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Mapping STI policy capacity building initiatives and exploring its transformative value for the SDGs

UN – IATT Workstream on Capacity-building Case Study

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ACKNOWLEDGEMENTS

We would like to thank our project supervisors, Dr. Jean-Christophe Mauduit and Dr. Ine Steenmans from the STEaPP department at UCL. Their continued encouragement and guidance over the past several months are greatly appreciated and we cannot thank them enough for their expertise, time and commitment.

We would also like to thank Kornelia Tzinova and Zengmei Wang at UNESCO for giving us the opportunity to work on such an interesting and pressing issue and for their support over the duration of the project. We are incredibly grateful for their willingness to help us through the process and the time they gave us amid their busy schedules.

Special thanks to our classmate, Karina Izquierdo, for conducting one interview that required Spanish as a main mode of communication.

Last, but certainly not least, we want to thank all those who agreed to be interviewed as a part of our research. Their expertise and insights have been fundamental to the project's development and valuable to the UN-IATT's future developments.

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1. EXECUTIVE SUMMARY

In 2015, the United Nations (UN) set up the 2030 Agenda for Sustainable Development to achieve a more sustainable future. 17 Sustainable Development Goals (SDGs) were proposed in the 2030 Agenda to achieve the balance between economic, social and environmental development (United Nations, 2015b). Science, Technology and Innovation (STI) are identified as an important component for achieving the SDGs by 2030 (United Nations, 2015a). The last goal, SDG 17, relates to the implementation of the SDGs and fostering global cooperation and partnerships. SDG 17 has 19 targets, one of which is to "strengthen the science, and innovation capacity in the least developed countries" (Target 17.8, SDG 17). The Technology Facilitation Mechanism (TFM) was launched to support the implementation of the SDGs, and the UN Interagency Task Team (IATT) on STI for SDGs is one of its mechanisms to actualise the TFM (United Nations, 2021a).

The UN-IATT's Workstream 6 (WS6) focused on STI capacity building and began to deliver training sessions on STI policy for SDGs in 2017, especially for developing economies (United Nations, 2021b). WS6 aims to improve the capacity of policymakers, public sector experts and other key STI stakeholders by informing them of the approaches in STI policymaking and policy implementation, and to enhance their abilities in integrating STI into their strategies to achieve the SDGs (UN-IATT, 2021). This research project provides insights into STI for SDG capacity building and recommendations for its future development by mapping global initiatives and exploring their transformative value in the context of the UN-IATT. Overall, this research will contribute to an important base for future work and will contribute to a global repository of STI training literature, as well as a policy brief (see Annex B), to inform future developments in the UN-IATT.

Part A of this report maps global STI capacity building initiatives to establish the most current landscape on such programmes, their relationship to the SDGs, as well as gaps and opportunities in the field. This also served to position the UN-IATT workshops in the global context of STI capacity building. Our research mapped where global initiatives are taking place, who is involved in them, how they are being delivered and their topical content. To accomplish this, we undertook desktop research and used web scraping software to collect raw data on global STI policy training initiatives. This resulted in a dataset of 97 verified programmes. Content analysis of each initiative enabled them to be mapped according to the research focus. The analysis illustrated the critical influence of short-term professional training courses and workshops delivered by academic institutions and non-governmental agencies. Topical content is highly diverse and interdisciplinary in nature. However, there is a significant deficiency in the number of openly accessible initiatives and training materials. The analysis also revealed a paucity in the quantity of STI capacity building initiatives that are specific to the SDGs. Furthermore, such initiatives are concentrated predominantly in the West. Greater collaborative efforts between public and private organisations in different contexts, particularly within developing countries, could meaningfully make a difference to the STI for SDG capacity building space, as well as further North-South and South-South cooperation. All data pertaining to Part A is also openly accessible for preview and download on GitHub: https://jmherre.github.io/STI4SDG-STEaPP2021-Group9/. On the website, summary statistics have been detailed, in addition to analyses looking at how closely global STI capacity building initiatives are aligned to the SDGs.

Part B of the report explores how STI for SDG capacity building initiatives are transforming policymaking by using semi-structured interviews and anecdotal evidence from UN-IATT members involved in WS6

activities and recipients of the training. We interviewed 17 participants and identified four interview participant categories: UN-IATT WS6 members; WS6 trainers; workshop participants, and academics researching in this field. From the information gleaned, we could extract various perspectives on the value of capacity building initiatives, the challenges associated with the initiatives, how COVID-19 has impacted the capacity building efforts and suggested recommendations for improvement from the various stakeholders. We looked at where participant answers overlapped and where they differed and then used this knowledge to inform our recommendations. However, we had a significantly larger number of UN-IATT members and trainers partake in the research than workshop participants, and we acknowledge that this may result in certain biases in the results. Nevertheless, the interview results were used to gauge the current situation of WS6 activities. We then used a Theory of Change model to assess the WS6 initiatives according to their inputs, outputs, and outcomes to identify how WS6 can shift from its current situation to the desired future.

The report recommends a set of actions to the UN-IATT by proposing:

1. The creation of an enabling environment that is conducive to peer learning, networking and knowledge acquisition whilst being sensitive to contextual needs
2. The construction of a comprehensive feedback mechanism that takes participants' needs into account and measures long-term impact
3. The formalisation of stakeholder engagement and collaboration mechanisms to improve the diversity of knowledge

2. INTRODUCTION

2.1. BACKGROUND OF THE STUDY

In 2015, the United Nations (UN) set up the 2030 Agenda for Sustainable Development to achieve a more sustainable future. 17 Sustainable Development Goals (SDGs) were proposed in the 2030 Agenda to achieve the balance between economic, social and environmental development (United Nations, 2015b). Science, Technology and Innovation (STI) are identified as an important component for achieving the SDGs by 2030 (United Nations, 2015a). The last goal, SDG 17, relates to the implementation of the SDGs and fostering global cooperation and partnerships. SDG 17 has 19 targets, one of which is to "strengthen the science, and innovation capacity in the least developed countries" (Target 17.8, SDG 17). The Technology Facilitation Mechanism (TFM) was launched to support the implementation of the SDGs, and the UN Interagency Task Team (IATT) on STI for SDGs is one of its mechanisms to actualise TFM (United Nations, 2021a). See Annex E for a comprehensive diagram showing the organisation of the UN-IATT.

The UN-IATT's Workstream 6 (WS6) focused on STI capacity building and began to deliver training sessions on STI policy for SDGs in 2017, especially for developing economies (United Nations, 2021b). WS6 aims to improve the capacity of policymakers, public sector experts and other key STI stakeholders by informing them of the approaches of STI policymaking and policy implementation, and to enhance their ability to integrate STI into their strategies to achieve the SDGs (UN-IATT, 2021).

The UN-IATT WS6 currently comprises of 15 UN agencies, including UNESCO, UNCTAD, UNIDO and others, including regional commissions (United Nations, 2021b). Additional partnerships include

organisations outside the UN system, such as the European Union (EU) Joint Research Centre (JRC). WS6 is also working closely with the 10-Member Group, made up of representatives from the scientific community, private sector, and civil society, whose mission is to support TFM (United Nations, 2021b).

EVOLUTION AND CURRENT STATUS OF THE UN-IATT WS6

From 2015 to 2017, WS6 designed and developed a training program on STI capacity building. After the 2nd STI Forum in May 2017, the training program was revised, with the completion of the STI activities mapping exercise, which was conducted by the TFM as a prerequisite to identify a focus for WS6 capacity building activities. Based on the draft program, two regional training sessions were organised in cooperation with the UN regional economic and social commissions. The first training workshop for the Arab region took place in Jordan in April 2018 and the second training workshop for Latin American Countries (LAC) took place in Panama in May 2019 (United Nations, 2021a).

However, due to COVID-19, in-person training activities had to be postponed, and instead, a series of online training sessions were delivered in 2020 and 2021. A series of online training workshops for LAC and the Southern Africa Development Community (SADC) region were delivered in 2021. Additionally, WS6 is collaborating with EU JRC to prepare a Massive Open Online Course (MOOC) on STI for SDGs, which is currently at the design stage (UN-IATT, 2021).

PROJECT OBJECTIVES

The UCL STEaPP research team aims to assist UNESCO and the wider UN-IATT with background research on capacity building. The research team will explore and analyse global trends in STI for SDGs capacity building and provide evidence of effectiveness and recommendations for future development. This research project has three key objectives:

1. provide a global overview of STI for SDGs capacity building initiatives;
2. evaluate capacity building in the STI policy for SDGs space; and,
3. provide recommendations for future development.

Overall, this research will contribute to an important base for future work and will contribute to a global repository of STI training literature, as well as a policy brief (see Annex B).

The project will also aim to answer these research questions:

1. How do capacity building initiatives provide value to policymakers and transform policymaking?
2. What is the global landscape of STI capacity building initiatives?
3. How can capacity building initiatives be improved to aid policymakers?

REPORT STRUCTURE

The report is organised into two main parts, Part A and Part B, each with its own set of methodologies and purpose. Part A aligns with the first goal of the research, which is taking a global look at STI policy education. Part B narrows in on the value of STI for SDG capacity building initiatives and how these initiatives transform policymaking in the context of the UN-IATT WS6. Part A provides a broad, contextual knowledge base which then feeds into Part B's exploration of utility.

The methodology of Part A involved desktop research in forming a dataset of global STI capacity building initiatives. Our research mapped where these initiatives are taking place, who is involved in them, how they are being delivered, and the different topics they focus on. Content analysis of each initiative enabled them to be mapped according to the research focus to draw valuable insights. A website was also developed via GitHub to provde open access to the data: https://jmherre.github.io/STI4SDG-STEaPP2021-Group9/. On the website, summary statistics have been detailed, in addition to analyses looking at how closely global STI capacity building initiatives are aligned to the SDGs. Part B used desktop research, survey analysis of secondary data and semi-structured interviews to form an in-depth analysis of the UN-IATT STI for SDG workshops. These findings enabled exploration of the transformative value of such capacity building initiatives. It also formed the basis of the recommendations to the UN-IATT that are presented in this report.

3. PART A: MAPPING STI CAPACITY BUILDING INITIATIVES

3.1. UNDERSTANDING THE GLOBAL CONTEXT

The value of aligning STI policy towards a grander purpose and creating mission-oriented innovation policies have been well cited in academic literature (Mazzucato, 2018; Miedzinski, Mazzucato and Elkins, 2019; Wanzenböck *et al.*, 2020). Governments have recognized the need to align STI policy objectives toward issues like climate change, reduction of inequality, poverty, and pollution (Schot and Steinmueller, 2018). With the focus on global goals like the SDGs, academics and policymakers have been looking at the ways that STI policy can serve the SDGs. Accordingly, capacity building in this area is vital to ensure that individuals and organisations are better equipped to orient their STI policies towards the SDGs. The UN-IATT delivers training workshops specifically for this purpose. However, there is currently a paucity of literature exploring the positioning of capacity building initiatives in the STI field, particularly with regards to STI alignment to the SDGs.

In response to the knowledge gap in relation to capacity building, STI and the SDGs, Part A aims to map existing STI capacity building initiatives worldwide. This mapping aimed to establish the most current landscape on capacity building initiatives for STI policy, including the extent to which the SDGs are integrated into these programmes. The mapping also served to position the UN-IATT workshops in the global context of STI capacity building, which contributed to the overall recommendations.

3.2. BUILDING A PICTURE OF GLOBAL INITIATIVES

DATA COLLECTION

Desktop research was conducted to collect data on global STI policy capacity building initiatives. A web scraping tool, Octoparse, was utilised to systematically and efficiently use the Google search engine to look for relevant training programmes based on search criteria inputted into the software (Figure 1).

The search criteria included, but is not exclusive to, phrases such as:

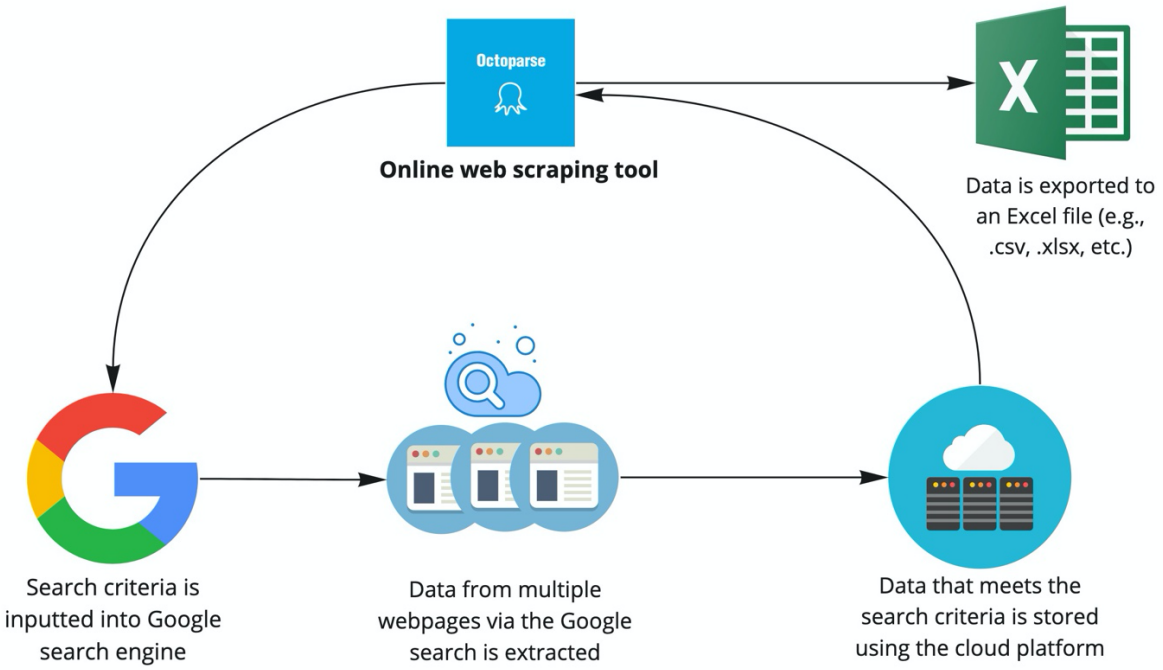
- "Science Technology Innovation Policy Workshop"

- “Science Technology Innovation Policy Short Course”
- “Science Technology Innovation Policy Online Course”
- “Science Technology Innovation Policy SDG Workshop”
- “Science Technology Innovation Policy SDG Online Course”

Octoparse was selected because of its user experience, features, cloud bot extraction, and overall efficiency. The tool contains existing templates on different websites where the user can input phrases and have a pre-set mapping on the website to collect information. Octoparse allows the simultaneous use of six bots with internet protocol address rotation, preventing blockages from certain websites.

The web scraper collected data of the search results according to the title, description and URL of the webpage, based on the phrases of the original search criteria. The data was then mined by Octoparse’s bots and exported to Excel.

