currently no source reporting on the number of countries that have adopted legislative, administrative and policy frameworks for national STI strategies, nor aggregate data about independent reviews of STI policy frameworks or their significance in sustainable development strategies. Vis-á-vis the importance of such frameworks this constitutes a gap.

This mapping identified several UN agencies assisting countries on national STI policy frameworks, including the World Bank, UNCTAD, UNESCO, UNIDO and regional Commissions (e.g. ECA and ESCAP), through policy diagnostics, technical assistance, data compilation and report production. These initiatives may represent further cross-fertilization opportunities.

An important consideration is the impact this work on policy has in terms of uptake by governments. AidData[ix] measures policy influence of diagnostics and cross-country benchmarking to countries at the agenda-setting stage. The representative survey to decision makers, opinion leaders and stakeholders identified the most influential diagnostics and benchmarks across sectors, such as OECD's PISA (learning attainment) and IMF's FSAP (financial sector assessment). Unfortunately, none of the existing, similar diagnostics or benchmarks for STI policy show up in the list of top 100 influential diagnostics. A study commissioned by UNESCO Institute for Statistics[x] also pointed out limitations of existing STI indicators in measuring progress toward SDGs.

Is it that we do not have an adequate frame of reference or good practice knowledge for STI policy frameworks? Or that policymakers aren't sufficiently aware of role of STI in sustainable development? Or that STI issues bear low perceived impact in political cycles determining politicians' incentive structures? Whichever we think the case might be, what can we do to improve the interface of the UN's policy work with decision-making? These questions may warrant rich discussions.

3.4 Summary for Discussion

With regard to bottom-up or specific considerations for possible improvements in UN STI initiatives, it would be constructive to hear from Member States and stakeholders what arguments could be made in synergizing the mix and optimizing the distribution of UN STI efforts (across science, technology, and innovation, and through the global to local linkages), given the UN system's comparative advantages and fitness for purpose per specific thematic areas, development challenges or country circumstances. For example:

- Do Member States perceive the support received from the UN at national level to be coordinated with or informed by regional or global level initiatives?
- Is there room for stepping up local, rather than national or international, engagements to accelerate progress on the ground, where demands may be clearer than on more aggregate levels? If so, could existing science/technology centers (e.g. UNIDO, UN Environment, WIPO and UNESCO) play stronger coordinating and integrating roles?
- Is there room for greater synergies or consolidation of international engagements, across and within agencies, where products and expertise may be dispersed?
- What would it take for lower income countries to identify and elaborate on their demands for STI support, which may be under-represented or unidentified?
- Can regional commissions play greater roles as an interface between the entire UN System's expertise and offerings, and regional demands and priorities? For example, ESCWA proposed to organize inter-sessional regional workshops to stimulate the selective adequate use of UN System's initiatives in the region.
- Given its significance, can World Bank lending be more leveraged, including through the Financing for Development agenda, to fund and synergize the UN system's STI diagnostics, capacity development or design/implementation of policy reforms in accordance with respective agencies' comparative advantages?

With respect to top-down or systemic learning potentials, an important question is whether the UN system has adequate mechanisms and/or information to identify, prioritize, align and monitor performance of what it does on STI. This difficulty corresponds with the varying degree of member states' incorporation of STI into their sustainable development strategies and lack of comparable measures to prioritize areas needing further work and/or identify potentials STI can contribute to. Pragmatic deliberations, depending on the level of ambitions member states place on STI, may encompass questions such as:

- In assessing progress and priorities, do countries have clear STI policy frameworks, and should the UN System do more to assist countries to establish or strengthen STI policy frameworks as an integral element of national sustainable development strategies, as committed through AAAA?
- Do Member States wish to have UN Agencies adopt more strategic approaches to STI for the implementation of the SDGs to increase their effectiveness and accelerate progress? For the UN System to formulate adequate approaches, if it is deemed desirable, what gaps need to be filled – such as knowledge, measurement, or political ownership/championship?
- To advance such deliberations, better elaborating countries STI priorities and to increase impact of the UN support to address such priorities, what experience sharing, assessments or experimentation may be beneficial?

4. A Framework for STI Needs and Gaps Discussions

Discussions at the first UN Multi-stakeholder Forum on Science, Technology and Innovation for the SDGs held in 2016 repeatedly made reference to the importance to discuss STI needs and gaps to better inform decision-makers. To stimulate initial but informed discussions, this chapter proposes a framework, which momentarily relies on available information, leaving rooms for refinements through further work.

4.1 Proposed framework

The overall efficacy and additionality of UN System's STI initiatives, and their room for improvement or priorities for collective actions, cannot be discussed by looking inward into the UN System in isolation from the world but rather has to take into account the diverse landscape of activities by other public and private stakeholders. To effectively facilitate such discussions, it is critically important to first look at the demand for STI support to achieve SDGs, and then compare supply of STI support, either by UN System or by others across public, civic and private sectors with respective comparative advantages to satisfy the demand.

The following definitions were applied in the analysis (all elements are explained in more detail below):

- Gaps are defined as "scarcity of supply of UN and non-UN STI support where demand for STI to achieve SDGs is high";
- Demand encompasses both i) the need to accelerate achievement of different SDGs, and ii) the importance of STI in accelerating achievement of respective SDGs. For both dimensions, adequate measures or indicators such as through the substantiated global indicators framework, do not exist, therefore the analysis considers two proxy factors: i) lack of progress in achieving SDGs through an informal assessment; and ii) STI as explicitly recognized in the negotiated language specifying the SDG targets.
- Supply encompasses UN STI initiatives in the mapping alongside three non-UN factors: i) non-UN STI initiatives as supplementary inputs, ii) technological outputs and iii) opportunities identified by businesses, as documented in recognized inventories or systematic stocktaking.

4.2 Available proxy data and methodology for meta-analysis

Demand (1) – lagging SDGs achievement: While the global indicator framework should be the official and sole mechanism to monitor progress towards achieving SDGs, at the time of conducting this analysis, its status of development and substantiation is not yet conducive to an assessment of relative progress (or lack of) across the 17 Goals. The unofficial SDG Index and Dashboards[xi], commissioned by the Sustainable Development Solutions Network (SDSN) and Bertelsmann, provides one of a very few systematic assessments undertaken to date. According to SDSN's methodology[11], 5 Goals are relatively lagging (Goals 2, 3, 9, 12, 14), 6 Goals are relatively advanced (Goals 1, 4, 5, 6, 11, 17), and the remaining 6 Goals are in the middle.

Demand (2) – importance of STI in achieving specific Goals: Given cross-cutting nature of STI and dependencies across SDGs, specification of how STI contributes to achievement of SDGs requires substantive analyses and learning from experiences. As an initial step, this analysis considers explicit mentions to STI in SDG languages as an official outcome of consultation and negotiation expressing political agreements on importance of STI[12]. SDG Targets indicate that 6 Goals have multiple mentions to STI, across MoI or STI-specific outcome (Goals 4, 7, 8, 9, 14, 17); 2 Goals have no mention to STI (Goals 10, 11); and the rest in the middle.

Combining these two factors, Goals 2, 3, 9, 12 and 14 are identified as areas with high STI demand (both lagging and requiring STI); Goals 2, 3, 12, 13 next highest; Goals 4, 7, 8, 10, 13, 15 and 16 as modest, and

[11] The purpose of SDG Index and Dashboard is to assist countries in getting started with implementing the SDGs, by scoring with 79 indicators with available data at country level. The report adopted "traffic-light" approach with thresholds for each indicator to classify countries across three bands, "green" (achieved), "yellow" (modest challenges), and "red" (major challenges in achieving the goal). Our analysis uses the average occurrence of "red" countries in these indicators, excluding those only available for OECD countries, per Goal as a proxy to lag in implementing SDGs. For details, see Annex 5.

[12] Among 169 Targets, 26 explicitly refer to STI as either Means of Implementation or part of their intended outcomes. Our analysis scored 17 Goals by the frequency and contents of these references. For details, see Annex 4.

Goals 1, 5, 6 and 11 as areas with low STI demand. SDSN methodology and SDGs reference to STI are elaborated in Annex 4 & 5.

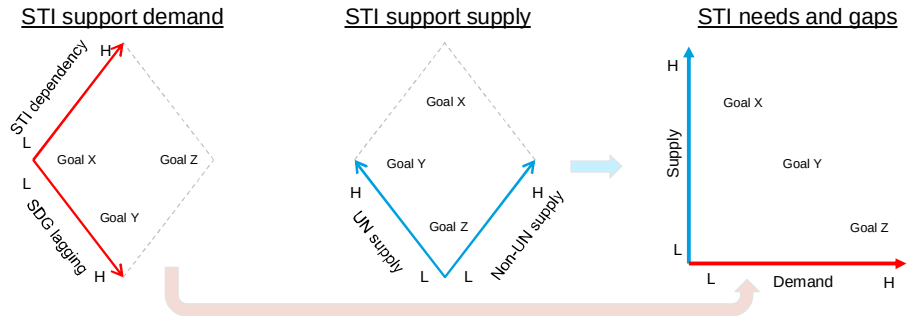
Non-UN Supply (1) – initiative inputs: STI initiatives span across public (multilateral agencies, bilateral donors, national and sub-national governments), civic (philanthropic foundations, non-profit or civil society organizations) and private (industry associations, corporate social responsibility activities, individual businesses) sectors. Information on these initiatives was collected through UNFCCC's mapping of climate technology development and transfer initiatives, and supplemented by IATT with broader scope through desk research. The analysis of the sampled 60 initiatives, following typologies similar to UN initiatives[13], indicates that the distribution of levels of engagement and coverage of SDGs of public and non-profit STI initiatives largely resemble the UN's initiatives, showing concentration in several Goals (e.g. 2, 3, 7, 9, 13) and scarcity in some other Goals (1, 5, 10, 16).

Non-UN Supply (2) – technological outputs: With the advance of technological frontiers as well as progress in implementing the SDGs, technological solutions to development challenges will increasingly become available. Likewise, related knowledge of how to best adapt and apply them in different circumstances will accumulate and spread. The interesting question, however, is whether and in which areas such technologies and innovations concentrate might concentrate, particularly if they have a high impact or transformational/disruptive potential. As an initial snapshot, two horizon-scanning studies of potential "game-changers" informed current analysis: *50 Breakthroughs* (50BT)[xii] and *Transition Through Innovation* (TTI)[xiii]. Both identified specific challenges in line with SDG Targets and examined the state of possible solutions, with regard to technological maturity and affordability, as well as policy changes necessary to increase readiness or de-bottleneck adoption at scale (see Annex 7 & 8). The 80+ possible solutions disproportionately distribute across the SDGs, most concentrated in Goals 2, 3 and 7.