Figure 1: Data collection process via the Octoparse web scraping tool. *Firstly, relevant search criteria is inputted into the Google search engine tool via a webscraping software called Octoparse. The software then uses five bots to simultaneously collect information from multiple webpages extracted from the Google search. Data that met the initial search criteria is then stored on the Octoparse dashboard on the cloud platform. The data can then be exported to an Excel file, ready for further preparation.*



DATA PREPARATION

Following the initial data collection phase, the raw data was further processed and cleaned. The purpose was to: 1) ensure that there were no duplicated data entries present; 2) improve the quality of the data by ensuring that each entry corresponded to a real STI training programme; and, 3) add additional variables to the data to ensure broader exploration.

In total, the web scraping activity returned 1048 data entries. Post-removal of duplicated entries, the data cleaning was completed manually by sifting through the remaining 969 entries to ensure that irrelevant data was removed. This guaranteed that the only data remaining corresponded to actual training programmes related to STI policy. After data cleaning was complete, this reduced the number

of data entries to 97 STI capacity building initiatives. The amount of data entries were extensively reduced as the Excel output file returned many irrelevant web pages which did not relate to an STI capacity building initiative. This could be a result of the use of Google's search engine, which produced a lot of unrelated content due to the lack of initial filters.

The remaining 97 initiatives were further processed to add additional variables that Octoparse was unable to record. These included 'country of organisation'; 'type of training provider'; 'SDG connection'; 'delivery method'; 'training type'; 'level of expertise'; 'duration'; 'locality'; 'target audience'; 'target audience location'; and, 'topics'. The details of these additional variables are summarised in Annex D. The level of the SDG connection gives an indication of how closely STI policy capacity building initiatives are aligned with the SDGs and are ranked as either low, medium or high. More details can be found in Annex D.

Initiatives were individually accessed via their URLs which enabled manual content analysis to determine their characteristics. Thus, the characteristics of the initiatives in line with each variable were recorded in the dataset, according to the information provided in their respective web pages. Topics were categorised based on those that were explicitly mentioned in the programme descriptions. The standardised categorisation presented in Annex D was created through a process of clustering the different topics listed for the different programmes to ensure that points of commonality could be established across the content of the courses. To do this, topics shown in each web page were listed and similar topics were clustered to form standardised topic categories. These standardised categories then replaced the original topics of each initiative. The trade-off of clustering was that some topic areas covered by courses had to be simplified. However, this was necessary to ensure systematic data exploration.

DATA EXPLORATION

The prepared data was inputted into a series of pivot tables to gather summary statistics, as well as some initial observations and visualisations. The summary statistics on Excel was then imported to R Markdown to enable further exploration. R Markdown is a file format that enables the production of dynamic and interactive documents with R; a statistical and graphical computing language (Grolemund, 2014). The 'ggplot' and 'knitr' R packages were used to visualise the data using graphs and tables. After the data was transferred to R Markdown, the file was knit to an HTML file and uploaded to GitHub to enable open access to potential users and contributors. The raw data was also made available as a CSV file to provide others with the additional option to download and analyse the data themselves.

3.3. KEY INSIGHTS: PRESENTING THE CURRENT LANDSCAPE

A comprehensive overview of the numbers of global STI capacity building initiatives pertaining to each categorical variable shown in Annex D is openly available through a web link via GitHub: https://jmherre.github.io/STI4SDG-STEaPP2021-Group9/.

This activity was an initial attempt to map global STI capacity building initiatives, in order to fill a gap in the current literature and gather insights that are relevant to this present study, as well as the UN-IATT. However, this is by no means an exhaustive and finalised account of all available initiatives, as there are inherent biases in how the data was collected. For example, not all training programmes may be openly available on the internet or be advertised and delivered in English. Furthermore, the data recorded

from each initiative was limited to the information provided by their respective web pages, and the potential discrepancies of this information are unknown. More contributors can build upon this initial dataset which is accessible on GitHub.

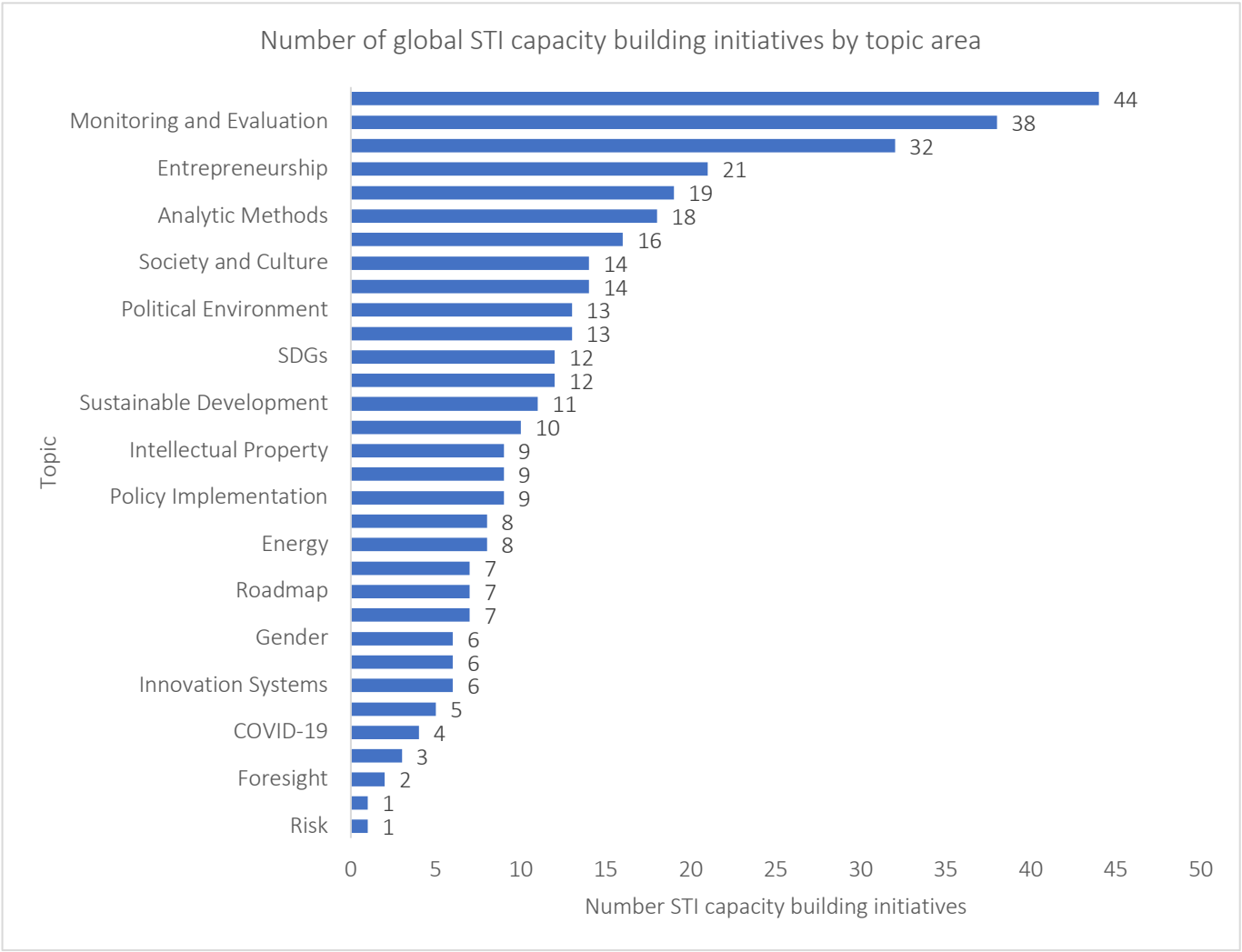
WHAT DOES THIS MAPPING SHOW?

The mapping gathered a total of 97 global initiatives which were highly diverse in their format, delivery and subject content. The most common format were workshops which accounted for 41% of the initiatives. This was followed by short courses (28%) and degree courses (27%). This finding is reflected in the most common duration of the initiatives where 51% last for less than a week, which is likely to consist of workshops / short courses, and 22% last for one year or more which are indicative of degree programmes. Guidebooks and Massive Open Online Courses (MOOCs) were the least used, accounting for only 3% and 2% of the total initiatives respectively. Refer to Annex D for definitions of these delivery formats. Furthermore, the majority of programmes were delivered in-person (58%) which was followed by online initiatives (39%). However, the proportion of otherwise in-person programmes that may have transferred to an online platform as a result of COVID-19 is unclear. Publications only composed 1% of the whole dataset.

These findings imply that initiatives for STI capacity building are generally more concentrated on practitioner-led courses where facilitators have direct involvement in the organisation and delivery of the programme, as well as interaction with participants. Consequently, there is a significant opportunity to engage stakeholders in formulating capacity building initiatives that are openly available for a potentially unlimited period of time, such as guidebooks and MOOCs. This would allow users to engage with the material on their own terms and revisit information when needed. Additionally, the expansion of such initiatives could play key a role in reducing barriers to entry, as many courses and workshops require participants to pay a fee or have certain work experiences which could also require individuals to be a part of specific professional networks.

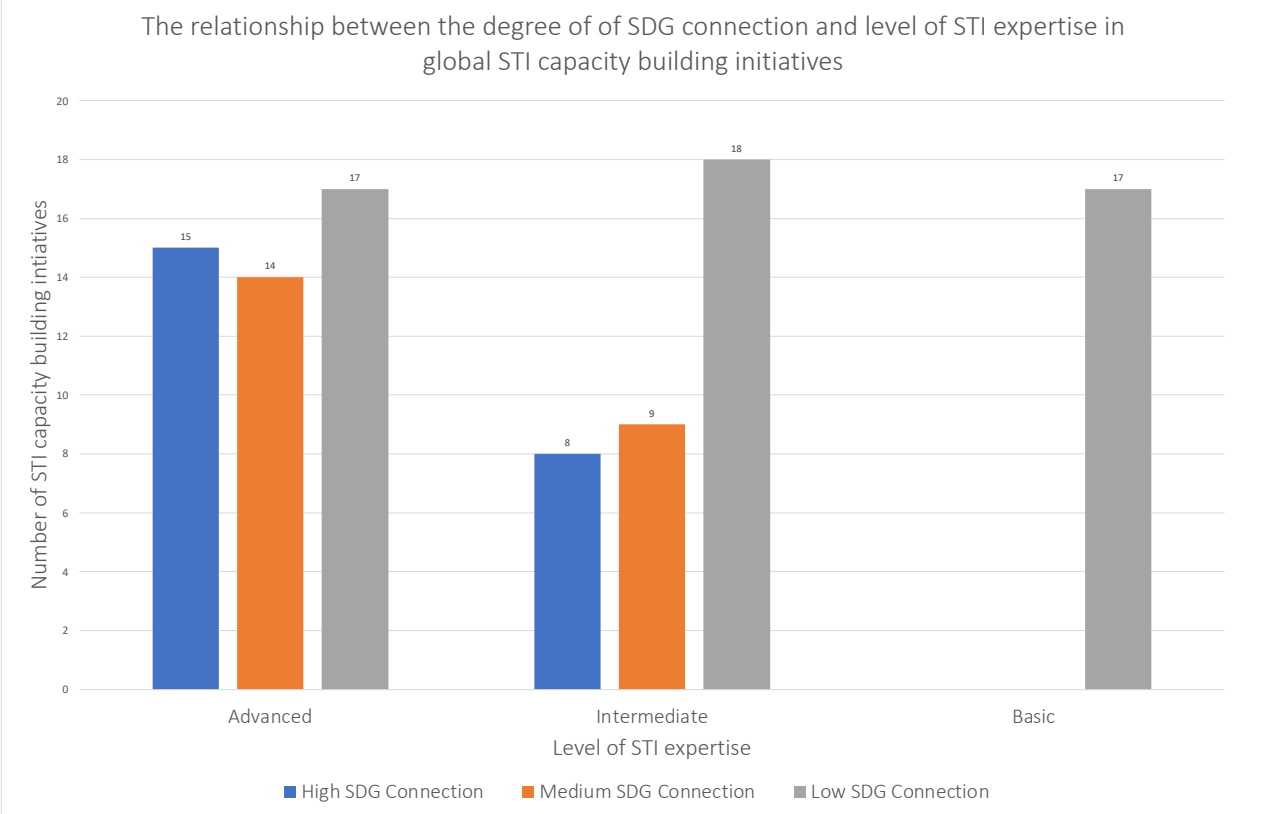
The conceptual topics covered in the initiatives were highly varied. 34 broad topic areas across the training programmes were covered to varying degrees across all initiatives (Figure 2). The most common topics included policymaking; monitoring and evaluation; emerging technology; entrepreneurship; economics, and analytic methods. Interestingly, many of these areas are not specific to the STI field. However, this is also indicative of the interdisciplinary nature of STI. Moreover, many topics may be perceived to be rudimentary, which is consistent with how the level of expertise is distributed across the dataset.

Figure 2: The number of global STI capacity building initiatives covering different topics.



53% of the initiatives require a basic or intermediate level of expertise. Thus the high frequency of seemingly basic topics such as policymaking is to be expected; many advanced initiatives, such as the UN-IATT workshops, also include basic content before introducing more complex issues. The contribution of the SDGs in the STI capacity building initiatives was also highly variable, and very few made explicit connections to the SDGs. Only 23% of the initiatives had a high connection to the SDGs, whereas 53% had a weak connection. This means that the majority of STI courses made no reference to the SDGs. When assessing the relationship between STI expertise and connection to the SDGs (Figure 3), it is shown that a low SDG connection is evenly distributed across the different levels of expertise. However, low and medium connections to the SDGs are more heavily concentrated among initiatives at advanced and intermediate levels.

Figure 3: Graph depicting the relationship between the strength of SDG association and the level of STI expertise in global STI capacity building initiatives. *A 'high SDG connection' indicates that the training is highly relevant to the SDGs and is an explicit connection made in the course title or description. A 'medium SDG connection' suggests that sustainability may be a significant focus of the initiative, although there is no explicit connection made to the SDGs. A 'low SDG connection' shows that there is little to no mention of sustainability in the course. The 'advanced' STI level indicates that the course covers STI policy best practice, emerging issues, case studies, indicators of success and how to track impact, whilst targeting individuals with a high level of knowledge and expertise. The 'intermediate' level covers the basics of STI policy and some prior knowledge of policymaking is desirable for participation. The 'basic' level covers the very basics of policymaking and barriers to entry are very low as no prior knowledge and experience are required.*



These findings imply that STI for SDG capacity building initiatives are generally more advanced in their content and, which suggest higher barriers to entry. Therefore, a significant gap exists in the provision of more foundation-level STI initiatives that also cover the SDGs and sustainability in general, even when degree courses are excluded from the analysis. However, further research should be conducted to assess whether there is sufficient need to fill this gap.

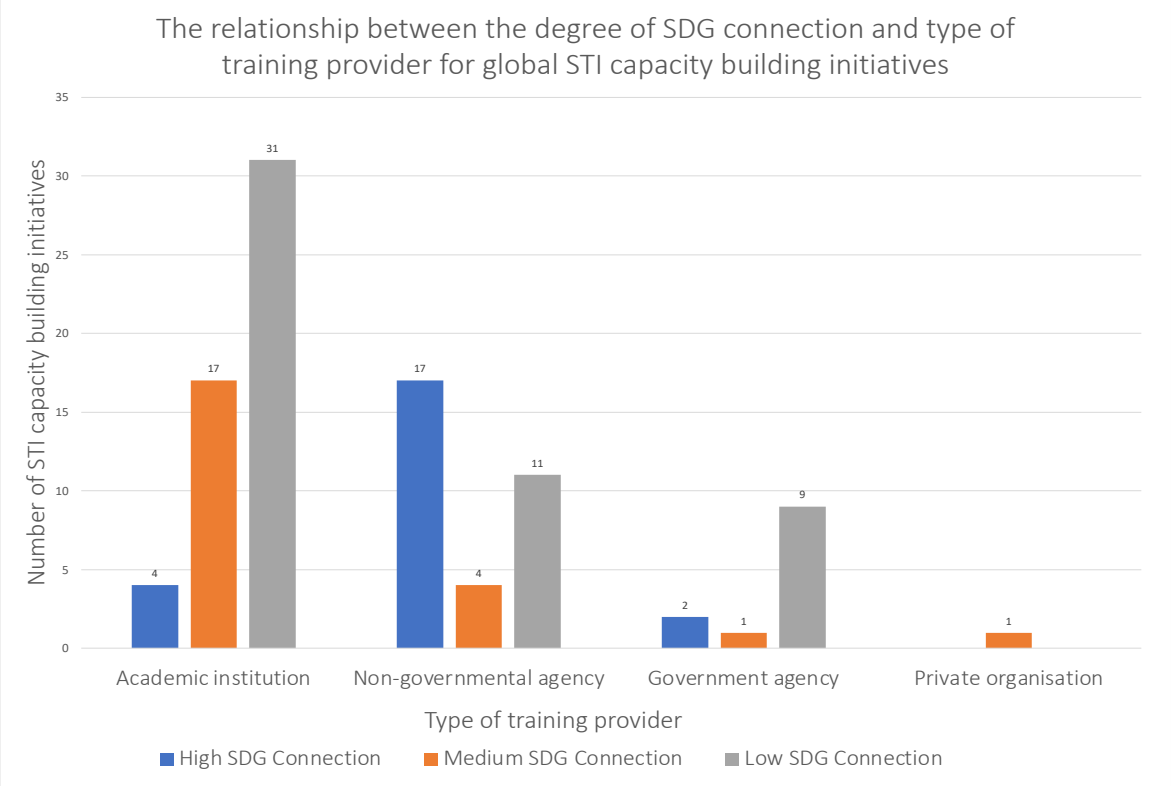
WHO IS INVOLVED IN GLOBAL STI CAPACITY BUILDING INITIATIVES?

The majority of STI capacity building initiatives were delivered by academic institutions and accounted for 53% of the total programmes. This illustrates that these institutions are a key convener in the field, however, the majority of their influence is likely to be a result of the high proportion of degree courses in the dataset (27%). When degree programmes are excluded, 28% of the initiatives (short courses) can be attributed to academic institutions, showing that although they are significant stakeholders in the field, much of their capacities are focused on formal higher education. Non-governmental and governmental agencies composed of 33% and 12% of the total initiatives respectively, whilst only one training programme was led by a private organisation. This indicates that there is very little interest in

the private sector for STI policy capacity building. One of the foremost barriers in enlisting the private sector as an SDG actor is the competing priorities between business goals, which are short-term and focused on profit, and the longer-term social, economic and environmental goals of the SDGs (Scheyvens, Banks and Hughes, 2016), which can explain the scarcity of private sector initiatives.

Interestingly, when evaluating the relationship between the type of training providers and the strength of association to the SDGs, non-governmental agencies deliver the highest proportion of initiatives with a high SDG connection, whereas academic institutions and government agencies predominantly create programmes with a low SDG connection (Figure 4). A 'high SDG connection' indicates that the training is highly relevant to the SDGs and is an explicit connection made in the course title or description. Whereas a 'medium SDG connection' suggests that sustainability may be a significant focus of the initiative, although there is no explicit connection made to the SDGs. Contrastingly, a 'low SDG connection' shows that there is little to no mention of sustainability in the course. The main distinction between a 'high' and 'medium' SDG connection is that an with a high SDG connection would be explicit in its association with the SDGs, for example the UN-IATT WS6, although a programme with a medium SDG connection, would not have a clear relationship. This implies that whilst academic institutions are major stakeholders in the field, non-governmental agencies, such as UN agencies and the World Bank have the greatest role in STI capacity building specifically catered towards the SDGs. It is also suggested that academic institutions, government agencies and private organisations do not align their STI initiatives to the SDGs. Consequently, greater efforts to engage these organisations in SDG-specific activities should be made. Increased collaborative endeavours between public and private organisations could reap many benefits for capacity building initiatives and potentially expand interest in integrating the SDGs in such programmes. This is emphasised in the literature, as there have been calls for greater importance to be placed on interlinkages across societal actors, including civil society, in order to allow progression towards the SDGs (Bowen *et al.*, 2017; Stafford-Smith *et al.*, 2017; Zhou and Etzkowitz, 2021). A failure to integrate all actors within society may cause unrealised synergies, although further work must be done to address possible power imbalances and cross-sectoral boundaries.

Figure 4: Graph showing the relationship between the strength of SDG connection and the type of training provider in global STI capacity building initiatives. *A 'high SDG connection' indicates that the training is highly relevant to the SDGs and is an explicit connection made in the course title or description. A 'medium SDG connection' suggests that sustainability may be a significant focus of the initiative, although there is no explicit connection made to the SDGs. A 'low SDG connection' shows that there is little to no mention of sustainability in the course.*



When looking at the target audiences of STI capacity building initiatives, 58% of the total number of programmes were aimed towards professionals, 30% were for students and only 10% were for general use. The different SDG connections are generally evenly distributed across thr various target audiences. This emphasises that barriers to entry for these initiatives are relatively high, and there is a gap for more openly accessible programmes and resources to enable capacity building for a wider audience, who are not necessarily professionals or postgraduate students. The global shift towards digital transformation, particularly in education (Koohang and Harman, 2007; Mok and Leung, 2012; Tømte *et al.*, 2019; Rönkkö and Herneoja, 2021) has increased the potential for online platforms to openly host capacity building initiatives and enable accessible education for all, for example through MOOCs. However, as shown by these findings, the uptake of MOOCs for STI for SDGs capacity building has been limited. MOOCs have been particularly under-utilised by UN agencies and most international organisations (Lambert and Hassan, 2018). This is potentially due to factors such as language barriers; limited investment; human resource requirements; high upfront costs, and delayed interest (Lambert and Hassan, 2018). Therefore, efforts to mobilise MOOCs must address these limitations. Nonetheless, there have been advancements within the UN-IATT WS6 to produce an STI for SDGs MOOC in collaboration with the EU JRC, which is highly welcomed considering the current scarcity of openly accessible initiatives in this field.

WHERE DO THESE INITIATIVES TAKE PLACE?

STI capacity building initiatives have global prominence, however, a high proportion is concentrated in the USA and UK (Figure 5). Yet, when only accounting for initiatives with a high connection to the SDGs, the number of countries providing such programmes is more limited, although there is still a higher concentration in the USA and western Europe (Figure 6). This concentration exists even when degree courses are excluded from the dataset.

Figure 5: A heat map displaying the geographical distribution of where global STI capacity building initiatives are being produced.

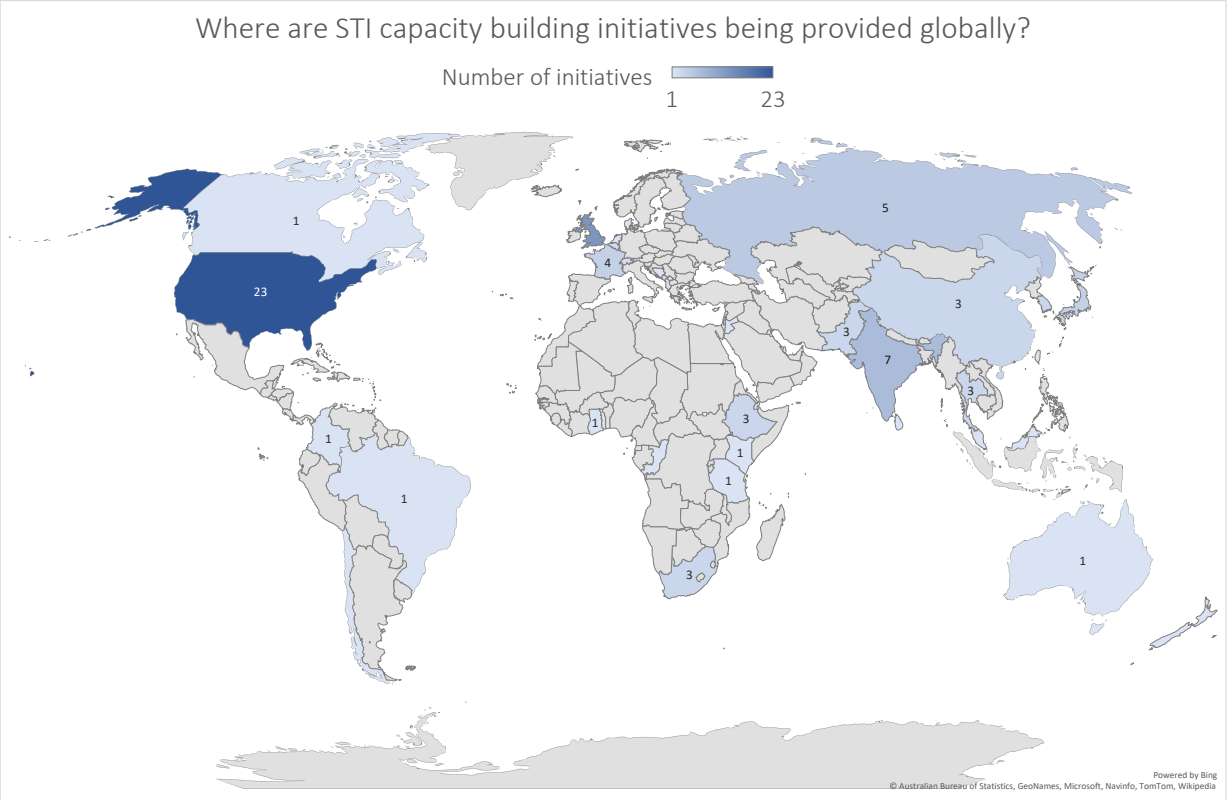
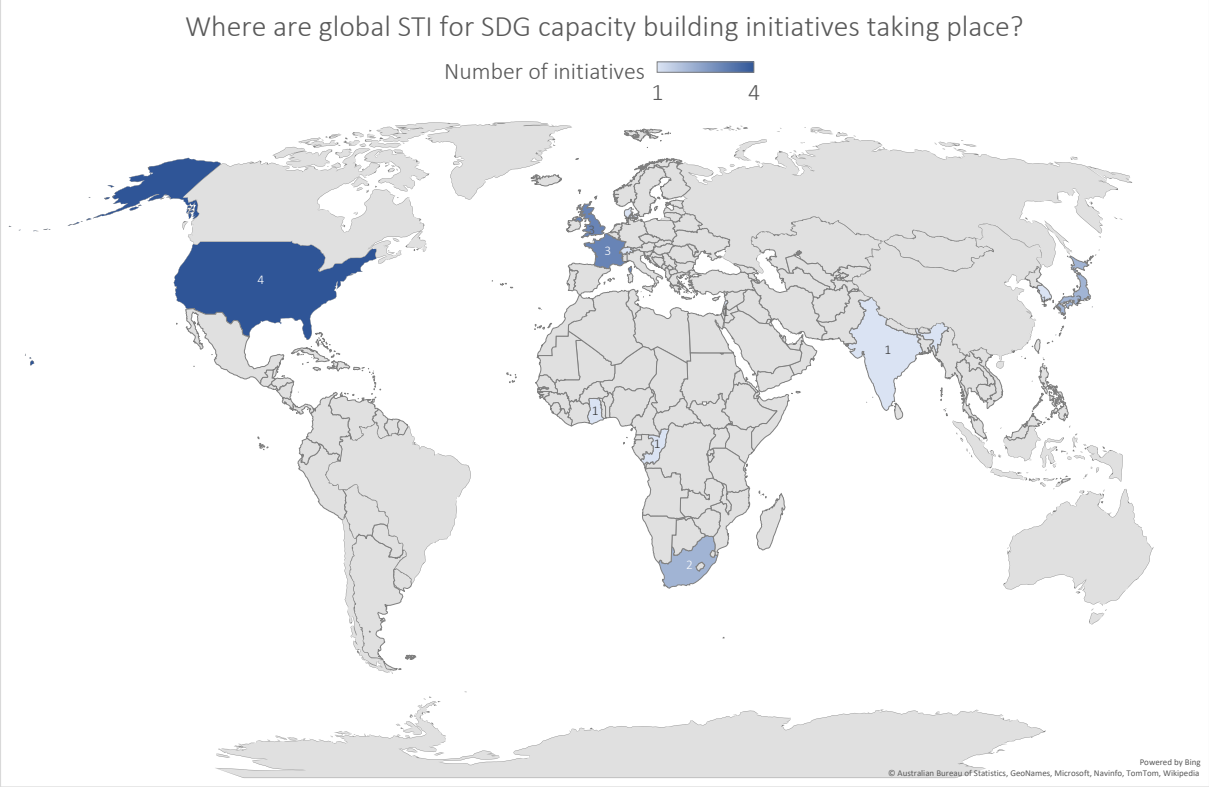


Figure 6: A heat map depicting the geographical distribution of where global STI capacity building initiatives with a high connection with the SDGs. *This suggests that the initiatives are highly relevant to the SDGs and have an explicit connection made in their course titles or descriptions.*



In contrast, the countries targeted by these initiatives, i.e., the target audience locations, are very broad; most programmes do not specify specific countries and/or regions to cater towards. This could be an issue as course content may be highly influenced and biased by Western perspectives, without enough regard for local contexts. While further research is required to assess whether this is true, this finding is echoed in academic literature; one paper found that there has been policy failure at the macro-international level due to developed and developing countries disagreeing on who should take on the majority of responsibility in global challenges like climate change (Lee and van de Meene, 2012). Another study was concerned with which goals are foregrounded and which ones are de-emphasised and the politics that drive those decisions, especially between developing and developed countries (Wanzenböck *et al.*, 2020). Differences in context can mean variations in development capacities, which can impact the implementation of policies to further the SDG agenda, particularly in terms of STI capacity. Government policies must acknowledge and reconcile these differences to ensure that North-South knowledge sharing is successful. However, it has been argued that there is a significant paucity of information within STI knowledge systems that address contextual differences to assist transference between nations (Walsh, Murphy and Horan, 2020). This is especially a point of consideration when developing and delivering capacity building initiatives to different public administrations and jurisdictions. Ultimately, the impact of STI on SDG implementation is currently very context-specific (Managi, Lindner and Stevens, 2021). Without significant means of implementation at a global level, the SDGs are dependent on the STI contexts of lower-income countries which may be ineffective and inefficient. For future development, inter-regional collaboration could further North-South and South-South cooperation and empower developing countries with the capacity to carry out such initiatives. Collaboration should happen across societal actors, like government, non-government and private

actors, as well as across sectors like agriculture, energy, and technology (Stafford-Smith *et al.*, 2017). Furthermore, the SDGs are a highly complex network of goals that require close attention to contextual priorities (Nilsson, Griggs and Visbeck, 2016; Stafford-Smith *et al.*, 2017). Thus, individuals and organisations would benefit from initiatives that are more closely tailored to their country-specific and regional needs. Nevertheless, a lack of resources in these contexts is a limiting factor, hence the feasibility of this is uncertain.