Non-UN Supply (3) – business opportunities: The private sector is an essential vehicle for STI solutions to spread through economic activities, while business practices, behaviors, and incentives are expected to evolve in a conducive manner over the years for the private sector to be even more integral contributors to SDGs. The Business and Sustainable Development Commission (BSDC), launched by the World Economic Forum, has commissioned a report, *Better Business Better World*[xiv], to highlight business opportunities in line with the SDGs, many of which apply available technologies and some others require further innovations (Annex 9 & 10). BSDC estimated that business opportunities in the implementation of the SDGs could be worth at least $12 trillion annually by 2030, predominantly driven by four systems including food and agriculture; cities; energy and materials; as well as health and well-being[14]. The 60 opportunities identified thereunder, accordingly concentrate in the area of the 4 respective Goals (2, 11, 3, 7) and spread across several adjacent Goals (8, 9, 12, 14 and 15).

Figure 6 illustrates how these factors may identify gaps for priority actions: Goal Z, facing a high demand for STI support (both lagging in achieving the goal and its achievement is heavily dependent on STI), and scarce supply of STI support (by either UN or non-UN actors), may require actions to fill the demand-supply gap.

Figure 6: Framework for needs and gaps analysis

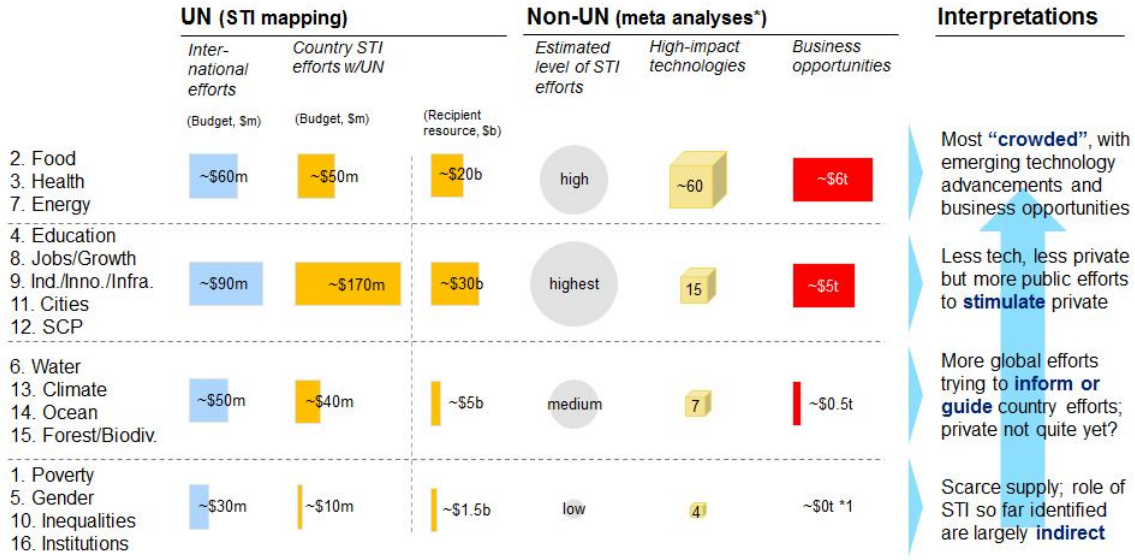


[13] For non-UN initiatives, amount of recipient resources is available for some public initiatives; budget or staffing information is not available for most initiatives.
[14] Current analysis supplements opportunities in education, admittedly under-estimated by BSDC.

4.3 Observed patterns from the initial meta-analysis

Together with the landscape of UN STI initiatives, patterns of supply of STI support show four distinct groups (Figure 7: see Annex 1-5 for underlying data):Crowded and "most private ready"; second "public inviting private STI," with large UN efforts including recipient resources and evolving private sector appetite; third "limited STI supply" with UN efforts largely at global level but not as much for countries' STI investments; and fourth "scarce STI supply" with little STI activities, both from the UN and non-UN stakeholders.

Figure 7: Summary of identifiable non-UN supply of STI support



** Estimation of non-UN supply draws on existing studies and reports to make tentative assumptions. It can not claim comprehensiveness and is intended to stimulate discussion. Estimated level of STI efforts draws on the UNFCCC mapping on climate technology and desk research. Existence or emergence of high-impact technologies as identified by 50 Breakthroughs (50BT) and Transition Through Innovation (TTi). Business opportunities as estimated by the Business and Sustainable Development Commission.*

Box 5: Do business opportunities follow technological outputs?

It is not coincidental that SDGs with large business opportunities also have many existing and emerging technological outputs, as businesses pursue new opportunities. Yet, non-technological factors, such as policies, incentives and behaviors, can either promote or hinder adoption of innovations at scale. Three groups of UN and public as well as private supply patterns illustrate this point:

- Food, health and energy (Goals 2, 3, 7). These areas represent 50% of the business opportunities BSDC identified. Technologies to capture these opportunities are largely available (e.g. small metal silos or plastic crates to reduce post-harvest food losses; efficient heating and cooling for energy efficiency) or close to readiness (e.g. biometric ID systems, PrEP antiretrovirals for HIV prevention). Policies and business practices still require innovations to fully unlock these potentials (e.g. penetration of private, public-private and community insurance schemes, enabled by digital technologies, for better risk pooling)) or well-coordinated execution (e.g. Rwanda's modern civil aviation authority enabling use of drones for rapid delivery of health supplies throughout the countries).
- Infrastructure/industries, cities and SCP (Goals 9, 11, 12). Relevant technological outputs in these fields include those facing significant commercialization challenges (e.g. new generation electric vehicles). What matters may be policy, rather than technological, enablers (e.g. offering "density bonuses" to developers to unlock new land and better use of space for affordable housing), as well as regulations unpopular or difficult to enforce under capacity constraints (e.g. building standards).
- Water, ocean and terrestrial ecosystems (Goals 6, 14, 15). Mechanisms and polices to price externalities (e.g. tax, carbon price) will be necessary conditions for major new opportunities in sustainable forest services, watershed services and biodiversity conservation. Beyond single point protection, natural science and socioeconomic research is yet to identify most effective systemic interventions.

BSDC estimated that business opportunities in the implementation of the SDGs could be worth at least $12 trillion annually for the private sector in 2030, creating 380 million jobs and producing 10% of global output. Over half of the opportunities, and 90% of the jobs, are for developing countries. The investment required to achieve these opportunities, according to BSCD, is around $4 trillion per year. On climate and clean technologies as a sub-set of these opportunities, World Bank[xv] estimated that the market opportunities in developing countries will exceed $6.4 trillion over the next decade, of which $1.6 trillion will be for small and medium enterprises (SMEs) as a key driver for job creation.

Comparison across the SDGs highlight the intersection between Financing for Development and STI agendas: At the Addis Ababa Conference, countries agreed on the need to selectively and smartly use the scarce, international concessional resources to mobilize domestic resources and catalyze international private capital ("billions to trillions"). The same will apply to financing for STI for some of the SDGs – the "millions" UN efforts at international level and "billions" that countries receive for STI is by far smaller than, and therefore could best be envisioned as a catalyst for, the $4 trillion investment to unlock $12 trillion opportunities for private sector. UN efforts could be best leveraged by addressing early-stage scientific/technological investment gaps as well as non-technological barriers, with differentiated approaches according to the existing private and non-UN public supplies.

Gaps and priorities: The comparison of demand and supply patterns identifies gap areas and topics for possibly useful discussions. Figure 8 summarizes the above-mentioned supply patterns in context of the demand analysis (combining lags in SDGs implementation and importance of STI in the negotiated language).

Figure 8: Needs and Gaps of STI for SDGs

4.4 Summary for Discussions

On the framework:

- Acknowledging the inherent limitations of data availability, can the proposed needs and gaps analysis framework based on meta-analysis provide a useful starting point for discussion?
- What do experts and stakeholders see as missing? What do Member States see as needed for closer and granular discussions lacking in the aggregate analysis?

On needs and gaps:

- High STI demand and limited STI supply (Goals 14, 15 and 16): How can we address these critical gaps?
- High STI demand and moderate private engagement (Goals 8, 9, 12): What policies and investments can best engage and mobilize private sector?
- High STI demand and high private participation (Goal 2, 3, 7): Is there a room for better division of labor or synergies, and what will it take to accelerate and further scale private activities?
- Granular, country-sector-level views may be important also for "congested" areas – for example, where and what public international support may be essential for food and energy if policies and other surrounding environments are not conducive for businesses?
- Low STI demand areas, in this aggregate view, also warrant granular discussions. What different country circumstances may require tailored approach to STI, for example, for Goals 1, 5 and 10? Or is there room for reallocation of resources from low-demand to high-demand areas?

5. Discussions and Recommendations

5.1. Observations on Mapping contribution to TFM mandates

Findings from the mapping underscore the need for more work. The current mapping is limited in its concepts, methodologies, data, and integration to the global indicators framework. If the continuation of discussions as informed by the current mapping is considered useful, the work needs to broaden its scope including non-UN actors/initiatives to further inform on needs and gaps; and/or specify its focus on the Goals to be discussed at HLPF in 2018, according to Member States' and STI Forum Co-Chairs' guidance.

The mapping can usefully inform the design of the TFM Online Platform. Some of the findings, as well as the frameworks and typologies applied in the analysis, can inform the way online platform contents can be structured. For example, for Member State policymakers, the platform may usefully navigate the support available to the specific country, or curate the experiences related to instruments or development objectives similar to the activities under consideration. The information curated for scientists or entrepreneurs, for example, would have different focuses, on access to scientific publications or single window for incubation opportunities.

The process of conducting the mapping may inform on the potential business case for the TFM. Member States, when agreeing to the 2030 Agenda, rightly called for greater coherence and coordination of the existing STI initiatives through the TFM. The findings and experiences from the mapping, however, exemplify the challenges TFM faces in delivering on its mandates: namely, varying and in some cases unclear positioning of STI under UN agencies' respective strategies; lack of common metrics; voluntary nature of IATT and absence of resources. Member States are invited to support, and fund, TFM to continue the work as high-leverage global public goods, through mapping-of-mapping, providing quality analysis and informing inter-sessional meetings substantive and cumulative dialogues.

Box 6: Synergies and Collaborations through the STI mapping exercise

Already, the mapping exercise is starting to inform possible areas of collaboration among UN agencies and with non-UN partners, where activities promise strong synergies. Also, in several organizations, the mapping exercise has given impetus to efforts aimed at exploring more strategically leveraging STI activities for the SDGs.

Within UN, IATT is advancing discussions on capacity building to maximize UN system synergies. Agencies are also examining areas for further collaboration, such as between UNIDO and ITU[15].

With non-UN partners, a first example of mapping and matching initiatives is on scientific research collaboration in Africa, between WB and several research funding agencies[16]. WB is also strengthening operational and fiduciary procedures to deliver through UN agencies[17] and financial instruments to de-risk and catalyze private investments, such as through IDA 18 Private Sector Window, some of which may be suitable to UN and non-UN STI interventions across SDGs.