3.4. TAKEAWAY MESSAGES

Overall, the mapping activity illustrates the critical influence of short-term professional training courses and workshops delivered by academic institutions and non-governmental agencies. However, barriers to entry are considerably high, as a result of the significant deficiency in the number of openly accessible initiatives and the under-utilisation of digital platforms to deliver these. The analysis also shows that there is a greater need to deliver STI capacity building initiatives that are specific to the SDGs, whilst ensuring that content is closely tailored to local contexts. An increased number of collaborative efforts between public and private organisations in different contexts, particularly within developing countries, could meaningfully make a difference to the STI for SDG capacity building space. Nonetheless, substantial advancements have been made in the field since the inception of the SDGs, for example by the UN-IATT WS6 who deliver workshops to policymakers. In Part B, the value of STI capacity building initiatives for the SDGs will be explored through the lens of the UN-IATT.

4. PART B: EXPLORING THE TRANSFORMATIVE VALUE OF STI CAPACITY BUILDING

4.1. CONTEXT: CAPACITY BUILDING AS A MEANS OF IMPLEMENTATION

While Part A of the report focused on the landscape of capacity building initiatives, this part of the report explores the value of capacity building in the context of STI policy for the SDGs. Capacity building is one of seven interdependent focus areas that form part of the 'Means of Implementation' (MoI) targets listed in SDG 17. Other areas include Finance, Technology, Trade, Policy and Institutional Coherence, Multi-Stakeholder Partnerships and Data, Monitoring and Accountability (United Nations, 2015b). However, all seven MoIs must work together to facilitate knowledge transfer across nations to meaningfully facilitate SDG implementation worldwide (Walsh, Murphy and Horan, 2020). Thus, SDG implementation is complex, requiring the cooperation of multiple components and actors. The UN-IATT is a component of the TFM that attempts to facilitate implementation. It is comprised of 10 workstreams that aim to bring together multiple UN agencies to collaborate on STI policy programmes and enable knowledge transfer. However, Surana, Singh and Sagar (2020) suggested that greater integration between workstreams would reap greater benefits, for example between STI for SDG roadmaps (Workstream 9) and capacity building (Workstream 6).

Policy capacity is of high importance in addressing public problems. According to Wu, Ramesh and Howlett (2015), "policy capacity is a function of three sets of skills and competences (political, operational, and analytical) and three levels of resources and capabilities (systemic, organizational, and individual), generating nine different components of policy capacity". The separation of three levels of capabilities shares the same idea with a paper by OECD (2008), which declares that capacity development is not limited to improving the knowledge and skills of individuals, but essentially depends on the quality of the organisations where they work and the enabling environment of those organisations. In other words, political leadership and the dominant political and governance system are key to creating opportunities and setting boundaries for capacity building efforts (OECD, 2008). Additionally, the definition of policy capacity by Wu, Ramesh and Howlett (2015) recognises that not only the government, but also a diverse range of organisations, including political parties, non-governmental organisations and the private sector are involved in policy processes.

Through secondary data analysis, as well as primary data collection and analysis, Part B will present an overview of the value and the transforming capabilities of capacity building through the lens of WS6 initiatives to direct policy towards the SDGs.

4.2. OUR APPROACH: MECHANISMS FOR UNDERSTANDING VALUE

DATA COLLECTION AND METHODS

The preliminary stage of data collection and organisation was intended to gather insights on the capacity building initiatives in STI for SDGs facilitated by the UN-IATT and to contextualise it within the wider policy space. For this purpose, two methods were employed:

1. survey analysis, and

2. semi-structured interviews.

The use of multiple methods allowed methodological triangulation (Salkind, 2010), to compare the resulting data and determine the extent to which the findings are consistent between the techniques and increase the credibility of the research.

SURVEY ANALYSIS

Secondary data analysis was conducted on pre-existing survey data collected by WS6 and provided by UNESCO. The survey data is comprised of the feedback from participants of the 2020 and 2021 online UN-IATT capacity building workshops. This includes in-session feedback collected through an interactive presentation software called Mentimeter, in addition to an exit survey via the Google Forms tool.

The purpose of the survey analysis was to understand user insights, perceptions and needs, as well as to further comprehend the current situation of the UN-IATT's capacity building initiatives. Moreover, as the first attempt of delivering the training workshop online amid the COVID-19 pandemic, the data provided some valuable findings regarding this shift of the course delivery.

The analysis of the survey results is presented in Section 5.1.

Table **1***: Survey analysis summary*

Survey type	Participant number	Purpose
In-session Mentimeter feedback	25	• Use pre-existing feedback from the UN-IATT 2020 online capacity building workshop to assess user insights, perceptions and needs. • Explore the workshop's shift to a digitalised platform and make preliminary observations about the performance of the course.
Google Forms exit survey	30	

Note*: The number of responses from the LAC training workshops are not available, so the participant number is only the number of participants who attended the first online training workshop.*

INTERVIEWS

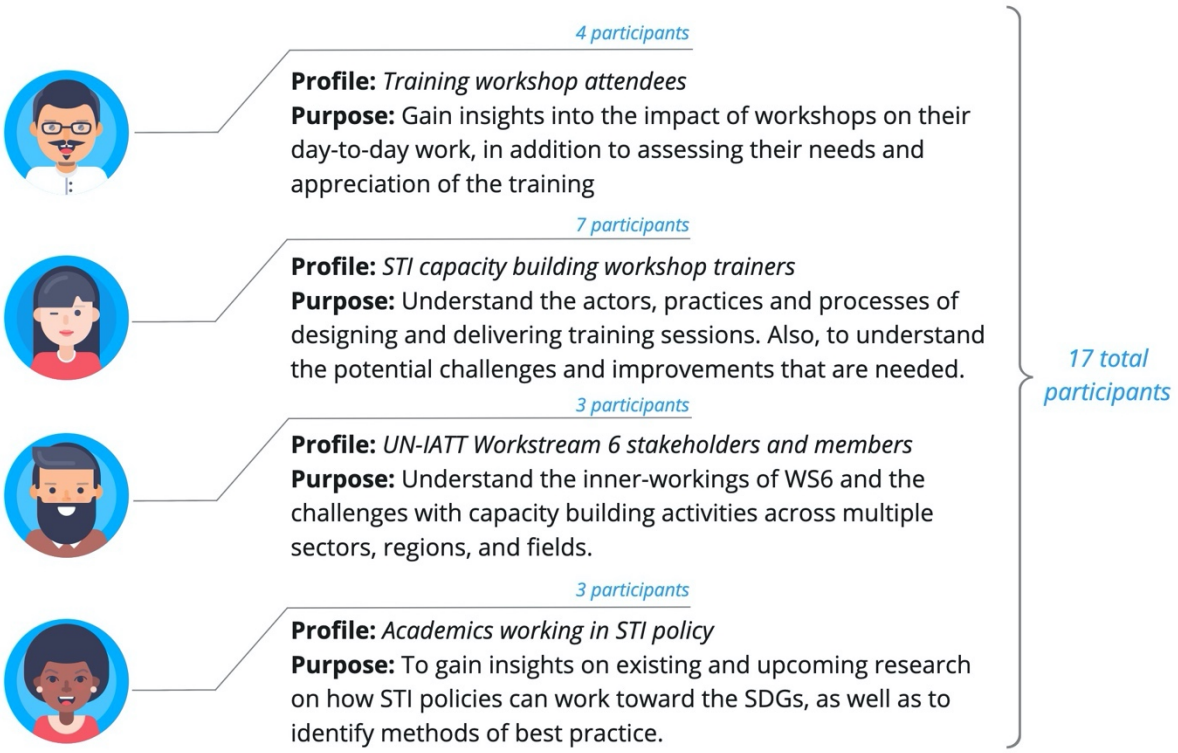
Semi-structured interviews were conducted to collect information first-hand from individuals to leverage their experience and expertise. Interviews were organised into the following four participant categories: 1) workshop attendees who participated in WS6 capacity building workshops; 2) workshop trainers who conducted training and are also part of the UN-IATT member organisations; 3) UN-IATT stakeholders who are not trainers, but are involved in the creation of the workshops; and, 4) academics doing research in the field (see Figure 3). The first three participant categories were chosen because of their proximity to WS6 activities, whilst academics were selected to provide a broader contextual understanding of the value and capabilities and limitations in STI policy for SDG capacity building initiatives. This enabled further examination of the UN-IATT's current position, as well as a broader understanding of capacity building in STI for SDGs due to the diversified participant pool.

A standard interview guide was created (see Annex C) according to each participant category and was designed to be adaptable to ensure that the conversation was tailored to each participant, as well as to facilitate engagement and the emergence of new themes. Interviews were conducted and video

recorded on Microsoft Teams. Interviews were anonymised and coded based on their categories (see Annex G), and the detailed results are listed in Annex F.

The analysis of interview results is presented in Section 5.2.

Figure 7: Participant categories, including profile and purpose



UNDERSTANDING SYSTEM BEHAVIOUR

Findings from desktop research, surveys and interviews were anonymised and integrated into a singular matrix to enable qualitative content analysis (Bengtsson, 2016). This assisted with the identification of areas of consensus, contention, and uncertainty. Triangulation of the data and methods ensured greater credibility of the results and reduced potential biases inherent to specific sources. It also enabled a multi-dimensional analysis of the current situation with regards to STI for SDG capacity building both globally and within the UN-IATT.

To conceptualise the UN-IATT WS6's capacity building workshops, a process of Outcome Harvesting (Wilson-Grau, 2018) was developed to iteratively analyse intended and unintended outcomes and to understand how the intervention contributed to these changes. Outcome Harvesting was used as a monitoring and evaluation method as a Theory of Change for the WS6 initiative was absent.

Consequently, as an initial stage of the harvest, a Theory of Change was developed (Mayne, 2017), which evolved over the course of the project based on the emergence of new data. The purpose of creating a Theory of Change was to understand how capacity building is intended to operate in practice; make underlying assumptions about the initiative explicit, and assess wider contextual factors. This involved mapping the UN-IATT's current inputs, outputs, outcomes and impacts, framed based on empirical evidence collected and triangulated from survey analysis and interviews. This enabled the proposal of causal links, based on the available evidence which was reviewed and refined over the

course of the harvest, the result of which can be seen in the analysis and discussion section of this report (see Section 5.3).

The final method used was Backcasting (Robinson, 1990) to understand how a desirable future situation could be produced. This ensured that the research did not become constrained by the extrapolation of the current situation into the future, as is common with forecasting. By Backcasting from the ultimate goal from the Theory of Change whilst considering the initial inputs, intermediate outputs and outcomes were identified. These were necessary to realise how WS6 can shift from their current situation to the desired future. This consequently helped to inform a set of recommendations that could be presented to UNESCO (see Section 6).

5. RESULTS AND KEY FINDINGS

The following results make use of two sources of information: 1) secondary data in the form of surveys, and 2) primary data in the form of semi-structured interviews. Together with Part A, this section is intended to provide an overview of the overall value of capacity building training and how the knowledge transfer from WS6 trainings are being utilised by workshop participants. The information from the two sources of data are then analysed and used to inform recommendations (see Section 6)

5.1. SECONDARY DATA SURVEY: UN-IATT PARTICIPANT FEEDBACK

This project collected survey data from three IATT WS6 online training workshops on "STI policy and policy instruments for SDGs" (UN-IATT, 2020). The survey data was collected by WS6 and provided by UNESCO. The data comprises of responses from Google form questionnaires after the three workshops and Mentimeter surveys during the sessions.

The first online training workshop was held in 2020 and was in English. The objective of the training workshop was to improve understanding of the key aspects of STI policies and instruments, such as approaches in STI policymaking for the SDGs, as well as country examples of STI alignment to the SDGs and policy implementation. The workshop is composed of three sessions, which were held based on three core elements: 1) "Current approaches to STI Policymaking in the context of SDGs"; 2) "STI Policy instruments: Design and implementation"; and, 3) "Innovation and entrepreneurship" (UN-IATT, 2020). 25 Google form questionnaire responses and 30 Mentimeter survey responses were collected by the UN-IATT WS6 from the six regions.

The last two online training workshops were held in April and May 2021. These two workshops were aimed towards Latin American and Caribbean (LAC) regions and were delivered in Spanish. The workshop in April was aimed at national institutions working on STI policies, and the workshop in May was aimed at subnational and regional policymakers.

QUALITY OF THE TRAINING SESSIONS

Unfortunately, feedback regarding the quality of the sessions was only collected for the first online training workshop; feedback on the LAC training workshops is not available because of the limitation of secondary data.

In terms of the quality of the first online training workshop, 96% of the 25 respondents from Google form questionnaire expressed that the sessions met their expectations, and only one participant expressed the expectation was not met. 80% of the 25 respondents rated the sessions are very useful for their work, and only one respondent rated the sessions as not useful.

RECOMMENDED TOPICS AND APPLICABLE KNOWLEDGE

The feedback about recommended topics was collected from the three workshops, but unfortunately the feedback about applicable knowledge is only available from the first workshop.

This section focuses on the topics that UN-IATT workshop participants recommended to be included in future workshops, as well as the knowledge they believe they gained from the workshops and plan to use in their work. Since the participants recommended a diverse range of topics for future workshops, a table is used to list the topics. The details of the results are shown in Table 2.

Table 2: Recommended topics and applicable knowledge from secondary data surveys. *This table outlines the recommended topics by UN-IATT online training workshops participants and the knowledge they plan to use in their work. Applicable knowledge is summarised from responses to the question, "How do you plan to use in your work the knowledge gained in the sessions?" in the original surveys. Recommended topics are summarised from responses to the question, "What topic would you recommend for future sessions?" in the Google and Mentimeter surveys. The topics are categorised into summative themes. It is worth noting that two cells are empty as there were no comments on 'education' and 'experience sharing' when the participants were asked how they would plan to use the knowledge in their work.*

Themes	Applicable knowledge indicated by workshop participants	Recommended topics by IATT workshop participants
Education		• Role of higher education institutions • Goal 4 (quality education) • Transformation of learning environments
Multi-stakeholder governance	• Raise the importance of having STI policy in place to all relevant stakeholders	• Engaging with the private sector and non-governmental organisations for policy development • Alignment and collaboration with the private sector • Effective connectivity between national science and technology system • Human capital formation • Formation of Latin American networks • International cooperation in innovation • Private-public partnerships for innovation • Building cooperation between the real economy and conservative scientific institutions; reforming scientific institutions as a challenge to the needs of the time

Entrepreneurship	• Disseminate the information to the national committee working on the development of STEM and on start-ups	• Science and technology-based social entrepreneurship • Policies to promote innovative entrepreneurship • Policies for start-ups in provinces/regions • Fundraising mechanisms for STI related activities • Intellectual property issues • Engaging with the private sector and non-governmental organisations for policy development • Alignment and collaboration with the private sector
R&D, technology and innovation	• Technological development and innovation, creating synergies between companies and universities	• Research, development and innovation for sustainable development • Open science • Open innovation, bridges between science and technological development/innovation • Technology development • Technology transfer and facilities • Technology foresight • Technology readiness levels • Linking science and innovation with productive scaling up
The implementation of the SDGs	• Offer inputs and review in policy development for SDGs • Conduct case studies on STI and SDGs and analyse various dimensions • Update STI policy and align it to the SDGs • Take the SDGs into account in the next stage of writing STI policies and choosing development priorities	• Practical hands-on delivery on how to create policies for the SDGs • STI instruments for the SDGs • Guidance on STI policy implementation for SDGs

Monitoring and evaluation	• Inform the review of the currently ongoing national STI policy • Design effective and useful public policies for the country • Implement our country STI policy that endorsement condition currently • Input to polices and their M&E	• A detailed session on the formulation of STI policy and instruments • Practical tools and approaches for policy creation • Resources for design of the STI policy and monitoring and evaluation • STI indicators • Monitoring and evaluation of STI policy and implementation • Research and development and monitoring evaluation • Design of impact assessment and creation of baselines • Management of prototyping projects • STI policies with a territorial emphasis
Sharing experiences		• Share the experience gained in the development of projects, their implementation progress and completion, including overcoming the difficulties and problems that have arisen (COVID-19 pandemic) • Various countries to share their experience in this regard
Others	• Knowledge sharing and learning to develop and design STI for SDGs roadmaps	• Forecasting and foresight • Roadmap • Local/territorial productive development • Prioritisation of investment in public administration • Mission-oriented policy formulation

5.2. INTERVIEW RESULTS

15 interviews were conducted with STI training workshop attendees, workshop trainers, academics working in STI policy, UN-IATT WS6 stakeholders and members. This included a total of 17 participants: four workshop attendees; seven workshop trainers; three UN-IATT WS6 stakeholders and members, and three academics. See Figure 7 for further details regarding these participant categories and Annex G for information about the anonymised participant codes referenced throughout the report.

The interviews provided suggestions and views from the different stakeholders on the effectiveness of the training. Participants reflected on the current state of STI capacity building implementation in various developing countries, and provided insights on the challenges, mechanisms, and inner-workings of the various UN agencies involved in UN-IATT WS6. The interviews also provided good directions for future development and improvement of STI capacity building initiatives.

However, it should be noted that there are inherent biases present in the results, as a result of a low response rate from workshop attendees. The majority of the participants interviewed were working with the UN-IATT, or associated with their activities. Thus, the responses are not equally representative of attendees and their views, although their perspectives have been highlighted in the results where appropriate.

THE VALUE OF UN-IATT WS6 INITIATIVES

UN-IATT stakeholders, trainers, trainees and academics were asked questions regarding the value of WS6 STI for SDG capacity building workshops. These values have been categorised into five themes: practical knowledge; a greater awareness of STI systems and SDG implementation; strengthening human capacities; peer-learning; and, the diversity of the UN-IATT.

Gaining practical knowledge

Across the four participant categories, a total of ten participants reported that they are an opportunity to gain practical knowledge. Four participants specifically mentioned the usefulness of the case studies used during trainings and how they increase the practicality of the workshops, as well as the understanding of best practices in different contexts. One trainee mentioned a greater awareness surrounding the processes needed to develop STI for SDGs roadmaps; an initiative under the UN-IATT's Workstream 9 (TWA1 interview, 2021). Two other trainees discussed the utility of the training in their work. However, one of these respondents claimed that the workshops were ineffective, due to difficulties in implementing policies in the workplace (TWA2 interview, 2021).

A greater awareness of STI systems and SDG implementation

Nine participants suggested that such initiatives can help to raise awareness of STI policy and how to align it to the SDGs; this included five trainers, one WS6 stakeholder and all three academics. Four respondents specifically signposted the importance of integrating the SDGs into national development strategies and how the training can also enable alignment in this respect. One participant suggested that this awareness is also about the realisation that "everyday life connects to larger and strategic goals" (WT4 interview, 2021) and another emphasised the importance of an "enabling environment" (WT2 interview, 2021) to facilitate STI for the SDGs. Another trainer also specifically referred to the

importance of acknowledging the systemic nature of STI policy, as well as directionality (WT5 interview, 2021).

Strengthening human capacities

Another value of STI for SDG capacity building is the development of human resources. Seven participants; three trainers, three WS6 stakeholders and an academic, specifically referenced the importance of strengthening human capacities. They all alluded to the idea that the development of capacities is the key to designing and implementing policies. One individual also suggested that trainees are willing to disseminate what they learned in WS6 workshops to their colleagues to further develop their capacities (WT5 interview, 2021). Another individual emphasised that helping countries build their own technical competencies drives development (OWS3 interview, 2021).

Peer-learning

The value of peer learning was also a significant value proposed by six participants, which included three trainers, two WS6 stakeholders and one trainee. They all explained that the diverse array of workshop attendees who come from different regions and contexts enable individuals to share their experiences and learn through others. Some of these participants suggested that this aspect is something that is unique to the WS6 and is, therefore, an important value (WT4 interview, 2021; WT5 interview, 2021).

Diversity of the UN-IATT

Many participants who were associated with the UN-IATT suggested that another value was the diversity of UN agencies that are involved in the workshops and the different perspectives that they can bring. This included four trainees and one WS6 stakeholder. A collaboration of this scale is rare in the UN system and each organisation can bring different insights in the workshops. Two participants also said that the UN is responsible for delivering and operationalising the SDGs (WT4 interview 2021; OWS3 interview, 2021), thus the collaborative efforts of agencies are imperative.

IMPACT OF COVID-19 AND DIGITALISATION

Although there was no specific question on COVID-19, all four categories of interviewees including UN-IATT members, trainers, trainees and academics mentioned the impact of COVID-19.

Because of COVID-19, the face-to-face training activities have been postponed, and online training workshops are delivered instead. Six participants (including three UN-IATT members, two trainers, and one trainee) expressed their concerns that online training was less interactive. One trainer and two UN-IATT members reported a lack of participant engagement, and one trainee and one UN-IATT member reported fewer opportunities for peer learning in online trainings.

The COVID-19 pandemic is a global issue, and the way countries dealt with the pandemic has exposed problems. One academic stated that the pandemic had shown fragility and a lack of resilience in the nations' systems (A3 interview, 2021). One trainer and one UN-IATT member suggested that future training sessions should address how STI could support building resilience of social, economic, and environmental systems (WT5 interview, 2021; OWS3 interview, 2021).

The digitalisation of STI has accelerated with COVID-19, and there has been greater adoption of digital tools and technologies, including machine learning, big data and Artificial intelligence (AI), in both the

public and private sectors (Paunov and Planes-Satorra, 2021). Four participants (including two trainers, one UN-IATT member, and one trainee) suggested digitalisation as one of the emerging issues that the future training workshops should address, with a special focus on how to prepare and manage digital transformation.

CHALLENGES FOR UN-IATT WS6

WS6 members and trainers were explicitly asked what they found most challenging about STI for SDG capacity building initiatives. The two challenges most frequently mentioned were; 1) a mismatch in the level of seniority of the participants attending, and 2) time constraints. A number of other challenges could also be identified, namely context, knowledge limitations of participants and a lack of resources. The full list of responses to challenges can be found in Annex F.

Participant seniority and knowledge gaps

One of the main challenges for the UN-IATT is the level of participants' seniority. Seven interviewees from the study referred to this as a major challenge. Two WS6 stakeholders emphasised that the different levels of STI expertise among workshop participants made it difficult to cater to the needs of each individual (OWS2 interview, 2021; OWS3 interview, 2021). Two trainers suggested that some of the participants were middle-level policymakers who did not have sufficient authority to formulate relevant policies, whilst lower-level policymakers who attended the training workshop were not able to immediately influence the decision-making process in their countries (WT2 interview, 2021; WT4 interview, 2021). Three interviewees indicated that the current challenge is the lack of participants' knowledge with many policymakers in attendance having no or little background in STI policy (WT1, interview, 2021; OWS2, interview, 2021). Two trainers raised the difficulty in discussing STI concepts when workshop participants have no basic knowledge of STI (WT6, interview, 2021; OWS2, interview, 2021).

Time constraints

Another major challenge is the time constraints of training workshops. Seven interviewees from the UN-IATT indicated that the time constraints were mainly related to the duration of the training workshops, these are particularly challenging with online workshops which run for one hour at a time. Furthermore, having online training means there is limited peer learning and insufficient time to address questions and have a rigorous discussion (OWS3 interview, 2021; OWS2 interview, 2021). One trainer explained that due to time limitations, it often means that only basic concepts of STI for the SDGs are being covered (WT5 interview, 2021). Furthermore, WS6 trainers often do not have much time to work on WS6 activities, especially when it is not a part of their core work priorities (WT5, interview, 2021).

Context

Five WS6 trainers and members emphasised contextual challenges due to the different levels of development of the participating countries. One trainer mentioned that because the contexts are so different in each country, the generic content is not always sufficient (WT6, interview, 2021). Another interviewee found it challenging to find a balance between general topics and the specific topics requested by the participants (OWS2 interview, 2021). Likewise, WT4 (2021) expressed that trainers should be sensitive to the level of development in different countries, “Latin American countries may

not find case studies in Africa useful and vice/versa" (WT4, interview, 2021). And WT1 (2021) expressed that development policy often fails when the mindset and perspectives of the policymakers are not taken into account.

Interactivity during workshops

Four interviewees indicated that the current challenge was the interactivity of the online training workshops. One trainer and one stakeholder of the UN-IATT suggested that online training workshops are less interactive and participants struggle to stay engaged (WT4 interview, 2021; OWS2 interview, 2021). One trainer and one stakeholder of the UN-IATT suggested that digitalisation of online training workshops poses logistical challenges and online training courses are difficult to maintain their interactivity and effectiveness compared to face-to-face training sessions (WT6 interview, 2021; OWS1 interview, 2021).

Resources

Three interviewees reported a lack of resources as a challenge, stating that the UN-IATT WS6 does not have dedicated resources, meaning trainers and members operate based on what their own agencies can provide (WT4 interview, 2021). Furthermore, mechanisms for UN agencies to share resources with other agencies do not exist, even if there is a surplus in one agency (WT5, interview, 2021).

LOOKING AHEAD: AREAS FOR IMPROVEMENT

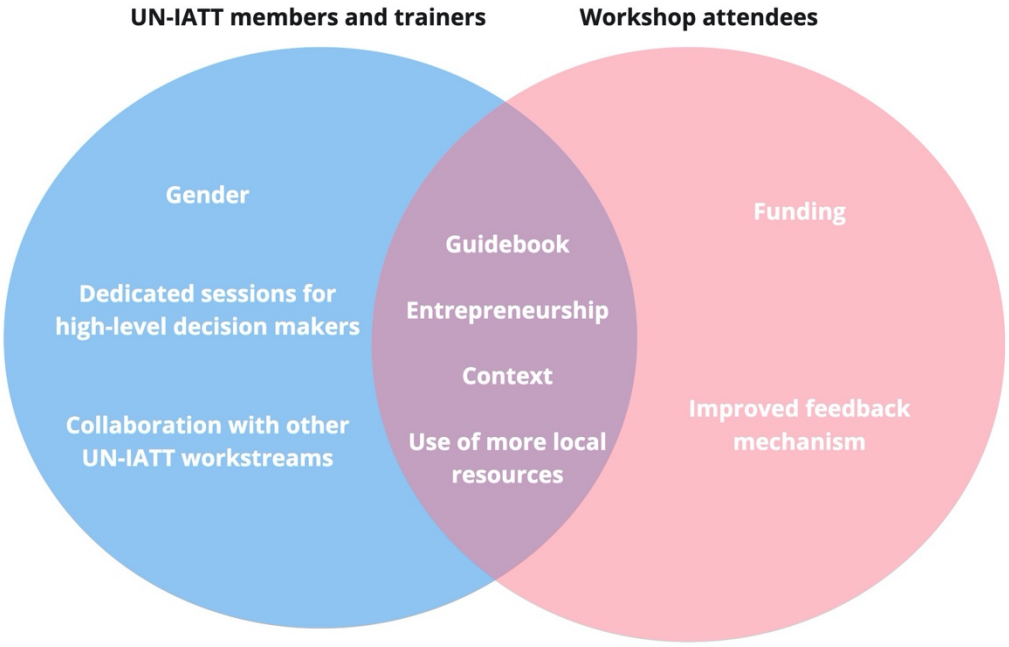
UN-IATT members, trainers, and trainees were asked what they thought should be improved in the workshops, and which topics should be included in future trainings. The importance of context was mentioned across the three participant groups. One interviewee from the UN-IATT group elaborated on the different types of emerging issues policymakers may have to contend with depending on their context. For example, in Europe, policies may have to take into account an ageing population, while in Africa there are issues of poverty and developing infrastructure (OWS3 interview, 2021). Similarly, workshop attendees asked for context-specific courses that are considerate of the particularities of each region and the level of development.

Both the UN-IATT members and trainers and workshop participants suggested the use of guidebooks to supplement the online or in-person workshops. One suggestion was that participants be given pre-workshop reading material to orient attendees ahead of the training. Another workshop participant advised that the use of a platform where training materials can be accessed and workshop participants can co-create knowledge, would be useful (TWA1 interview, 2021).

Two workshop participants requested that future workshops include content on funding and how to mobilize funding for STI activities. This was not raised by the UN-IATT member and trainer groups. Additionally, a workshop participant put forward the idea of using more local resources, like local researchers and universities to engage in the process (TWA1 interview, 2021), and this was echoed by one UN-IATT member (WT1 interview, 2021).

There are several suggestions to improve future trainings, such as including topics on gender and hosting regional and national workshops, and focusing on entrepreneurship and intellectual property, which both groups suggested. A Venn diagram summarising the key similarities and variances is included in Figure 8.