On filling knowledge gaps on STI efforts, results and priorities, IATT mapping has informed USAID/3ie evidence gap map on Science, Technology, Innovation and Partnerships, aligning instruments and results typologies to the extent possible to generate comparable assessments. Another example of cross-fertilization of mapping for mutual strategic work programing is with Group of Earth Observations (GEO)[xvi], comprising 100+ space agencies, to develop a demand "heat map" to apply satellite imagery and other types of geospatial information technologies on planning and monitoring of geospatially targeted policy interventions.

Subsequent to the Annual STI Forum, IATT will welcome engagements with interested Member States and stakeholders with specific suggestions, for substantive inter-sessional meetings (contingent to resourcing and work programming of TFM/IATT onward).

[15] On digital transformation, broadband infrastructure, IoT and connecting the unconnected; vocational training for job creation/adaptation; green industry and ICT-enabled efficient natural resources and e-waste management; standardization, conformance and interoperability; support to SMEs to scale, innovate and access new markets; entrepreneurship and start-up innovation, especially for youth and women, for quality employment in ICT ecosystems; joint advocacy and communication.

[16] World Bank's African Centers of Excellence (ACE) and Partnership for Skills in Applied Science, Engineering and Technology (PASET) as possibly common operating platforms, envisioning an African version of European Research Council (ERC), with NSF (US), DGF (Germany), JST/JSPS (Japan), RCUK (UK) and CNRS (France).

[17] As WB has traditionally done with FAO, and building on lessons from WHO/Global Fund experiences for Ebola response.

5.2. Discussions on SDGs 1, 2, 3, 5, 9 and 14

The landscape of UN STI initiatives and potential framework for needs and gap analysis imply specific considerations for the SDGs for focused discussions this year:

SDGs 2 and 3: Despite the absence of WHO data for this mapping, it is clear that in both goals 2 and 3 there exists a large number of UN initiatives and supply of efforts from non-UN stakeholders, across science, technology and innovation. The long-standing importance and positioning of food security and health at the heart of the international communities' efforts to further sustainable development has been conducive to create and maintain the current level of efforts, while non-UN STI initiatives, such as through large foundations, innovative partnership arrangements and private sector businesses, advanced specifically toward these Goals. Interesting questions to address might be:

- What are key lessons from MDGs experiences related to use of STI to achieve these Goals?
- What do the changes in STI landscape and actors mean for the way UN contributes?
- How can private sector be more transformational force – what are readily available technological solutions for businesses to scale, and what promising innovations are on the horizon?
- What conducive business environments and international support may policymakers consider for fully utilizing the STI potentials for these Goals?
- Do humanitarian efforts represent substantial part of the STI initiatives for these goals? If so, how could they transition to development work/work across the pillars of the UN system?
- Does the UN System have room for greater synergies and greater consolidation of dispersed services?

SDG 9 constitutes a major focus of the current UN system's initiatives, largely on technology and innovation, as it encompasses three complex and inter-linked areas: infrastructure, industrialization and innovation. The large supply by public and private stakeholders suggests that this area would offer potential synergies within each of the three areas of ongoing initiatives, while causal linkages and varying level of maturity of debates and development results across the three distinct areas require differentiated and sequenced deliberations. Interesting questions for further discussion could be:

- On infrastructure: What financing options may be applicable for technology-intensive infrastructure investment gaps?
- On innovation: What cross-fertilization opportunities may be applicable both from upstream science and downstream technologies, to maximize contribution to SDG 9?
- What lessons can be applicable from the innovation ecosystem policies and approaches that have been implemented to enrich science or technology approaches elsewhere?
- On industrialization: Does the rapidly evolving technological landscape, such as for artificial intelligence, internet of things and automation, represent productive or disruptive implications to future of industrialization as a commonly accepted development pathway? Are current discussions conducive to formulate policy responses and mitigate associated risks, such as on jobs, productivity and trade, from developing countries' perspectives?

SDG 14 faces a pronounced lack of initiatives explicitly focusing on STI for oceans, despite the importance of the ecosystem services derived from them. While there are important efforts, particularly focusing on science, overall supply from both the UN as a whole as well as from non-UN stakeholders seems to be limited. A traditionally existing bias towards terrestrial activities (as evident in the GEF funding structure with only 1/17 being focused on international waters) might be one reason for this. Considering that the majority of challenges faced by ocean ecosystems originate in land-based activities, such as is the case with pollution (including marine litter and microplastics), or climate change-induced ocean acidification, the following questions would merit discussion:

- What are concrete areas needing most support? Do we have sufficiently accumulated body of knowledge to discuss demand for STI in these areas?
- How can the impact of innovation and land-based technologies on oceans be better mainstreamed in initiatives and science focusing on terrestrial activities?
- Can countries and agencies share experiences and examples indicative of promising STI efforts for oceans?
- How can STI needs for this goal, at global and local levels, be best elaborated to mobilize necessary resources and fill the gap?

SDGs 1 and 5: In the areas of direct poverty eradication and gender equality, available data suggests limited supply of UN and non-UN STI initiatives, which may be intuitive considering that most STI efforts tend to indirectly contribute to poverty reduction and empowerment of women and girls through other SDGs (e.g. food, health, education, economic development or access to ICT). While limited in volume, existing initiatives play an important role in fostering adaptation of and access to appropriate technologies as well as inclusive innovation. There remains a large potential to use technologies to improve delivery of poverty-combatting interventions. Technological advancements, such as mobile telecommunication and satellite imagery, are also stimulating initiatives on measurement (such as on geospatially granular poverty), therefore enabling targeting and policy planning to address these Goals, in ways previously either technically / capacity-wide impossible or prohibitively expensive. Against this backdrop the following questions would merit consideration:

- What most transformational impact could STI have as ingredients of "secondary STI" or broader policy interventions (e.g. poverty-combatting programs, women's economic participation)?
- What are emerging practices, solutions and lessons that could be documented and broadly shared with regard to use of technologies in addressing these goals?
- What are promising models of partnerships beyond UN System and public/civic sector around STI specifically toward these Goals?

5.3. Recommendations on TFM's Next Steps

The TFM/IATT's work toward the next STI Forum could be organized through a few groups of possible work programs, including through inter-sessional meetings, but contingent to MS and Stakeholders' endorsement and resources.

- **"Fix plumbing."** Aim at utilizing IATT as a Forum to exchange information, and align, cooperate, differentiate and/or synergize where appropriate, its member agencies' STI priorities and work programs at **institutional levels**. To that end, task IATT to develop steps toward identifying harmonized ways to identify and report on STI initiatives, with relevant metrics and parameters building on the mapping findings. Also task IATT to work with FfD IATF on relevant indicators and analysis to adequately monitor progress to STI-related AAAA commitments. Through the mapping process, several agencies' focal points reported that they were not in a position to solicit inputs from respective agencies as a whole beyond the departments they belonged to. With this respect, recognition, positioning, and resourcing of the work programs within agencies to contribute to IATT may represent a gap that agencies may want to address.
- **"Line of sights in upstream."** Aim at identifying **STI policy framework diagnostics and benchmarks** that can be commonly referenced. To that end, consider commissioning an expert group (including through 10 MG) to formulate adequate requirements and diagnostic elements.
- **"Move the needle"** with the private sector. In response to WEF / BSDC's work, specifically for Goals 2 and 3 (food and health) where businesses are indicated to have highest potential to contribute, identify most promising partnership proposals or matchmaking results from the STI Forum, and task TFM/IATT to follow up with ongoing support for information and contacts, including through TFM's online platform and with relevant UN initiatives as examined through the mapping. Report back the progress of pilot initiatives at the next year STI Forum, discuss and take lessons to improve functioning of the TFM.

Although severely limited, the mapping provides a basis for initial discussions to engage broad stakeholders on needs, gaps and priorities for STI for the SDGs. The indicative views provided herein are an attempt at illustrating the current composition of the UN STI efforts in order to deliberate on where synergies and complementarities could be leveraged. The IATT will stand ready to engage in further deliberations with Member States and stakeholders to advance the contribution of STI to achievement of the STI.

Acknowledgements and Disclaimers

The groundwork for this paper was conducted under the IATT-STI's mapping sub working group within the programming and analytics cluster over the course of the past months, before conducting several rounds of discussion within the larger IATT.

Nonetheless, the views expressed in this paper are the personal views of the authors and do not necessarily represent the views of the members of the Inter-agency Task Team, the United Nations/World Bank Group or its Member States. Any mistake or omission in this paper is the sole responsibility of the authors: Naoto Kanehira (World Bank) and Tobias Cabani (UN Environment).

At this stage we wish to recognize the sterling support of colleagues throughout the UN development system to this voluntary exercise that made this paper possible, despite the challenging workload faced throughout the system. In particular the members of the IATT's mapping sub-working group, whose substantive and critical comments and suggestions have benefitted the paper greatly, including: Ana Persic (UNESCO), Anders Isaksson (UNIDO), Augusto Luis Alcorta (UNIDO), Kornelia Tzinova (UNESCO), Liu Wei (DESA), Lucinda Longcroft (WIPO), Mario Castro-Grande (ITU), Marta Perez Cuso (UNCTAD), Michael Lim (UNCTAD), Rashmi Jawahar (UN Environment), Vaggelis Igglesis (ITU).

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At this stage it merits again calling to the attention of the readers that the present paper is intended as an initial input to discussions, recognizing the limitations of data availability and accuracy as well as potential shortcomings of the methodology.

Annex 1-1: Summary of STI inputs by UN Agencies (gray without institutional submissions; blue focus for granular analysis)

	Agencies	Total inputs				Inputs to STI initiatives					of which "primary" STI initiatives				
		Regular staff	Admin budget ($m, agency)	Grant ($m, recipient)	Loan, credit ($m, recipient)	# of proj.	Staff time (FTE)	Admin budget ($m, agency)	Grant ($m, recipient)	Loan, credit ($m, recipient)	# of proj.	Staff time (FTE)	Admin budget ($m, agency)	Grant ($m, recipient)	Loan, credit ($m, recipient)
Regional Commissions	ECLAC														
	ESCAP	n.a.	n.a.	n.a.		1	n.a.	n.a.	n.a.	-	1	n.a.	n.a.	n.a.	-
	ECA	196	36	n.a.		15	n.a.	n.a.	n.a.	-	15	n.a.	n.a.	n.a.	-
	ECE	400	n.a.	n.a.		7	11	1	n.a.	-	4	6	1	n.a.	-
	ESCWA	n.a.	n.a.	n.a.		14	41	1	3	-	13	37	1	3	-
Secretariat/Offices, Programs, Specialized Agencies	UNDP														
	WHO														
	UNICEF														
	UN-Habitat														
	UN Women														
	DESA														
	WTO	1,900	47	n.a.		2	24	-	n.a.	-	1	21	n.a.	-	-
	OCHA	20	n.a.	n.a.		13	1	0	n.a.	-	7	-	-	-	-
	UNOSSC	700	n.a.	n.a.		3	5	1	n.a.	-	3	5	1	-	-
	ITC	306	90	n.a.		13	44	6	3	-	2	n.a.	n.a.	-	-
	WFP	14,700	5,571	334		23	86	52	650	-	12	47	n.a.	-	-
	UNCTAD	400	110	n.a.		27	25	8	n.a.	-	21	n.a.	n.a.	-	-
	UNIDO	700	253	n.a.		24	92	19	112	-	23	90	17	112	-
	UNESCO	1,200	347	n.a.		42	179	84	10	-	27	84	39	10	-
	UNEP	1,187	501	n.a.		44	212	115	271	-	33	122	42	176	-
	WIPO	1,265	298	n.a.		21	n.a.	44	n.a.	-	20	n.a.	44	n.a.	-
	ITU	705	162	n.a.		86	n.a.	86	n.a.	-	64	n.a.	60	n.a.	-
	FAO	3,300	n.a.	n.a.		244	797	199	n.a.	-	83	281	70	n.a.	-
	World Bank	11,900	3,300	106,700	250,000	990	1,119	409	51,434	66,581	489	339	129	11,043	27,232
Total		**38,879**	**10,715**	**107,034**	**250,000**	**1,569**	**2,637**	**1,024**	**52,482**	**66,581**	**818**	**1,032**	**404**	**11,343**	**27,232**

* "Primary" defined as initiatives with objectives to directly contribute to STI outcomes as explicit in SDGs at target level, or using STI as most significant means of implementation (explicit in the 23 STI-related AAAA commitments), in terms of achievement or measurement of relevant SDG targets, either evidently in project title or pre-defined project development objectives, or through more than half of input resources planned/used for components dedicated to STI.;

Annex 1-2: Distribution of STI initiatives by Agencies

(Primary STI initiatives only, by budget $ million)

By STI Domains

	WB	FAO	ITU	WIPO	UNEP	UNESCC	UNIDO
Technology	**63**	**20**	**55**	**18**	**36**	**2**	**12**
Infra scale	26	-	35	-	1	-	-
Mid scale	11	11	6	6	23	2	11
Small scale	16	8	4	-	10	-	1
Scale-agnostic	2	-	8	11	1	-	-
eGovernment	8	1	2	-	-	-	-
Science	**20**	**45**	**2**	**7**	**6**	**35**	**-**
Science stat	1	45	2	-	-	2	-
Research	11	-	-	7	2	15	-
STEM/TVET	8	-	-	-	-	16	-
Sci policy interface	-	-	-	-	4	2	-
Innovation	**41**	**6**	**4**	**19**	**1**	**-**	**4**
Innovation system	23	-	-	19	-	-	3
Sector innovation	13	5	4	-	1	-	1
Social/incl. inno.	5	1	-	-	-	-	-
STI Policy Framework	**5**	**-**	**-**	**-**	**-**	**3**	**1**
	129	70	60	44	42	39	17

By Level of engagement and instruments

	WB	FAO	ITU	WIPO	UNEP	UNESCC	UNIDO
International	**35**	**62**	**44**	**13**	**16**	**25**	**1**
Knowledge production	24	15	8	-	4	8	-
Databases	3	21	3	13	-	7	-
Norm, guide, tool	0	22	17	-	4	1	-
Convening	0	2	16	-	3	10	1
Secretariat	7	1	-	-	5	-	-
Government	**77**	**6**	**10**	**11**	**17**	**10**	**5**
Technical Assistance	29	6	10	11	11	9	5
Lending	45	-	-	-	-	-	-
Country Diagnostics	1	-	-	-	5	1	-
Protocols	2	-	-	-	2	-	-
Local	**17**	**3**	**6**	**20**	**10**	**4**	**11**
Centers	4	-	3	-	10	1	9
Training courses	1	3	3	13	-	3	1
Incubation/competitior	11	-	1	-	-	0	1
Matchmaking/transfer	1	-	-	6	-	-	1
	129	70	60	44	42	39	17

Annex 1-3: Summary of STI inputs by UN Agencies

	Agencies Budget ($m p.a.)																					Recipient Res. ($b)	
	"Primary"															"Secondary" (Local to Global)								Total		Total, country	
	Global/International							Local/Local/Country																o/w Primary		o/w Primary	
	UNIDO	UNESCO	UNEP	WIPO	ITU	FAO	WB	UNCTAD	UNIDO	UNESCO	UNEP	WIPO	ITU	FAO	WB	UNIDO	UNESCO	UNEP	WIPO	ITU	FAO	WB				
Goal 1	-	-	-	-	1	3	9	-	-	-	-	-	-	2	1	-	-	-	-	-	13	47	76	15	5	0.5
Goal 2	-		-	-	-	35	5	-	-	-	-	-	1	2	11	-	-	-	-	-	77	13	144	54	17	8.9
Goal 3	-	-	3	-	1	6	2	-	2	-	9	-	1	-	2	-	-	26	-	2	10	2	66	26	3	2.3
Goal 4	-	5	-	-	-	1	2	-	-	7	-	13	5	2	12	-	4	-	-	-	-	51	100	45	14	4.7
Goal 5	-	3	-	-	1	2	1	-	-	1	-	-	-	-	1	-	-	-	-	-	5	3	16	8	0	0.1
Goal 6	-	9	-	-	1	2	1	-	-	-	2	-	-	-	3	-	4	-	-	-	2	66	90	18	4	2.2
Goal 7	-	-	2	-	1	3	3	-	3	1	13	6	0	-	8	-	-	3	-	-	1	9	52	39	13	8.9
Goal 8	-	-	-	-	2	1	5	-	4	-	-	-	-	1	24	-	-	-	-	-	12	27	77	37	8	2.7
Goal 9	1	2	-	13	32	2	10	-	16	3	-	-	12	2	56	1	9	-	-	22	2	60	243	149	34	15.4
Goal 10	-	-	-	-	5	1	1	-	-	-	-	-	-	-	0	-	-	-	-	4	2	31	44	7	2	-
Goal 11	-	4	-	-	1	-	2	-	-	-	1	-	1	1	4	-	3	0	-	4	1	23	46	14	18	5.1
Goal 12	1	-	9	-	-	-	0	-	-	-	3	-	-	-	2	-	-	63	-	-	-	0	79	16	2	1.5
Goal 13	-	-	8	-	4	9	0	-	2	-	17	6	-	-	3	-	-	8	-	0	3	1	62	51	17	1.6
Goal 14	-	3	-	-	-	5	1	-	-	3	-	-	-	-	1	-	6	2	-	-	10	24	54	12	19	1.1
Goal 15	-	-	5	-	-	6	0	-	-	-	7	-	-	-	1	-	5	39	-	-	16	24	104	19	22	0.2
Goal 16	-	-	-	-	-	-	4	-	-	-	-	-	1	-	7	-	-	-	-	1	4	6	23	12	2	0.8
Goal 17	-	-	-	-	-	-	-	-	-	-	1	11	-	-	2	-	-	5	-	-	4	-	23	14	6	1.3
All Goals, All Agencies							240								298							758	1,297	538	184	57

Annex 1-4: UN System's primary initiatives at International level

	SDGs															
	1	5	10	16	6	13	14	15	4	8	9	11	12	2	3	7
Total parimary ($m)	15	8	8	12	18	50	12	18	45	37	149	14	22	52	26	39
% of international	83%	78%	95%	32%	70%	45%	72%	63%	15%	24%	40%	55%	77%	77%	48%	22%
Breakdown of international, by instruments																
knowledge production	81%	49%	62%	99%	4%	32%	27%	22%	83%	65%	24%	4%	24%	13%	29%	32%
data	7%	0%	13%	0%	12%	0%	67%	13%	5%	8%	29%	53%	4%	35%	26%	0%
convening	0%	16%	6%	1%	67%	5%	0%	23%	0%	27%	26%	1%	28%	2%	0%	0%
fund/protocol secretariat	0%	0%	0%	0%	0%	24%	0%	0%	11%	0%	1%	24%	32%	12%	0%	22%
policy guideline/tool/standards	11%	35%	19%	0%	17%	39%	6%	42%	0%	0%	19%	18%	12%	37%	44%	46%
Breakdown of international, by STI domains																
STI	-	10%	-	-	-	-	-	-	-	7%	2%	-	-	-	-	-
sci	6%	56%	24%	-	84%	44%	68%	56%	78%	9%	18%	53%	32%	85%	49%	30%
inno	9%	6%	8%	-	-	2%	10%	0%	11%	69%	21%	-	18%	2%	-	-
tech	85%	29%	68%	100%	16%	54%	23%	44%	11%	16%	58%	47%	50%	13%	51%	70%

* Grouping of the SDGs in this table preliminarily follows the needs and gaps analysis framework in the subsequent section of the paper for easier comparison.

Annex 1-5: Summary of STI inputs by UN Agencies

		UN (primary only)			Non UN		
		Global $m budget	Local/Ctry $m budget	Ctry resource ($bn)	initiatives # count	Tech (50BT, TTI) # of areas	BSDC ($br
"most private STI-ready"	2. Food	38	12	9.0	5	13	980
	3. Health	8	6	2.2	4	20	2,365
	7. Energy	9	32	8.9	31	25	2,400
"public inviting private STI"	4. Education	7	38	4.7	2	1	-
	8. Jobs/Growth	9	29	2.7	10	0	130
	9. Industry/Inno/Infra	60	89	15.4	25	4	355
	11. Cities	8	6	5.0	4	7	1,861
	12. SCP	11	5	1.5	2	3	3,050
"limited STI supply"	6. Water	11	5	2.2	1	3	-
	13. Climate	22	27	1.6	13	2	-
	14. Ocean	9	3	1.1	1	1	125
	15. Forest/biodivrsty	11	7	0.2	7	1	405
"scarce STI supply"	1. Poverty	13	3	0.5	0	0	-
	5. Gender	6	2	0.1	0	1	-
	10. Inequalities	7	0	0.0	0	0	-
	16. Institutions	4	8	0.8	0	3	-

Annex 2: Note on Mapping Methodology

Overall approach and positioning of the current mapping

Key questions underlying the mapping exercise

This paper is an interim output of the IATT's longer term mandates and represents an initial step for its evolving inquiry, discourse and action planning. As such, the paper addresses a few basic questions, while attempting to inform on broader, more ambitious questions to be further explored in the future.

Basic diagnostic questions, for the paper to present empirical evidence to address:

- Who is doing what within the UN System for STI for the SDGs? What are patterns of inputs and outputs across UN Agencies? What is known about outcomes attributable?
- What are key features and variance of non-UN actors in their initiatives on STI for the SDGs?
- What is known about needs and demands for STI for the SDGs, at global and country levels? How unmet demands, if any, could be best addressed by UN, other public, and private actors? In doing so, what are respective comparative advantages and complementarities?
- What could be done by the UN system to strengthen synergies and coherence while leveraging its comparative advantages and mobilizing/catalyzing non-UN efforts on STI for the SDGs?