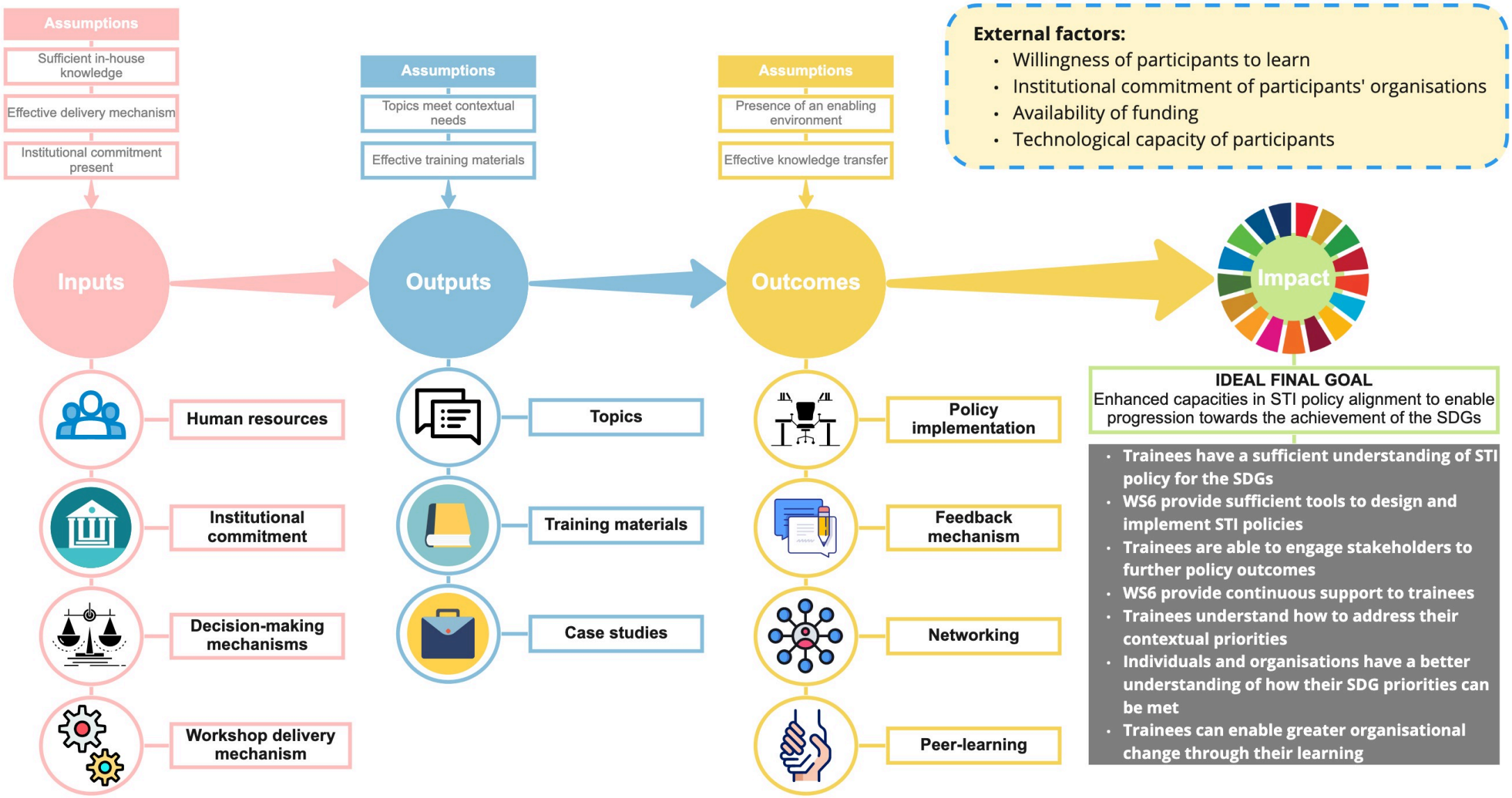
Figure *8: Interview results looking at suggested areas for future development in STI for SDG capacity building initiatives* *from the perspective of UN-IATT members and trainers and UN-IATT WS6 workshop participants. The UN-IATT members and trainers are combined into one category and workshop participants' answers are listed in another. An important caveat and limitation in the results are the number of UN-IATT members interviewed is much higher than the participants interviewed, and this could lead to a bias in favour of UN-IATT.*



5.3. ANALYSIS AND DISCUSSION

This section uses a Theory of Change model for analysis and discussion. The logic chain was developed based on the research evidence of the UN-IATT WS6's activities. The rationale was to analyse the UN-IATT's STI policy for SDGs training workshops through the process of design, delivery, and testing results, which are presented as inputs, outputs, outcomes, and impact (see Figure 9). Analysis through the four aspects of the training workshops will contribute to recommendations for further improving the UN-IATT's STI policy for SDGs training workshops.

Figure 9: *Summary of Theory of Change developed for the United Nations Interagency Task Team (UN-IATT) Workstream 6 (WS6) training workshops*



INPUTS: HUMAN RESOURCES & WORKSHOP MECHANISMS

The development of the Theory of Change typically begins with the consideration of proposed inputs, i.e., the resources committed and actions that will take place. This initiates a logic chain which follows the subsequent causal links between the outputs, outcomes and eventual impact (see Figure 9).

Assumptions:

1. There is sufficient in-house knowledge to adequately meet the needs of workshop participants.
2. The delivery mechanism of the workshop is suitable to achieve the needs of the programme.
3. There is institutional commitment from the UN-IATT, as well as participants' organisations and a will to enact change and apply the concepts from the course.

Current situation

The diversity of training experts from WS6 member organisations has largely received positive feedback from interview participants (WT2 interview, 2021; WT3 interview, 2021; WT5 interview, 2021). In fact, this collaboration between UN agencies, as well as the exposure and access to the knowledge on STI policy from within various UN agencies is recognised as a significant value of WS6 activities. However, the content of the workshops may not always be applicable to participants' local contexts (TWA1 interview 2021; TWA3 interview, 2021) and in some cases the workshop content may be too abstract for the policymakers who need more practical application (TWA1 interview, 2021). Furthermore, based on interviews results, there is no formal mechanism in place between WS6 member organisations whereby topics are selected, but rather there is a reliance on institutional knowledge and past experience (WT1 interview 2021; WT2 interview, 2021; WT4 interview, 2021, WT5 interview, 2021).

There are conflicting views on whether the workshops are more beneficial online or in-person. Whilst in-person workshops facilitate more networking opportunities and space for questions, online workshops are more accessible, allowing for more people to attend without having to travel (TWA3 interview, 2021; TWA1 interview, 2021; OWS1 interview, 2021). However, online workshops tend to be shorter, restricting the number of topics that can be covered and how in-depth a trainer can get into the topics (WT4 interview, 2021).

Due to the complexities of creating STI policies that align with the SDGs, it is difficult to infer meaning on governments' willingness to invoke change without looking at the multitude of factors that might be influencing how committed an institution is to the SDGs. Governments might not have the mechanisms in place to initiate change (WT4 interview, 2021). Furthermore, the workshop participants are not always at the level to make any kind of institutional change, and the number of policymakers being trained in STI policy is not enough to see change at a national level (WT4 interview, 2021). In addition, many policymakers in developing countries have conservative learning perspectives and backgrounds in business; this must be taken into account when advocating for policies that are geared towards the SDGs (WT1 interview, 2021).

Ideal scenario

In the ideal scenario, trainers would have a sufficient level of expertise to help participants with their individual needs and be attuned to the contextual needs of each region. Additionally, there would be a clear and organised mechanism to bring all the experts from different workstreams and UN agencies together to select topics and develop content based on regional or national contextual needs.

Furthermore, there would be sufficient communication with stakeholders, including governments of participating countries, for topic selection to satisfy the contextual needs. The value of engaging local institutions in capacity building initiaitives has been emphasised by several academic papers (Cuthill and Fien, 2005; Shiel *et al.*, 2016; Stafford-Smith *et al.*, 2017; Lepore, Hall and Tandon, 2021).

In terms of participants' seniority, the trainings would invite more high-level policymakers who have the power to implement policy when they go back to work. Moreover, to complement the current training workshops, there would be training sessions targeted at high-level policymakers to convince them to implement changes (WT2 interview, 2021).

OUTPUTS: WORKSHOP TOPICS

Assumptions:

1. The selected topics are sufficient for workshop attendees to address their contextual priorities.
2. Training materials are effective in supporting workshop attendees' learning.

Current situation

In terms of the topics, there is some agreement between the topics that participants suggested should be covered in the workshops and what WS6 are already covering in the workshops. For example, 'gender', 'entrepreneurship', 'monitoring and evaluation', and 'intellectual property' are covered by WS6 workshops and are also topics of interest for participants. There is literature supporting some of the suggestions, in particular, entrepreneurship and intellectual property are recognised as important factors in emerging economies with underdeveloped innovation systems (Lizuka and Hane, 2021), and monitoring and evaluation have been identified as a significant SDG research gap, with insufficiencies emanating from the unsuitability of metrics, indicators and assessment methodologies (Annan-Diab and Molinari, 2017; Brussel *et al.*, 2019; Del Río Castro, González Fernández and Uruburu Colsa, 2021).

Some of the themes interlink closely with each other, such as intellectual property, entrepreneurship and technology transfer and digitalisation. When looking at course topics globally, there is little consistency in naming conventions, or how topics are grouped together; while one workshop may have intellectual property as a sub-topic of entrepreneurship, another will have intellectual property as a standalone topic. Likewise, while one university may name a course 'analytic methods', another might use 'policy analysis' to describe the same type of course.

Furthermore, different stakeholders have varying opinions on which topics should be prioritised; while one trainer (WT3 interview, 2021) stated that intellectual property is the biggest driver of innovation and therefore must be utilised in order to achieve the SDGs, others (TWA3 interview, 2021; A1 interview, 2021) believe context should take priority. Contrastingly, workshop participants are more interested in the mechanics of policymaking, like policy design and implementation, rather than emerging issues like STI for SDGs (WT5, interview, 2021).

These linkages between topics and competing priorities could be a challenge when designing effective workshop content. For a full list of topics as suggested by interview participants, see Annex F.

In terms of the deliverables of the training sessions, WS6 mainly use PowerPoint slides in their presentations while workshop attendees have suggested the use of guidebooks to supplement the training (TWA1 interview, 2021).

Ideal scenario

In the ideal situation, the topics covered in the training sessions would be tailored to the participant countries' contextual needs, and be applicable in the participants' work. To be more specific, there would be surveys for the participants before the training workshops to articulate the regional or national needs to adjust the training content.

Additionally, the trainings would be complemented by case studies and real-world experience to assist the participants in having a deeper understanding of the topics and concepts delivered in the training sessions. The value of case studies is to help the participants develop practical wisdom and apply the knowledge in their daily work (Jarzabkowski and Whittington, 2008). Although WS6 has realised the importance of the case studies, as well as examples of real-world experience and has introduced case studies in the current training sessions (WT1 interview , 2021; WT4 interview, 2021; WT5 interview, 2021; WT6 interview, 2021), more contextualisation work is needed to satisfy participants' needs (TWA1 interview, 2021; TWA3 interview, 2021).

Furthermore, participants would have a sufficient amount of resources and materials to learn and engage with the content, so that they could have a more in-depth understanding and also revert back to the material at a later stage (TWA1 interview, 2021).

OUTCOMES: TRAINING OUTCOMES AND FEEDBACK MECHANISM

Assumptions:

1. There is an enabling environment to allow knowledge learned from the training to be transferred to the workplace.
2. If the participant's view is that the training is useful and practical, it means that the knowledge learned from the training could be practised in their daily work.

Current situation

In terms of the usefulness of the current trainings, the responses indicated in the surveys are quite positive. As mentioned in the survey data section, most of the respondents to the Google form questionnaire found the training useful for their work, and only one respondent rated the sessions as not useful.

The interviewed trainees' views towards the usefulness of the trainings are more mixed, although it should be noted that this is based on a limited sample of four trainees. Some mentioned that the knowledge learned from the training was useful to help in the process of STI for SDGs roadmap development and that the training provided opportunities for peer-learning, while some mentioned that the training was not effective and lacking in focus on policy implementation (TWA1 interview, 2021; TWA2 interview, 2021; TWA3 interview, 2021). One of the reasons why some participants rated the training not so useful could be that the training is not practical for low-level or middle-level policymakers to make policies, because they do not have enough power to make decisions (WT2 interview, 2021; WT4 interview, 2021; WT5 interview, 2021; OWS3 interview, 2021). Another reason is that the contexts in different countries are highly variable, so the regional training might not be very practical for the participating countries (WT2 interview, 2021; WT3 interview, 2021; WT4 interview, 2021; WT6 interview, 2021).

In terms of the feedback mechanism, surveys using Mentimeter and Google form questionnaires are the main ways in which feedback is collected. The training sessions currently use Mentimeter to get instant feedback during the training and Google form questionnaires to get more in-depth feedback after the training to further explore the training participants' needs (WT6 interview, 2021). However, besides the surveys, the training does not have an efficient feedback mechanism to follow up and evaluate how much the training is actually having an impact on the training participants after they complete the training (WT4 interview, 2021; TWA1 interview, 2021).

Ideal scenario

In the ideal scenario, the trainings would be correctly targeted at the corresponding levels of policymakers in the corresponding countries, so they could have a clear idea on how to implement the training into their day job in their countries. To be more specific, there would be different trainings targeting at different levels of participants' seniority, and also complement national trainings to satisfy the national needs to help the participants transfer the knowledge learned to their work (WT2 interview, 2021).

Additionally, there would be an efficient feedback mechanism in place. To be more specific, besides surveys to collect feedback during and shortly after the training, there would be channels for the trainers to get back to the trainees to follow up on how they implement the knowledge learned long after the training (TWA1 interview, 2021). The importance of the feedback mechanism is not only collecting feedback to adjust the training, but also creating opportunities for trainees to share materials and the resources to co-generate knowledge (TWA1 interview, 2021).

IMPACT: WHAT IS THE MAIN VALUE IN HAVING STI FOR SDGS TRAINING SESSIONS?

Current situation

Impact refers to the long-term results in the Theory of Change, and value is the long-term benefits of the training, so this section uses value as a proxy to analyse the long-term impact. Table 3 outlines the value of STI policy for SDGs trainings from different stakeholders' views. The content of the table is extracted and simplified from Annex F which details the interview results.

Trainers and workstream six members' views on the value of STI policy for SDGs trainings are positive. From the training providers' and organisers' points of view, the trainings play an important role in upskilling policymakers and raising their awareness on STI policy for SDGs by providing diversity of STI policy knowledge and expertise from different UN agencies and creating opportunities for peer learning (WT1 interview, 2021; WT2 interview, 2021; WT3 interview, 2021; WT4 interview, 2021; WT6, interview, 2021; OWS3 interview, 2021). Some also believed that STI policy for SDGs trainings would enhance the participants' capacities in stakeholder engagement and collaboration to further STI policy outcomes for the SDGs (WT2 interview, 2021; WT4 interview, 2021; OWS1 interview, 2021). Overall, the trainers and WS6 members believed that the trainings would support the participants in capacity building to enhance development in the participant countries (WT1 interview, 2021; WT5 interview, 2021; WT6 interview, 2021; OWS3 interview, 2021).

However, the training participants' views are not as positive as training providers' and organisers' feedback.

From the trainees' points of view, the value of STI policy for SDGs trainings is about enriching knowledge, sharing STI information, strengthening network, and raising initiatives for STI on capacity building, such as Gender Unit (TWA1 interview, 2021; TWA2 interview, 2021; TWA3 interview, 2021). However, one of the interviewed trainees mentioned that the lack of implementation in the trainings didn't successfully support them to fully realise the initiatives in the participant country (TWA2 interview, 2021).

From academics' points of view, they see STI as an important means for SDG achievement, and see STI policy for SDGs training as an approach to help policymakers align STI policy to SDGs (A1 interview, 2021; A2 interview, 2021; A3 interview, 2021). However, the STI policy for SDGs training workshops are not always sufficient. One academic (A2 interview, 2021) stated that STI policy for SDGs capacity building trainings are not sufficient in sub-Saharan Africa due to the lack of support from stakeholders including academic institutions.