Ambitious and action-oriented questions, for the paper to provide indicative or directional (not conclusive) perspectives to be further developed:

- Are the paces of scientific research, innovation and technology development, transfer and diffusion on track to achieve all of the SDGs in every country, and if not, where are the gaps?
- What are key areas and priorities for international support to STI where progress on the SDGs needs accelerated and incremental STI support can have substantial (or desirably, transformational) impact?
- What are accountabilities and results framework for TFM and IATT to deliver on their mandates? What are measurable outcome indicators of their work program, and what are the baselines?

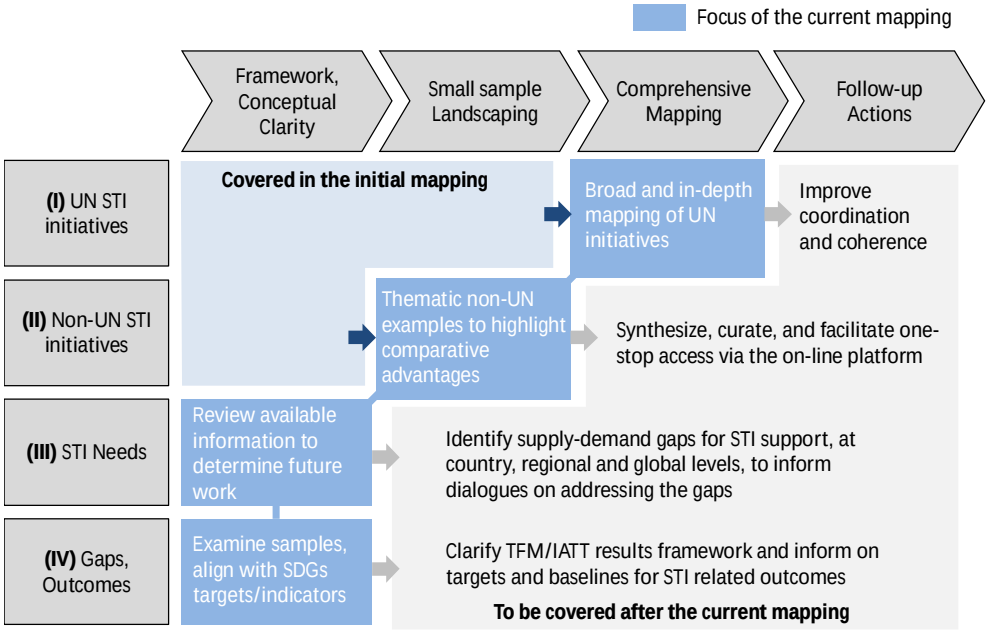
Approach and assessment framework

In addressing the questions in a sequenced manner, the topics to be covered through the current phase of the mapping are categorized into the following four groups.

I. **UN STI initiatives**, in accordance with harmonized frameworks.
II. **Non-UN STI initiatives**, following the similar and comparable frameworks applied to UN initiatives to clarify respective comparative advantages.
III. **STI needs**, either expressed through political statements or diagnosed through technical assessments, with regard to achievement of the SDGs at country, regional, and global levels.
IV. **Outcomes** (with regards to STI contribution to achievement of the SDGs) and **Gaps** (where STI support to accelerated progress on the SDGs are needed but not sufficiently addressed by available UN and non-UN supply).

The paper examines these four groups of topics at different depths, building on the previous paper/preliminary landscaping of UN initiatives, as indicated in the horizontal axis of the below Figure 1. Namely, UN STI initiatives for broad and in-depth mapping with comprehensive coverage; non-UN STI initiatives for limited, sample-based landscaping, possibly with thematic focus; STI needs for meta-analysis based on available information; and outcomes and gaps for illustrative discussions for conceptual framing. To examine UN and non-UN initiatives and illustrate comparative advantages and complementarities, 5 Goals will be presented: Goal 1, 2, 3, 5, 9 and 14, according to the HLPF deliberation in 2017.

Figure 1: Sequencing of the STI mapping inquiry and focus of the current mapping paper



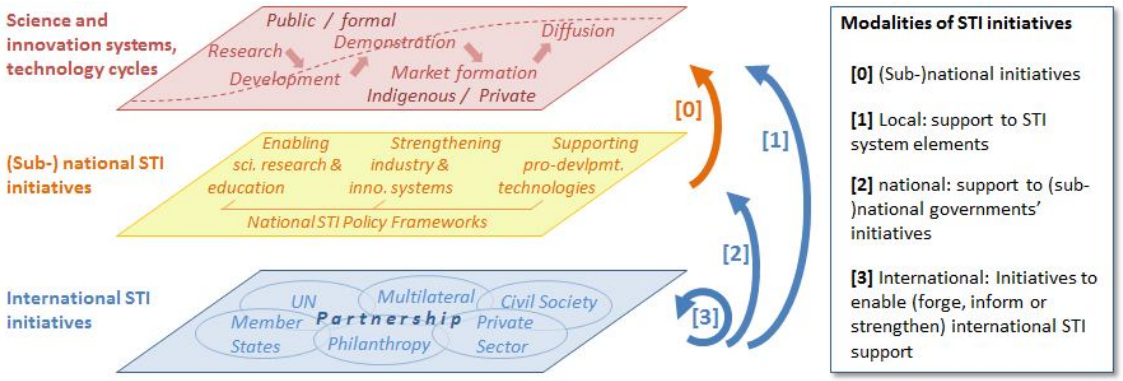
UN data definitions, data collection and tagging methodology

Initiatives and *actors* are the two units of analyses in this paper. An *initiative* is defined as a set of activities undertaken within or across public actors' mandates and/or private actors' business objectives, with allocated resource inputs (human, knowledge, financial or other) to produce observable outputs and to achieve intended outcomes. An initiative may involve a time-bound discrete task, or longer term programmatic tasks including through a partnership. An actor is defined as an either formal/legal entity or informal community/network, capable of deploying resource inputs and undertaking initiatives. An actor may be an agency/enterprise with its own governing or authorizing structure, or a program, mechanism, fund or partnership facility jointly instituted by multiple agencies or enterprises.

The *scope* of the initiatives to be analysed is defined by their intended outcomes to contribute to STI for the SDGs, either directly or indirectly. The scope of the actors for the paper has no pre-set limitation as long as the initiatives they undertake are meant to contribute to STI for the SDGs. Input deployed for the initiatives, especially in case of the UN System, is of particular interest given the explicit emphasis in the AAAA and Agenda 2030 on the use of ODA; in contexts of the discussions on sufficiency of existing resources; and international cooperation with regard to STI for the SDG including through mobilizing and catalysing private investments.

This paper refers to the 23 STI-related commitments in the AAAA to interpret the initiatives' intended outcomes with regard to *STI for the SDGs* (see Annex 2). The Member States agreed on 16 commitments for national actions, including i) five on *scientific research and education*; ii) five on *industry and innovation systems*; and iii) six on *technologies for specific development outcomes*. In addition, the AAAA includes two commitments on national policy frameworks and five on international arrangements across STI. While recognizing overlaps and interdependencies, and at a possible expense of accuracy and nuances, the paper identifies initiatives with either science, technology or innovation according to their links to the 16 AAAA commitments to national actions, and differentiates modalities of STI initiatives according to the relationships between providing and receiving actors (Figure 2).

Figure 2: Modalities of STI initiatives



In Figure 1, top (red) panel represents STI activities from scientific research to commercial deployment of technology products and services. Despite the simplified representation, it is noteworthy that modern innovation systems operate in increasingly non-linear (rather than linearly from upstream to downstream), open (e.g. user-participated design) and connected (through trade, investment, migration and information flows) manners. These activities vary across public (e.g. research institute) and private (commercial) sectors, and include grassroots entrepreneurs and indigenous knowledge systems.

The middle (yellow) panel represents what (sub-)national governments do to initiate, support, facilitate or inform STI activities in their territories (shown as **arrow [0]**). These *national initiatives* may vary in terms of their scope and focus, significance, coherence and effectiveness according to respective countries' priorities, capacities and other circumstances; and may involve a range of fiscal, regulatory, spatial or other measures to address market failures or produce positive externalities[18]. This paper does not intend to map or assess these national initiatives, but refers to them as the key contexts for international STI initiatives to supplement, and as the key drivers of countries' demands for international support.
The bottom (blue) panel represents *international STI initiatives* undertaken by UN and non-UN actors. According to the nature of their recipients/beneficiaries and their intended outcomes, these initiatives can be identified with the following three modalities:

1) Direct support to (or participation in) STI activities, such as provision of research funding, establishment of incubation centres, administration of innovation competition prize, or creation of skills-intensive jobs (**arrow [1]**);
2) Support to national initiatives, through policy advisory, technical/financial assistance and/or capacity building, in areas related to science/research/education, industry/innovation systems, or pro-development technologies (**arrow [2]**). These initiatives may be specific to one country or across multiple countries through knowledge and experience exchanges including South-South or triangular cooperation.
3) Initiatives provided to international actors, rather than to national authorities but including those for global general public as a target audience, to create, inform or strengthen international STI initiatives, through measures such as data gathering, policy research/publication, country benchmarking, convening political forums for policy harmonization, resource mobilization and administration of partnership facilities (**arrow [3]**). These initiatives may be either global, regional, or specific to country groups in their scope.

Given the breadth and heterogeneity of international STI initiatives and actors involved, the paper takes differentiated approaches between UN System and other initiatives beyond the UN system:

- **UN System** undertakes initiatives across all of the modalities [1], [2] and [3]. Entities or partnership programs with non-UN governing structures but established upon treaties or conventions, supported by UN-hosted secretariats and largely or partially delivered through UN actors as the implementing agencies (e.g. Global Environment Facility; Clean Technology Fund) are grouped with UN actors. This

[18] For taxonomy of policy tools covering both supply and demand sides, see Edler and Georghiou (2007). For rationales/policy goals, evaluative elements and developing country experiences, see World Bank (2010).

paper attempts to map these initiatives as comprehensively as possible, on inputs, outputs as per the modalities, intended outcomes as per science, technology or innovation dimensions if applicable, and links to the SDGs where explicit.

- **Non-UN multilateral institutions and bilateral donors** undertake initiatives in [1] and [2] similarly to UN actors, and to a lesser extent in [3] (specific to actors such as G20, OECD, Regional Development Banks). Some partnerships, administratively supported by an UN agency as an interim trustee but delivered largely through non-UN channels (e.g. Global Fund for HIV/AIDS, Tuberculosis and Malaria; GAVI) are included in this category. The paper intends to cover major actors, but is not necessarily representative or comprehensive, but with sufficient examples across modalities and intended outcomes to be mapped similarly and be comparable to UN initiatives.
- **Quasi-public, philanthropic, non-profit and civil society organizations** also undertake initiatives across modalities but with respective focus built on the actors' comparative advantages (e.g. World Economic Forum on convening; Gates Foundation with financial resources for thematic priorities; MIT for research and technology commercialization with explicit pro-development objectives). The paper attempts to characterize visible actors with important initiatives.
- **For-profit private sector** largely undertakes initiatives [1] through transformative investments (e.g. Intel in Costa Rica, exemplifying an AAAA commitment on *linkages between multinational companies and the domestic private sector to facilitate technology development and transfer*), and oftentimes [3] through demonstration, voluntary standard-setting and policy advocacy including through industry associations (e.g. GSMA on mAgri/mHealth). Boundaries are increasingly blurred in differentiating initiatives with CSR/ESG [19] orientation proactively targeting STI for the SDGs from "purely commercially driven" business activities. The paper attempts to characterize notable initiatives to further inform the important discussions on (international and national) public sector's roles in catalysing and mobilizing more and better private initiatives.

Limitations

One major challenge for the mapping and discussions on STI is that there is neither an internationally uniform standard definition of STI, nor a related UN-wide coordinated position. Against the backdrop of the breadth of organisations' mandates and activities, the IATT decided to avoid the risk of inadvertently excluding initiatives or limiting feedback by UN entities by developing a narrow definition up front. Rather, the aim is to discuss a possible common understanding based on the feedback derived from this mapping. The lack of a uniform definition is reflected in broad differences in how organisations label/map their activities against results and contribution to mandates. There is no systematic and aligned administrative reporting system across the UN system that utilises the same qualifiers for attributing activities to and impact on STI. In addition, existing data might not always be readily available or easily accessible to focal points. Against this backdrop and considering the voluntary nature of the mapping, in several cases the overall data is not complete and does not yet constitute a comprehensive representation of the whole UN system. It is however a considerable improvement in terms of coverage and detail compared to the initial landscaping conducted among a limited number of UN entities in 2015.

Limitations with respect to the data on resource inputs are particularly noteworthy in order to avoid misinterpretation. The collected data on staff and funding can only be used as proxy indicator for distributional patterns to identify foci of effort, the reason being that information provided relates to the whole initiative in each case and does not factor in how much of the overall resources flow into activities directly related to STI. Since initiatives/activities normally comprise a wide array of interventions, not all of which would be directly aimed at STI-related outcomes, there exists an inherent bias for overestimating the overall amount of resource directly targeting STI-related outcomes. Due to presence of lending operations the World Bank operates the highest amount of financial resources and concentrates a large number of staff, constituting a 'statistical outlier' in the overall sample.
Identification of the STI initiatives and estimation of input resources were primarily based upon the submissions by IATT focal points from respective agencies, solicited in early 2016. Several agencies, successive to compilation of the data based on the submissions, revised the submitted data where needs for better

[19] Corporate Social Responsibility and Environmental, Social and Governance. For related discussions, see Porter and Kramer (2011).

harmonization emerged or data gaps became apparent once input volumes were aggregated and compared across agencies.

At FAO, budget and staff input information per initiative was estimated through multiplication by an average based on a typical team composition (e.g. 1 P5, 1 P4 etc.). Resource for external recipients per initiatives at FAO is impossible to assess.

At UNESCO, objective based budget as in the FY17 Budget Document was used as a basis for estimation of resource inputs per initiatives. Delineation of specific initiatives under respective strategic objectives, where not specified in the Budget Document, is based on broad estimation and concurrence by the UNESCO focal points to the IATT.

At World Bank, the datasets for resource inputs is based on the institutional Expenditure Review (reducing $400m of admin budget over FY15-18), and activity identification approach followed the subsequent Business Review process (assuring continuous alignment of unit business models and resources to strategic priorities). STI initiatives in various sectors were validated with responsible sectoral units (Global Practices). As such, the data is a snapshot for FY15, before the budget reductions resulting from the Expenditure Review, and before the operational scale-up resulting from IDA18 Replenishment, which led to increase of the financing envelopes for lower income countries by 50% and doubling the envelopes for FCS, from FY18. To contain the size of the submission to IATT below 1,000, the focal point's discretionary judgment introduced cut-off thresholds to exclude smaller activities and also exclude initiatives with similar enough projects already included. On partnership facilities and trust fund programs, a few "secondary" initiatives were excluded from the original submission, where recipient resources are significant but the World Bank's institutional responsibilities in administration and substantive delivery of the programs are deemed relatively limited (i.e. Global Funds for AIDS, TB and Malaria, and GAVI / IFFIm, to which the World Bank's responsibility is limited as a Financial Intermediary Fund and neither involving secretariat, technical programming or delivery as an implementing agency). The current mapping did not cover the World Bank Group's sister agencies, IFC (International Financing Corporation) and MIGA (Multilateral Guarantee Agency), both directly supporting private sector investments with presumably significant portion of the portfolio involving technology transfers.

Annex 3: Commitments on Science, Technology and Innovation in AAAA

National STI Policy Framework

- *adopt **science, technology and innovation strategies** as integral elements of our **national sustainable development strategies (§119)***
- *craft **policies that incentivize** the creation of new technologies, that incentivize research and that support innovation in developing countries (**§116)***

Scientific Research and Education

- *scale up **investment in science, technology, engineering and mathematics education (§119)***
- *consider using **public funding to enable critical projects** to remain in the public domain and strive for **open access to research** for publicly funded projects, as appropriate (**§118)***
- *enhance **technical, vocational and tertiary education and training**, ensuring **equal access** for women and girls and encouraging their participation therein, including through international cooperation (**§119)***
- *enhance cooperation to strengthen **tertiary education systems** and aim to increase **access to online education** in areas related to sustainable development (**§119)***
- *increase the number of **scholarships** available to students in developing countries to enroll in higher education (**§119)***

Industry and Innovation Systems

- *consider setting up **innovation funds** where appropriate, on an open, competitive basis to support innovative **enterprises**, particularly during research, development and demonstration phases (**§118)***
- *encourage knowledge-sharing and the promotion of cooperation and partnerships between stakeholders, including between **Governments, firms, academia and civil society**, including linkages between **multinational companies and the domestic private sector** to facilitate technology development and transfer, on mutually agreed terms, of knowledge and skills (**§117)***
- *promote **entrepreneurship**, including supporting **business incubators (§117)***
- *promote **social innovation** to support social well-being and sustainable livelihoods (**§116)***
- *recognize that **traditional knowledge**, innovations and practices of **indigenous peoples** and **local communities** can support social well-being and sustainable livelihoods, and reaffirms that indigenous peoples have the right to maintain, control, protect and develop their **cultural heritage**, traditional knowledge and traditional cultural expressions (**§117)***

Technologies Supporting Specific Development Outcomes

- *promote the development and use of **information and communications technology infrastructure**, as well as capacity-building, particularly in LDCS, LLDCs and SIDs, including rapid **universal and affordable access** to the Internet (**§114)***
- *encourage the development, dissemination and diffusion as well as transfer of **environmentally sound technologies (§120)***
- *support developing countries to strengthen their scientific, technological and innovative capacity to move towards more **sustainable patterns of consumption and production** through science and technology (**§120)***
- *increase scientific knowledge, develop research capacity and transfer **marine technology** (…) in order to improve **ocean health** and to enhance the contribution of **marine biodiversity (§121)***
- *step up international cooperation and collaboration in science, research, technology and innovation, including through public-private and multi stakeholder partnerships, and on the basis of common interest and mutual benefit, focusing on the needs of developing countries and the achievement of the sustainable development goals (**§** 120) [such as, amongst others, research and development of **vaccines and medicines**, including relevant initiatives like GAVI (**§121)**; preventive measures and treatments for the **communicable and non-communicable diseases (§121)**; **earth observation (§121)**; **rural infrastructure (§121)**; **agricultural research and extension services and technology development (§121)**; increase scientific knowledge, develop research capacities and transfer **marine technology (§121)**]*

- *further facilitate accessible technology for **persons with disabilities** and to promote access to technology and science for **women**, **youth** and **children (§114)***

Supportive international arrangements

- *enhance international cooperation in these areas, including **ODA**, in particular to **LDCs, LLDCs, SIDS and countries in Africa** and **e**ncourages other forms of international cooperation in these areas, including **South-South cooperation (§120)***
- *recognizes the importance of adequate, balanced and effective protection of **intellectual property rights** in both developed and developing countries in line with **nationally defined priorities** and in full respect of **WTO rules (§116)***
- *strengthen **coherence and synergies** among science and technology initiatives within the UN system (**§122)***
- *established a **technology facilitation mechanism** to support the SDGs (**§123)***
- *operationalize the **Technology Bank for Least Developed Countries** by 2017 (**§124)***

* Grouping of the commitments and bold texts are by the Author for this paper's analytical purposes

Annex 4: STI as explicit in SDGs languages

Goal	Target	Language	Relevance
1	1.4	By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, **appropriate new technology** and financial services, including microfinance	Outcome: Tech
2	2.a	Increase investment, including through enhanced international cooperation, in rural infrastructure, **agricultural research and extension services, technology development and plant and livestock gene banks** in order to enhance agricultural productive capacity in developing countries, in particular least developed countries	MoI: Sci / Tech
3	3.b	Support the **research and development of vaccines and medicines for the communicable and non-communicable diseases** that primarily affect developing countries, provide **access to affordable essential medicines and vaccines**, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all	MoI: Sci / Tech
4	4.3	By 2030, ensure equal access for all women and men to affordable and quality **technical, vocational and tertiary education**, including university	Outcome: Sci (edu)
	4.4	By 2030, substantially increase the number of youth and adults who have relevant skills, including **technical and vocational skills, for employment, decent jobs and entrepreneurship**	Outcome: Sci (edu)
	4.b	By 2020, substantially expand globally the number of **scholarships** available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in **higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes**, in developed countries and other developing countries	MoI: Sci (edu)
5	5.b	Enhance the use of **enabling technology, in particular information and communications technology**, to promote the empowerment of women	MoI: Tech
6	6.b	By 2030, expand international cooperation and capacity-building support to developing countries in **water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies**	MoI: Tech
7	7.a	By 2030, enhance international cooperation to facilitate **access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology**, and **promote investment in energy infrastructure and clean energy technology**	MoI: Tech
	7.b	By 2030, expand infrastructure and **upgrade technology for supplying modern and sustainable energy services for all** in developing countries, in particular least developed countries, small island developing States and landlocked developing countries, in accordance with their respective programmes of support	MoI: Tech
8	8.2	Achieve higher levels of economic productivity through **diversification, technological upgrading and innovation**, including through a focus on high-value added and labour-intensive sectors	Outcome: Inno
	8.3	Promote development-oriented policies that support productive activities, decent job creation, **entrepreneurship, creativity and innovation**, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services	Outcome: Inno
9	9.4	By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of **clean and environmentally sound technologies and industrial processes**, with all countries taking action in accordance with their respective capabilities	Outcome: Tech