Table 3: Comparison between different stakeholders' views on the value of STI for SDGs workshops *outlines the value of the trainings from different stakeholders' views. The content is extracted and simplified from Annex F.*

	Trainers & Workstream 6 members	Trainees	Academics
The value of STI for SDGs workshops	• Upskilling policymakers • Diversity of STI policy knowledge and expertise • Peer learning • Enhancing development • Further UN agenda • Raising awareness • Stakeholder engagement and collaboration	• Enriching knowledge • Sharing STI information • Strengthening network • Raising initiatives for STI on capacity building	• Using STI as a means for SDG achievement • Aligning STI policy to SDGs

Ideal scenario

In the ideal scenario, there would be improved capacity to align STI policies to SDGs. To be more specific, the participants would have a sufficient understanding of STI policymaking for SDGs and sufficient tools to design and implement STI policies, so that they could have a greater insight into how STI policy tools are implemented in their local contexts.

Additionally, the participants could communicate the teachings from the UN-IATT training back to their work to enable greater organisational learning and change. More importantly, the participants could engage with the right set of stakeholders in different sectors to further STI policy outcomes for the SDGs (Pattberg and Widerberg, 2016). Furthermore, the participants could reach out to the UN-IATT for continuous support and assistance when they face challenges in the future.

6. RECOMMENDATIONS AND CONCLUDING REMARKS

This project has gathered insights on the global landscape of STI capacity building, as well as its transformative value in aligning with the SDGs in the context of the UN-IATT WS6 activities. The mapping analysis detailed in Part A provided a broad perspective on the STI capacity building initiatives globally, as well as the gaps and opportunities that exist within the field. Part B narrowed in on the WS6's workshops to build a picture of its Theory of Change. By Backcasting from the ideal final goal in the Theory of Change presented in Section 5.3, the research evidence has been used to propose recommendations to the UN-IATT WS6 for areas of future development.

I. Create an enabling environment that is conducive to peer learning, networking and knowledge acquisition, whilst being sensitive to contextual needs.

Overall purpose: *Increase the long-term value that participants attain from attending UN-IATT workshops*

1.1 Create bespoke training materials that can be used as an accompaniment to workshops or as a standalone resource.

In addition to the workshop PowerPoint slides, additional resources which complement this could enrich the knowledge that participants can gain. A complimentary deliverable would also serve as a point for participants to refer back to beyond workshops, in order to revisit different concepts. Furthermore, the use of preparatory work would ensure that workshop cohorts reach a certain level of STI expertise in order to 'level the playing field' (OWS2 interview, 2021). It is also advisable to make additional deliverables openly accessible to potentially reach a wider audience, as the majority of workshop participants belong to organisations that already exist in the UN-IATT's professional network. Part A showed a significant gap for more openly accessible programmes and resources to enable capacity building for a wider audience, who are not necessarily professionals or postgraduate students. The global shift towards digital transformation, particularly in education (Koohang and Harman, 2007; Mok and Leung, 2012; Tømte *et al.*, 2019; Rönkkö and Herneoja, 2021) has increased the potential for online platforms to openly host capacity building initiatives and enable accessible education for all, for example through MOOCs. However, the uptake of MOOCs has been relatively slow for UN agencies and most international organisations (Lambert and Hassan, 2018). Therefore, the creation of a MOOC alongside the EU JRC is a welcomed initiative in this respect and could also act to facilitate workshops. Not only could this be used to complement workshops, but it could also be used as a wider UN-IATT initiative to widen capacity building.

1.2 Deliver optional, complimentary workshops that cater to contextual needs.

Whilst the current UN-IATT workshops provide a firm foundational understanding of STI policy for the SDGs, supplementary workshops that cater towards specific SDG priorities and/or sectors would be valuable to ensure that participants' contextual priorities are met. Context-specific courses would be able to accommodate the characteristics and particularities of each region, according to their levels of development (TWA3 interview, 2021). The broad scope of the current workshops, whilst valuable, do not always provide participants with practical support that can be easily implemented in their

organisations. Moreover, it has been found that a greater focus on local contexts and needs in capacity building is essential for SDG progression and implementable policies (Franco and Tracey, 2019; Siddiqi *et al.*, 2020). Therefore, the option of attending workshops that have a narrowed scope offers the opportunity to access content that is more useful for local contexts.

1.3 Provide greater opportunities for participants to network and learn from each other.

One area of the UN-IATT workshops that are of value to participants is the diversity of attendees which can enable peer learning and networking opportunities. This value has been reported to be a unique aspect of WS6 activities, given the sheer diversity of workshop attendees (WT4 interview 2021; WT5 interview, 2021). It has been well cited that when peer learning is managed effectively, it can strengthen capacity building efforts (Cole and Neumayer, 2004; Mncwabe, 2010; Boud, Cohen and Sampson, 2013). However, as a consequence of shifting WS6 workshops online, many interview respondents felt that the interactivity and engagement had significantly weakened, in comparison to in-person workshops. Consequently, in order to reap greater benefits from the diversity of workshop participants and their unique insights, more opportunities should be given to participants during and after sessions for interactions. For example, 'breakout groups' during workshops can be utilised to allow attendees to work together interactively on set activities, whilst providing a platform for individuals to get to know each other. Additionally, an openly accessible online learning platform for participants could be created to extend training materials and resources after the workshops are complete to facilitate reflection, knowledge sharing and encourage knowledge co-generation. Furthermore, participants and trainers can remain in contact through social media platforms, such as Slack and LinkedIn, to facilitate ongoing communication. This would not only facilitate professional networking, but would also be a good resource to assist further discussion surrounding STI policy alignment to the SDGs.

II. Construct a comprehensive feedback mechanism that takes participants' needs into account and measures long-term impact

Overall purpose: *Create a sustainable feedback mechanism for training adjustment*

2.1 Provide follow-up workshops to enable further learning.

Long after the training workshops, there should be follow-up workshops for UN-IATT WS6 trainers to reacquaint themselves with trainees, to understand how participants have implemented the knowledge learned from the sessions in their work (TWA1 interview, 2021). The follow-up workshops should provide opportunities for the trainees to share their experiences and reflect on how they have applied their knowledge. These sessions should also serve as a platform for participants to communicate the issues and challenges that may hinder the application of knowledge, and be an opportunity for them to ask for further suggestions and support. Trainers who coordinate follow-up workshops should be able to provide further advice or resources when trainees ask for support, and actively collect feedback to adjust the training in the future.

*2.*2 Distribution of a pre- and post-workshop survey to measure impact of capacity building.

There should be a pre-workshop survey before participants attend the training workshops to develop a comprehensive understanding of their regional or national needs, so that training content can be adjusted to participants' individual priorities. A long-term survey after the training workshop is also

suggested. The purpose of this is to evaluate the long-term impact of the training workshops and make adjustments to future training sessions. A set of recommended questions and corresponding purposes are shown in Table 4, however this is by no means an exhaustive list.

Table 4: Recommended questions in pre- and post-workshop surveys

	Questions	Purpose
Pre-workshop survey	How would you rate your current knowledge of STI policy?	Understand participants' level in STI knowledge
	Did you participate in the UN-IATT STI for SDGs training workshop before?	Understand participants' familiarities in UN-IATT's trainings
	What training content do you expect most?	Collect participants' interests in training content
	What do you hope to gain from the training workshop?	Collect participants' needs
Post-workshop survey	Have you implemented any changes in your day-to-day work?	Follow up long-term implementations of the knowledge delivered in trainings
	Have you been able to use the network of policymakers?	Follow up the impact of networking
	Was the value UN-IATT proposed achieved?	Follow up long-term impacts the trainings have

III. Formalise stakeholder engagement and collaboration mechanisms to improve the diversity of knowledge

***Overall purpose**: Improved mechanisms for collaboration and stakeholder engagement*

3.1 Increase collaboration between different UN-IATT workstreams.

The UN-IATT should formalise working structures to improve knowledge sharing between workstreams to create a dynamic where the different workstreams' activities closely interlink with each other, thereby creating a holistic learning environment. The workstreams have purposes that closely interlink with each other, for example, Workstream 8 on gender and STI has been raised as a suggested topic in WS6 activities, likewise, Workstream 9's work on action plans and roadmaps has been referred to participant feedback on implementation. The integration of gender and roadmaps in capacity building workshops has also been specifically referenced in interview responses (WT1 interview, 2021; TWA1 interview, 2021). Furthermore, it has been specifically emphasised that policymakers engaging with STI roadmaps for the SDGs should ensure that capacity building for STI supplements their efforts (Surana, Singh and Sagar, 2020). Consequently, WS6 workshops could significantly benefit from partnerships with other UN-IATT workstreams to enrich the knowledge that can be acquired.

3.2. Implement closer collaboration with non-western academic institutions

Based on Part A's findings, a greater proportion of STI for SDG capacity building initiatives are generated in Western countries. This, coupled with participants' requests in Part B for more consideration to be made on contextual needs, highlights the need to engage local organisations and academic institutions to deliver STI capacity building initiatives for their own contexts, particularly in developing countries. Furthermore, there is a body of literature that emphasises the value of engaging local and regional institutions in capacity building initiatives to achieve sustainability goals (Cuthill and Fien, 2005; Shiel *et al.*, 2016; Stafford-Smith *et al.*, 2017; Lepore, Hall and Tandon, 2021). Therefore, the integration of local organisations would be valuable in providing valuable insights into local needs and priorities, as well as increase the inclusivity and diversity of organisations coordinating global initiatives.

CONCLUDING REMARKS

This project has demonstrated the transformative value of STI for SDG capacity building initiatives. The mapping analysis exemplified a distinct lack of initiatives that specifically cater towards the SDGs, but showed the significant role of short-term professional workshops with academic institutions and non-governmental agencies as being major conveners in the field. The UN-IATT's workshops serve to fill a significant gap in the capacity building landscape, which cater towards the development of policymakers' capacities to align STI policy to the SDGs, particularly for developing countries. Exploration of these workshops revealed they are able to offer substantial value to participants, although the long-term impact is currently uncertain and increased efforts need to be made to mobilise a feedback mechanism to assess this. The digital transformation of the training workshops since the COVID-19 pandemic has catalysed major changes to the delivery and has increased the accessibility of the trainings, enabling a diversity of attendees to join. This has reaped substantial benefits, for example, increased opportunities for peer learning and an understanding of different contexts. However, the online format has weakened the engagement and interaction between participants and trainers, thus, the value of peer learning could be hindered. Increased efforts should be made to improve the interactivity of the online environment, to ensure that attendees benefit from networking and peer learning. Furthermore, the use of the online space should be utilised more to provide additional learning materials to accompany workshops, and even act as a standalone learning resource to increase the accessibility to capacity building. The creation of a MOOC in collaboration with WS6 and the EU JRC is, therefore, a welcomed initiative. Efforts for future development should be focused on ensuring that workshops are an enabling environment for learning and that country-specific needs are being met. Finally, whilst the majority of such initiatives are concentrated in the West, it is important that different contextual priorities are being met. Collaboration between different societal actors, including academic institutions, private organisations and civil society in local regions would add to the richness of capacity building, ensuring that contextual priorities are addressed.

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8. ANNEX

ANNEX A: GLOSSARY OF TERMS

Terms	Meaning
CB	Capacity Building
CSV	Comma Separated Values
EU JRC	European Union Joint Research Centre
GGPlot	is an open-source data visualization package for the statistical programming language R
Github	Internet Hosting for Software Development and version control.
HTML	HyperText Markup Language
IATT	Inter-Agency Task Team
IP	Intellectual Property
ITU	International Telecommunication Union
KnitR	is an engine for dynamic report generation with R.
LAC	Latin America and Caribbean
M&E	Monitoring and Evaluation
MoI	Means of Implementation
MOOC	Massive Open Online Courses
NGO	Non-Government Organizations
OECD	Organisation for Economic Co-operation and Development
PPP	Public Private Partnership
R	a language and environment for statistical computing and graphics.
R&D	Research and Development
RSTI policy	Research, Science, Technology and Innovation policy
SADC	Southern African Development Community
SDG	Social Development Goal
STEM	Science Technology Engineering and Mathematics
STI	Science Technology Innovation
STIP	Science Technology Innovation Policy
TFM	Technology Transfer Mechanism
UN	United Nations
UN-IATT	United Nations Interagency Task Team
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
URL	Uniform Resource Locator
WS6	Work Stream 6

ANNEX B: POLICY BRIEF

The following policy brief is an additional deliverable that was requested by UNESCO to accompany this report. The policy brief summarises some of the key findings covered in the report, with a specific emphasis on the future directions of the UN-IATT WS6 capacity building programme.

Assessing STI capacity building as a means of implementation for the SDGs

Summary

This policy brief presents research evidence for the transformative value of STI capacity building for the SDGs, exemplified by analysis of global initiatives and the UN Inter-agency Task Team (UN-IATT) conducted by University College London (UCL), with support from UNESCO. In order to further the UN-IATT's Workstream 6 (WS6), it is recommended that a bottom-up, collaborative approach to capacity building is implemented, in order to diversify workshop content and integrate more local knowledge. It is also recommended that this diversification extends to training mechanisms, with more accessible materials to lower barriers to entry, for example the use of guidebooks and Massive Open Online Courses (MOOCs). Finally, a more elaborate feedback mechanism should be employed to improve the way in which the impact of WS6's initiatives is measured.

1. Background

In 2015, the United Nations set up the 2030 Agenda for Sustainable Development to achieve a more sustainable future. 17 Sustainable Development Goals (SDGs) were proposed in the 2030 Agenda to achieve the balance between economic, social and environmental development (United Nations, 2015b). Science, Technology and Innovation (STI) are identified as an important component for achieving the SDGs by 2030 (United Nations, 2015a). The Technology Facilitation Mechanism (TFM) was launched to support the implementation of the SDGs, and the UN Interagency Task Team (IATT) on STI for SDGs is one of its mechanisms to actualise TFM (United Nations, 2021a).

The UN-IATT's Workstream 6 (WS6) focused on STI capacity building (CB) and began to deliver training sessions on STI policy for SDGs in 2017, especially for developing economics (United Nations, 2021b). WS6 aims to improve the capacity of policymakers, public sector experts and other key STI stakeholders by informing them of the approaches of STI policymaking and policy implementation, and to enhance their ability to integrate STI into their strategies to achieve the SDGs (UN-IATT, 2021).

In 2018 and 2019, two regional training sessions for the Arab States and Latin American Countries (LAC) were organised in cooperation with the UN regional economic and social commissions (United Nations, 2021a). However, due to COVID-19, the training activities in presence had to be postponed, and online training workshops were delivered in 2020 and 2021. Additionally, WS6 is collaborating with EU-JRC to prepare a Massive Open Online Course (MOOC) on STI for SDGs, which is currently at the design stage (UN-IATT, 2021).

This policy brief is a collaborative effort between UCL STEaPP research team and UNESCO to advance the work of UN-IATT on STI for SDGs capacity building, with a special focus on the training workshops.

This policy brief aims to provide key insights into STI for SDGs capacity building and recommendations for its future development by mapping global initiatives and exploring their transformative value in the context of the UN-IATT.

2. The approach and methods

This policy brief summarises the findings of a 9-month research project which assessed the current landscape of STI for SDGs capacity building initiatives and the opportunities for future development in the UN-IATT WS6 workshops. In order to map the present global situation of STI capacity building and identify gaps, desktop research was used to collect data on relevant initiatives. The research mapped where global initiatives are taking place, who is involved in them, how they are being delivered and their topics. The transformative value of the UN-IATT WS6 was then explored through the use of semi-structured interviews with academics, workshop participants, trainers and other WS6 stakeholders, as well as additional survey analysis from workshop participants.