	9.5	Enhance **scientific research, upgrade the technological capabilities of industrial sectors** in all countries, in particular developing countries, including, by 2030, **encouraging innovation** and substantially **increasing the number of research and development workers per 1 million people** and **public and private research and development spending**	Outcome: Inno
	9.a	Facilitate **sustainable and resilient infrastructure development** in developing countries through enhanced **financial, technological and technical support** to African countries, least developed countries, landlocked developing countries and small island developing States	MoI: Tech
	9.b	Support **domestic technology development, research and innovation in developing countries**, including by **ensuring a conducive policy environment** for, inter alia, industrial diversification and value addition to commodities	MoI: Inno
	9.c	Significantly increase **access to information and communications technology** and strive to provide universal and affordable access to the Internet in least developed countries by 2020	MoI: Tech
12	12.a	Support developing countries to strengthen their **scientific and technological capacity** to move towards more sustainable patterns of consumption and production	MoI: Sci/Tech
14	14.3	Minimize and address the impacts of **ocean acidification**, including through **enhanced scientific cooperation** at all levels	Outcome: sci
	14.4	By 2020, effectively **regulate harvesting and end overfishing**, illegal, unreported and unregulated fishing and destructive fishing practices and implement **science-based management plans**, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics	Outcome: sci
	14.5	By 2020, **conserve at least 10 per cent of coastal and marine areas**, consistent with national and international law and based on the **best available scientific information**	Outcome: sci
	14.a	**Increase scientific knowledge, develop research capacity and transfer marine technology**, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries	MoI: sci/tech
17	17.6	Enhance **North-South, South-South and triangular regional and international cooperation** on and access to **science, technology and innovation** and enhance knowledge-sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a **global technology facilitation mechanism**	MoI
	17.7	Promote the **development, transfer, dissemination and diffusion of environmentally sound technologies** to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed	MoI
	17.8	Fully **operationalize the technology bank and science, technology and innovation capacity-building mechanism** for least developed countries by 2017 and **enhance the use of enabling technology, in particular information and communications technology**	MoI
	17.16	Enhance **the Global Partnership for Sustainable Development**, complemented by multi-stakeholder partnerships that **mobilize and share knowledge, expertise, technology and financial resources**, to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries	MoI

Bold by authors. Targets to be achieved through STI contributions are not limited to the list above.

Annex 5: SDSN/Bertelsmann SDG Index, indicators and country distribution

"% Red" represents occurrence of countries below threshold as experts judgments as minimal requirements. According to the report, "where possible, the thresholds are derived from the SDGs, their targets, or other official sources. The thresholds are the same for all countries and were subject to extensive consultations with expert communities."

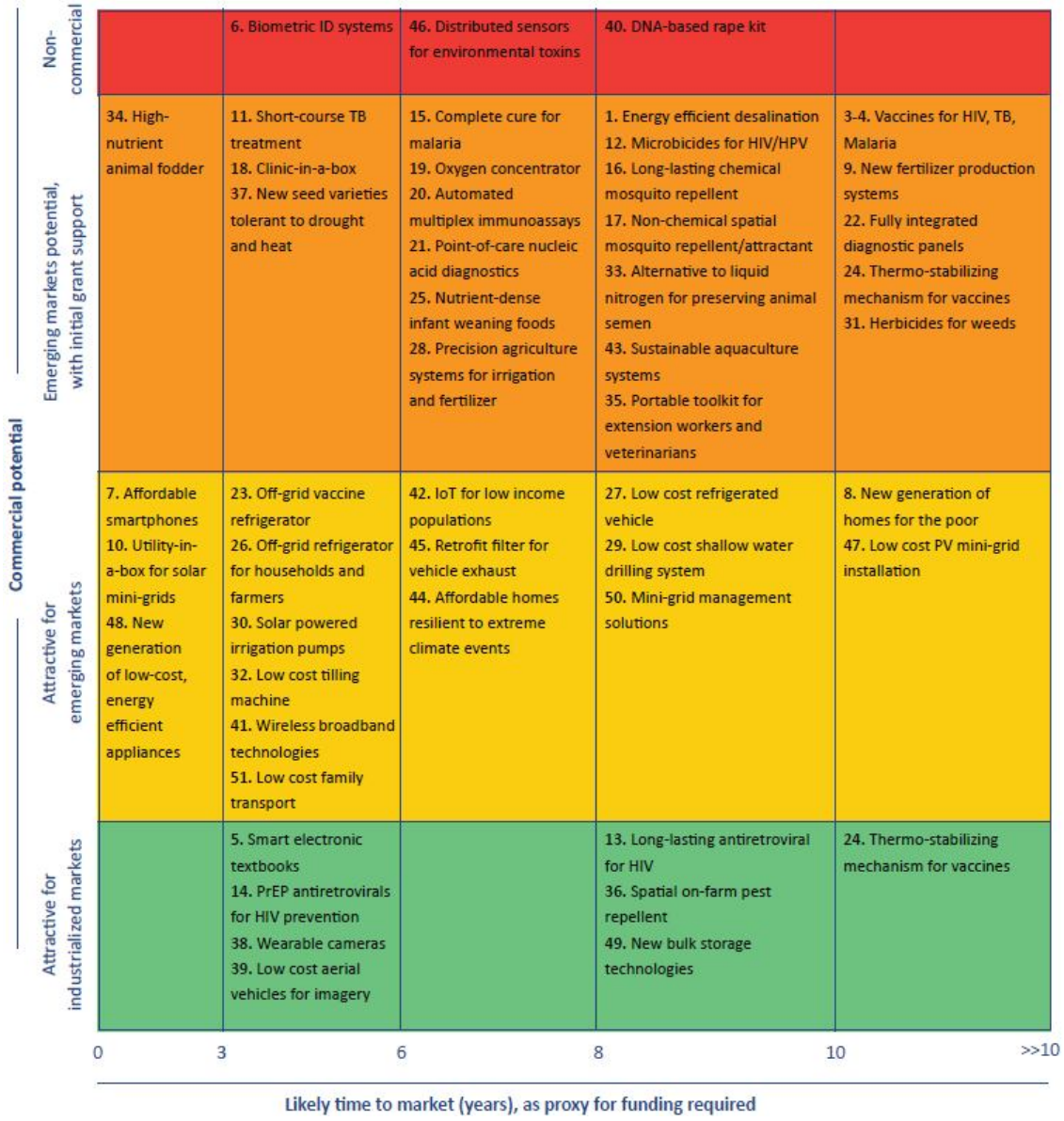
"Avg %" was calculated by taking the "% red" per Goals excluding the indicators applicable only to OECD countries.

Goal	Indicator (* OECD only; ** global only)	N	Threshold	% Red	Avg %
1	Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)	166	>12.7%	32%	32%
	Poverty rate after taxes and transfers, poverty line 50% (% of population) *	34	>15%	18%	
2	Prevalence of undernourishment (% of population)	163	>15%	25%	37%
	Cereal yield (t/ha)	172	<1.5	21%	
	Prevalence of stunting (low height-for-age) in children under 5 years of age (%)	143	>15%	59%	
	Prevalence of wasting in children under 5 years of age (%)	143	>10%	13%	
	Sustainable Nitrogen Management Index (0-1)	136	>0.7	68%	
	Prevalence of obesity, BMI ≥ 30 (% of adult population) *	189	>25%	22%	
3	Mortality rate, under-5 (per 1,000 live births)	191	>50	22%	37%
	Maternal mortality rate (per 100,000 live births)	191	>140	34%	
	Neonatal mortality rate (per 1000 live births)	191	>18	34%	
	Physician density (per 1000 people)	174	<1	44%	
	Incidence of tuberculosis (per 100,000 people)	191	>75	44%	
	Traffic deaths rate (per 100,000 people)	177	>16.8	51%	
	Adolescent fertility rate (births per 1,000 women ages 15-19)	183	>50	46%	
	Subjective wellbeing (average ladder score, 0-10)	152	<5	42%	
	Healthy life expectancy at birth (years)	191	<60	33%	
	Percentage of surviving infants who received 2 WHO-recommended vaccines (%)	191	<80%	21%	
	Daily smokers (% of population aged 15+) *	34	>25%	12%	
4	Expected years of schooling (years)	186	<10	17%	25%
	Literacy rate of 15-24 year olds, both sexes (%)	148	<85%	14%	
	Net primary school enrolment rate (%)	137	<90%	29%	
	Population aged 25-64 with tertiary education (%) *	34	<15%	6%	
	PISA score (0-600) *	60	<400	14%	
	Population aged 25-64 with upper secondary and post-secondary non-tertiary educational attainment (%) *	34	<70%	100%	
5	Proportion of seats held by women in national parliaments (%)	191	<20%	48%	28%
	Female mean years of schooling of population aged 25 and above (% of male)	167	<75%	25%	
	Female labor force participation rate (% of male)	121	<50%	13%	
	Estimated demand for contraception that is unmet (% of women married or in union, ages 15-49)	182	>50%	25%	
	Gender wage gap (% of male median wage) *	26	>15%	46%	
6	Access to improved water source (% of population)	189	<80%	23%	25%
	Access to improved sanitation facilities (% of population)	188	<75%	38%	
	Freshwater withdrawal (% of total renewable water resources)	171	>40%	12%	
7	Access to electricity (% of population)	192	<80%	34%	32%
	Access to non-solid fuels (% of population)	191	<50%	34%	
	CO2 emissions from fuel combustion and electricity output (MtCO2/TWh)	134	>1.5	27%	
	Share of renewable energy in total final energy consumption (%) *	34	<10%	50%	
8	Unemployment rate (% of total labor force) **	177	>10%	26%	33%
	Automated teller machines (ATMs per 100,000 adults)	179	<10	25%	
	Adjusted growth rate (%)	184	<-2%	41%	
	Youth not in employment, education or training (NEET) (%) *	34	>15%	15%	

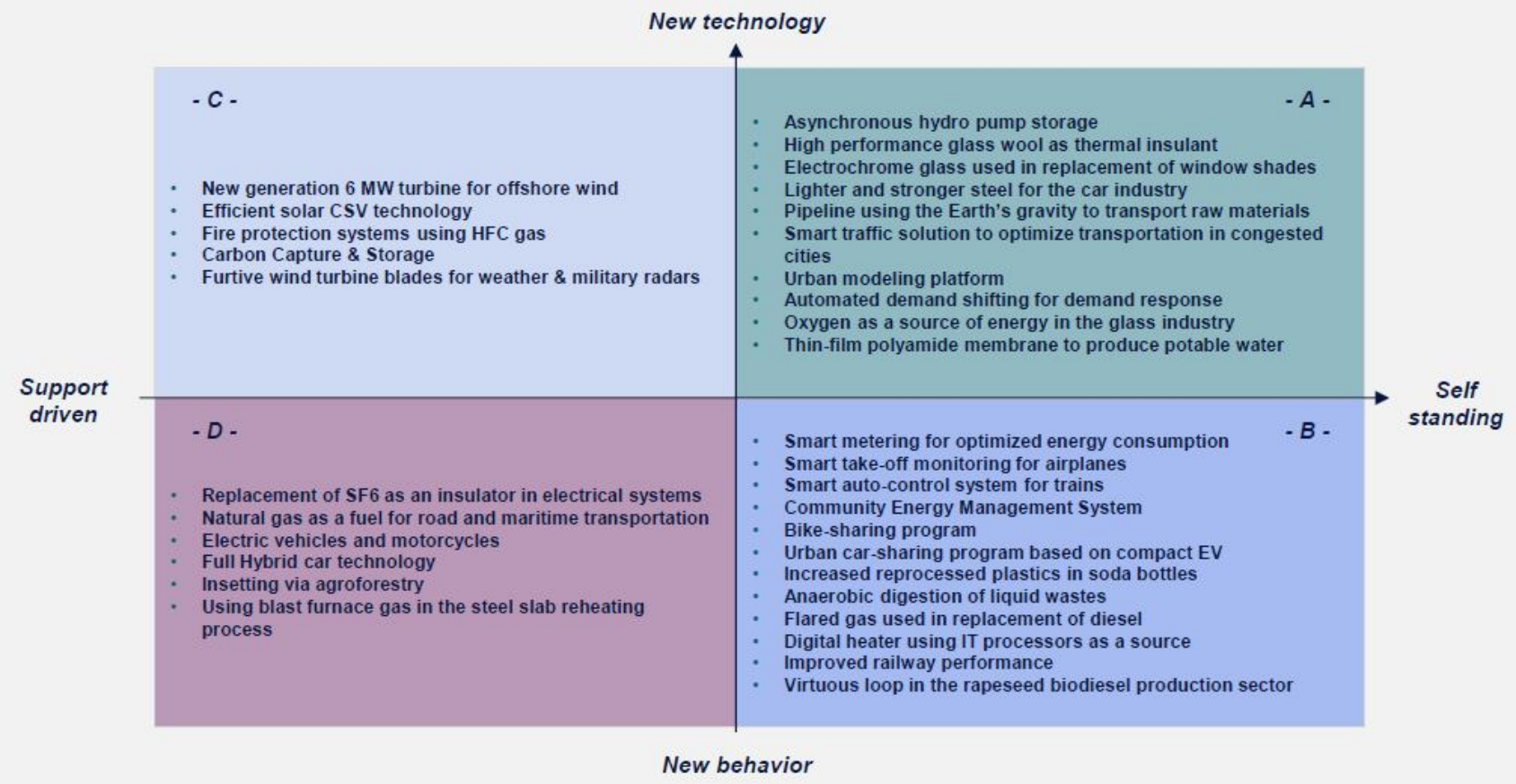
	Percentage of children 5–14 years old involved in child labor (%)	162	>10%	42%	
	Employment-to-Population ratio (%) *	34	<50%	12%	
9	Research and development expenditure (% of GDP)	161	<1%	73%	44%
	Research and development researchers (per 1000 employed) *	34	<7	26%	
	Logistics Performance Index: Quality of trade and transport-related infrastructure (1-5)	163	<2	5%	
	Quality of overall infrastructure (1-7)	138	<3	14%	
	Mobile broadband subscriptions (per 100 inhabitants)	142	<50%	69%	
	Proportion of the population using the internet (%)	187	<50%	57%	
	Patent applications filed under the PCT in the inventor's country of residence (per million population) *	34	<50	15%	
10	Gini index (0-100)	146	>40	40%	40%
	Palma ratio *	34	>1.2	41%	
	PISA Social Justice Index (0-10) *	28	<4	11%	
11	Annual mean concentration of particulate matter of less than 2.5 microns of diameter (PM2.5) (µg/m3) in urban areas	186	>20	29%	31%
	Rooms per person *	34	<1.1	0%	
	Improved water source, piped (% of urban population with access) **	173	<75%	34%	
12	Percentage of anthropogenic wastewater that receives treatment (%)	172	<15%	58%	29%
	Municipal solid waste (kg/year/capita)	159	>2	17%	
	Non-recycled municipal solid waste (kg/person/year) *	32	>1.5	53%	
13	Energy-related CO2 emissions per capita (tCO2/capita)	188	>4	43%	29%
	Climate Change Vulnerability Monitor (0-1)	158	>0.2	16%	
14	Ocean Health Index Goal - Clean Waters (0-100)	148	<60	28%	34%
	Ocean Health Index Goal - Biodiversity (0-100)	148	<80	29%	
	Ocean Health Index Goal - Fisheries (0-100)	146	<60	44%	
	Marine sites of biodiversity importance that are completely protected (%)	134	<10%	43%	
	Percentage of fish stocks overexploited or collapsed by EEZ (%)	112	>50	24%	
15	Red List Index of species survival (0-1)	192	<0.8	21%	32%
	Annual change in forest area (%)	179	>-2	38%	
	Terrestrial sites of biodiversity importance that are completely protected (%)	188	<10%	36%	
16	Homicides (per 100,000 people)	192	>3	58%	33%
	Prison population (per 100,000 people)	188	>200	25%	
	Proportion of the population who feel safe walking alone at night in the city or area where they live. (%)	156	<50%	28%	
	Corruption Perception Index (0-100)	162	<40	57%	
	Proportion of children under 5 years of age whose births have been registered with a civil authority, by age (%)	160	<75%	26%	
	Government efficiency (1-7)	138	<3	21%	
	Property rights (1-7)	138	<3	7%	
17	For high-income and all OECD DAC countries: International concessional public finance, including official development assistance (% of GNI) *	28	<0.35%	57%	28%
	For all other countries: Tax revenue (% of GDP) **	128	<15%	13%	
	Health, education and R&D spending (% of GDP)	120	<8%	14%	

Annex 6: External Assessment Influence at the Agenda-Setting Stage

Annex 7: Assessment Summary, 50 Breakthroughs (50BT)



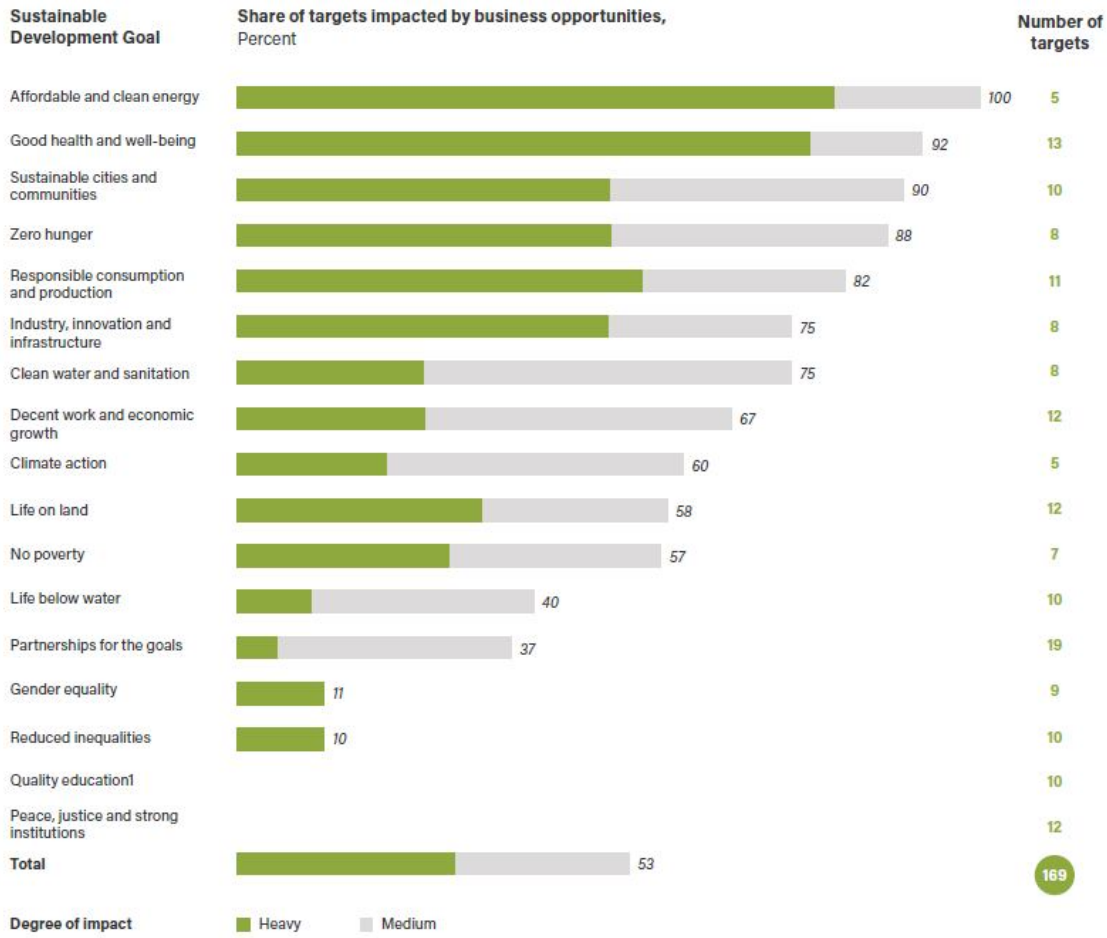
Annex 8: Assessment Summary, Transition Through Innovations (TTI)



Annex 9: Assessment Summary, Better Business, Better World (BBBW)

	Food and agriculture	Cities	Energy and materials	Health and well-being
1	Reducing food waste in value chain	Affordable housing	Circular models - automotive	Risk pooling
2	Forest ecosystem services	Energy efficiency - buildings	Expansion of renewables	Remote patient monitoring
3	Low-income food markets	Electric and hybrid vehicles	Circular models - appliances	Telehealth
4	Reducing consumer food waste	Public transport in urban areas	Circular models - electronics	Advanced genomics
5	Product reformulation	Car sharing	Energy efficiency - non-energy intensive industries	Activity services
6	Technology in large-scale farms	Road safety equipment	Energy storage systems	Detection of counterfeit drugs
7	Dietary switch	Autonomous vehicles	Resource recovery	Tobacco control
8	Sustainable aquaculture	Internal combustion engine vehicle fuel efficiency	End-use steel efficiency	Weight management programs
9	Technology in smallholder farms	Building resilient cities	Energy efficiency - energy intensive industries	Better disease management
10	Micro-irrigation	Municipal water leakage	Carbon capture and storage	Electronic medical records
11	Restoring degraded land	Cultural tourism	Energy access	Better maternal and child health
12	Reducing packaging waste	Smart metering	Green chemicals	Healthcare training
13	Cattle intensification	Water and sanitation infrastructure	Additive manufacturing	Low-cost surgery
14	Urban agriculture	Office sharing	Local content in extractives	
15		Timber buildings	Shared infrastructure	
16		Durable and modular buildings	Mine rehabilitation	
17			Grid interconnection	

Annex 10: SDG Targets affected by Business Opportunities (BBBW)



* Goal 4 (Quality education) Not directly impacted as BBBW analysis covered only four systems: food and agriculture, cities, health and well-being, and energy and materials.

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