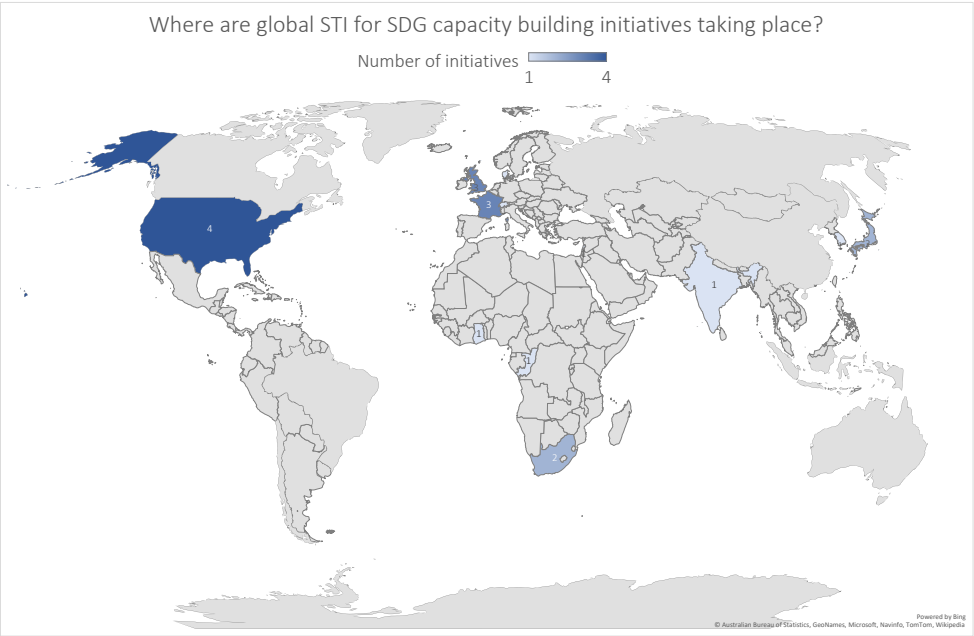
3. Key findings

CONTEXT

STI for SDG initiatives are heavily concentrated in the West

Firstly, STI for SDG initiatives are heavily concentrated in the West. Very few programmes made explicit connections to the SDGs; only 23% had a strong connection, whilst 53% had a weak association. This means that currently, the vast majority of global STI capacity building initiatives do not refer to the SDGs. Although STI capacity building occurs globally, initiatives are more focused in the USA and western Europe. This concentration is even more prominent for initiatives that have a focus on the SDGs (see Figure 1).

Figure 1: A heat map depicting the geographical distribution of where global STI capacity building initiatives with a high connection with the SDGs. *This suggests that the initiatives are highly relevant to the SDGs and have an explicit connection made in their course titles or descriptions.*



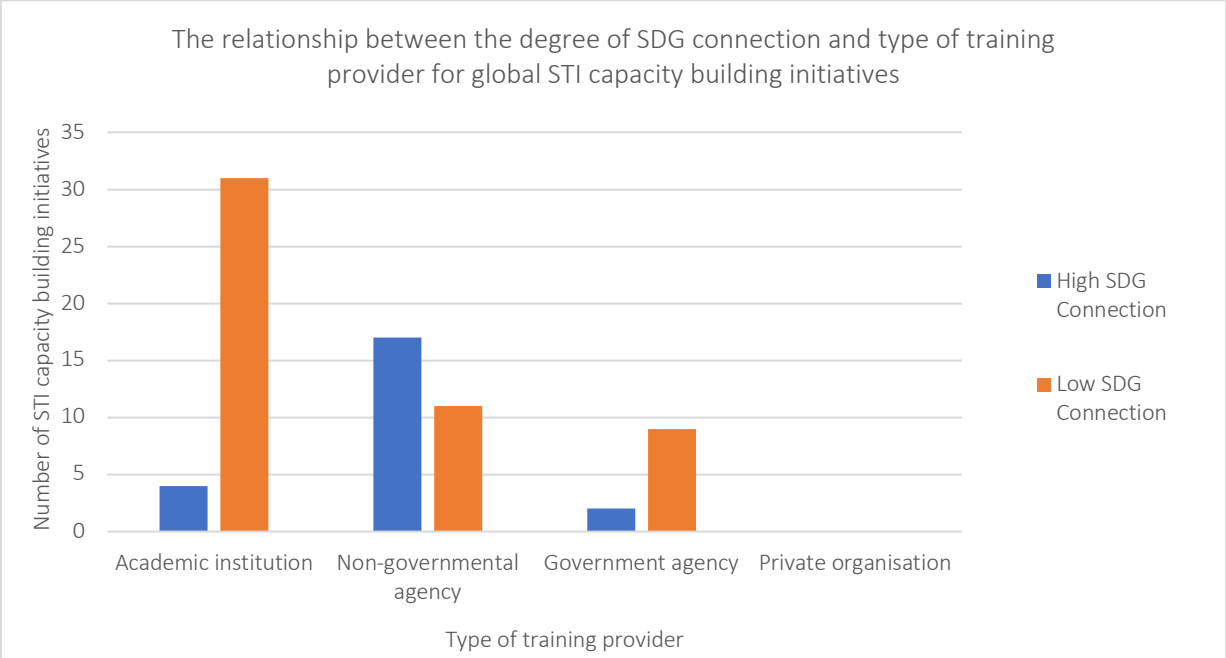
It should be ensured that initiatives produced in these regions are mindful of the local contexts of the countries they are delivered to, particularly developing countries. This includes an appreciation of their SDG priorities, development stage and sector-specific needs. Tailoring STI policy toward the SDGs could be more difficult in more conservative markets where policymakers' backgrounds and views are oriented toward business and GDP. Attention needs to be paid to which goals are foregrounded and which ones are de-emphasised and the politics that drive those decisions (Wanzenböck et al., 2020). Moreover, policymakers must contend with competing priorities. For example, many technologies are implicated in persistent environmental and social problems and contribute to current resource-intensive, wasteful mass production and mass consumption (Wanzenböck et al., 2020). Likewise, if developing countries were to 'catch up' by following the same path as developed countries, it might reduce inequality between countries (SDG 10), but that may come at a cost to the environment (SDG 13).

Contextual challenges were emphasised by interview participants across the participant groups, UN-IATT members and trainers, workshop participants, and academics. Based on the interview results, the content of the workshops may not always be applicable to participants' local contexts and in some cases the workshop content might be too abstract for the policymakers who need more practical application. One interviewee from the UN-IATT group elaborated on the different types of emerging issues policymakers may have to contend with depending on their context. For example, in Europe, policies may have to take into account an ageing population, while in Africa there are issues of poverty and a developing infrastructure. Similarly, workshop attendees asked for context-specific courses that are considerate of the particularities of each region and the level of development.

There is an opportunity to involve more local institutions

Secondly, academic institutions are a major convener in the field. The majority of STI capacity building initiatives are delivered by academic institutions (53%), however non-governmental agencies deliver the majority of programmes that have a high connection to the SDGs (see Figure 2).

Figure 210: Graph showing the relationship between the degree of SDG association and the type of training provider in global STI capacity building initiatives. *A 'high SDG connection' indicates that the training is highly relevant to the SDGs and is an explicit connection made in the course title or description, whereas A 'low SDG connection' shows that there is little to no mention of sustainability in the course.*



There is a body of literature that emphasises the value of engaging local and regional institutions in capacity building initiatives to achieve sustainability goals (Cuthill and Fien, 2005; Shiel et al., 2016; Stafford-Smith et al., 2017; Lepore, Hall and Tandon, 2021). Additionally, a workshop participant put forward the idea of using more local resources, such as local researchers and universities to engage in the process. Therefore, there is a substantial opportunity to engage local and regional organisations in the development of STI capacity building initiatives for the SDGs.

MECHANISM & DELIVERY

The diversity of the UN-IATT is under-utilised

Firstly, there is great potential for inter-workstream collaboration. The diversity of training experts from WS6 member organisations has largely received positive feedback from interview participants. In fact, this collaboration between UN agencies, as well as the exposure and access to the knowledge on STI policy from within various UN agencies is recognised as a significant value of WS6 activities. However, based on interviews results, there is no formal mechanism in place between WS6 member organisations whereby topics are selected, but rather there is a reliance on institutional knowledge and past experience.

There are many delivery formats, but not many are openly accessible

Secondly, the delivery formats of global capacity building initiatives are very diverse. The most common format of STI capacity building initiatives are short-term workshops, which accounted for 41% of the total number of initiatives. This is followed by short courses (28%) and degree courses (27%). However, guidebooks and Massive Open Online Courses (MOOCs) were the least used, accounting for only 3%

and 2% of the total number of initiatives respectively. Both the UN-IATT members and trainers and workshop participants suggested the use of guidebooks to supplement the online or in-person workshops. One suggestion was that participants be given pre-workshop reading material to orient attendees ahead of the training. Another workshop participant advised that the use of a platform where training materials can be accessed, and workshop participants can co-create knowledge, would be useful. Thus, there is a significant opportunity to build capacity building initiatives in this area. The expansion of such programmes could play a key role in reducing barriers to entry and can allow users to engage with material on their own terms.

A more comprehensive feedback mechanism can help to determine impact

Thirdly, an improved feedback mechanism can help to measure impact. The UN-IATT WS6 currently uses surveys as the main way to collect feedback. The training sessions currently use Mentimeter to get instant feedback during the training and Google form questionnaires to get more in-depth feedback after the training to further explore the training participants' needs. However, besides the surveys, the training does not have an efficient feedback mechanism to follow up and evaluate how much the training is actually having an impact on the training participants after they complete the training.

4. Conclusion and recommendations

The interview results show that policymakers find great value in STI for SDGs policy workshops and training activities, with peer learning and networking opportunities being particularly valued. However, based on the mapping analysis, a greater proportion of STI for SDGs capacity building is generated in Western countries. This, coupled with participants' requests for more consideration to be made on contextual needs, emphasises the need for STI for SDG capacity building initiatives to foreground context throughout activities. To diversify knowledge, a bottom-up and collaborative approach to workshop content will need to be created by including not only local policymakers, but also local researchers and universities. Engaging local organisations to help plan STI capacity building initiatives within their own contexts, particularly in developing countries, and coupled with the global knowledge of the WS6 members, could play a major role in meeting the contextual needs of participants while still retaining the valuable insights from within the WS6 member organisations. Expanding stakeholders to include more universities outside of the EU and the US will also help balance the current flow of information, where most of the STI for SDG work is being created in the global North and transposed in the South. Furthermore, there needs to be diversity and sensitivity to the political leanings and background of the participants to enable the workshops and content to "meet them where they are" and provide an environment for different perspectives and competing priorities to work together.

Formalising UN-IATT working structures to improve on knowledge sharing between workstreams to create a dynamic where the different workstreams' activities closely interlink with each other, thereby creating a holistic learning environment. Furthermore, it has been specifically emphasised that policymakers engaging with STI roadmaps for the SDGs should ensure that capacity building for STI supplements their efforts (Surana, Singh and Sagar, 2020).

Diversifying training mechanisms with more accessible training material, in the form of guidebooks and MOOCs to supplement workshops, will lower the barrier to entry and provide a tangible way for policymakers to refer to workshop content and to share knowledge among co-workers. Once-off

workshops are not sufficient in upskilling policymakers, thus a comprehensive feedback mechanism, including follow-up workshops to build on previous workshop knowledge, is recommended. These sessions should also serve as a platform for participants to communicate the issues and challenges that may hinder the application of knowledge, and be an opportunity for them to ask for further suggestions and support.

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ANNEX C: INTERVIEW GUIDE

Participant category	Primary questions	Rationale	Subsidiary questions
Workshop attendees	How and why did you attend the trainings?	*One of our assumptions is that attendees are interested in learning more about STI policy alignment with the SDGs. This question aims to test that assumption.*	Is there political and institutional will for engagement in STI for SDG capacity building? Were long-term outcomes achieved for the organisation? What tools/indicators did you use to assess the changes? What are the main challenges and obstacles to applying the knowledge and information learnt from the session to your country? What emerging issues do you think future training sessions should address? What suggestions would you like to raise for the training sessions? Is there political and institutional will for engagement in STI for SDG capacity building?
	What changes happened after attending the training sessions? Have you been able to implement a change in policy based on the training?	*One of the assumptions of our theory of change is that the effective delivery of the course will enable policymakers to implement change.*	
	How do you think the training sessions have contributed to your country's capacity building? To what extent do you think the training sessions are tailored to your local context?	*This will test the assumption that the generic course content will be sufficient for policymakers to address the contextual needs of their countries.*	
	What do you think policymakers should do to accelerate the progress?	*This will provide some insight into the contextual needs of the participant's country and areas of future direction.*	
Workshop Experts / Trainers	What do you think is the main value in having STI policy training for the SDGs?	*This will highlight perspectives on the importance of these training sessions.*	What support mechanisms are in place for you to facilitate training sessions? How do you tailor the sessions to meet the contextual needs of each region/country?
	What emerging issues do you think future training sessions should address?	*We have found some emerging issues through our own research; this question will help us understand what other topics are being covered in academia.*	
	What are the major constraints and	*This helps us to understand where the challenges lie as seen by the trainers*	

	limitations that you have experienced in facilitating these sessions?	*and try to answer the question on how to improve workshops*	
	How are workshop topics and content selected.? How do you select what to focus on in training?	*This will unearth how topics in the workshops are selected, for example choosing to cover "Entrepreneurship" or "digitalization".*	
Academics working in STI policy	What do you think is the main value in having STI policy training for the SDGs?	*To understand the perceived value and rationale in having capacity building initiatives catered towards STI policy for the SDGs*	How can STI policy training align with the SDGs? Do you have any comments on the scope of our research project or suggestions on how best to support the UN project and strengthen STI capacity building?
	What emerging issues do you think future training sessions should address?	*We have found some emerging issues through our own research; this question will help us understand what other topics are being covered in academia.*	
	If it were up to you, how would you go about getting change?	*This is to find any new ideas the IATT could explore*	
	What key contributions can your area of study make towards STI policy/SDGs?	*This is to understand how theoretical frameworks contribute to the real world's progress towards* STI policy/SDGs.	
UN-IATT workstream 6 stakeholders and members	Why is capacity building a key part of the STI for SDGs initiative?	*This links back to the UN-IATT's theory of change in how the capacity building relates to STI for SDGs and tests their rationale.*	How is capacity building tailored to meet the contextual needs of each region/country?
	What do you think is the main value of having STI policy training?	*To understand the perceived value and rationale in having capacity building initiatives catered towards STI policy for the SDGs*	
	How are workshop topics and content selected.? How do you select what to focus on in training?	*This will unearth how topics in the workshops are selected, for example choosing to cover "Entrepreneurship" or "digitalization".*	
	What are the major constraints and limitations that you have experienced in facilitating these sessions?	*This will feed into the final recommendations that are given to UNESCO.*	

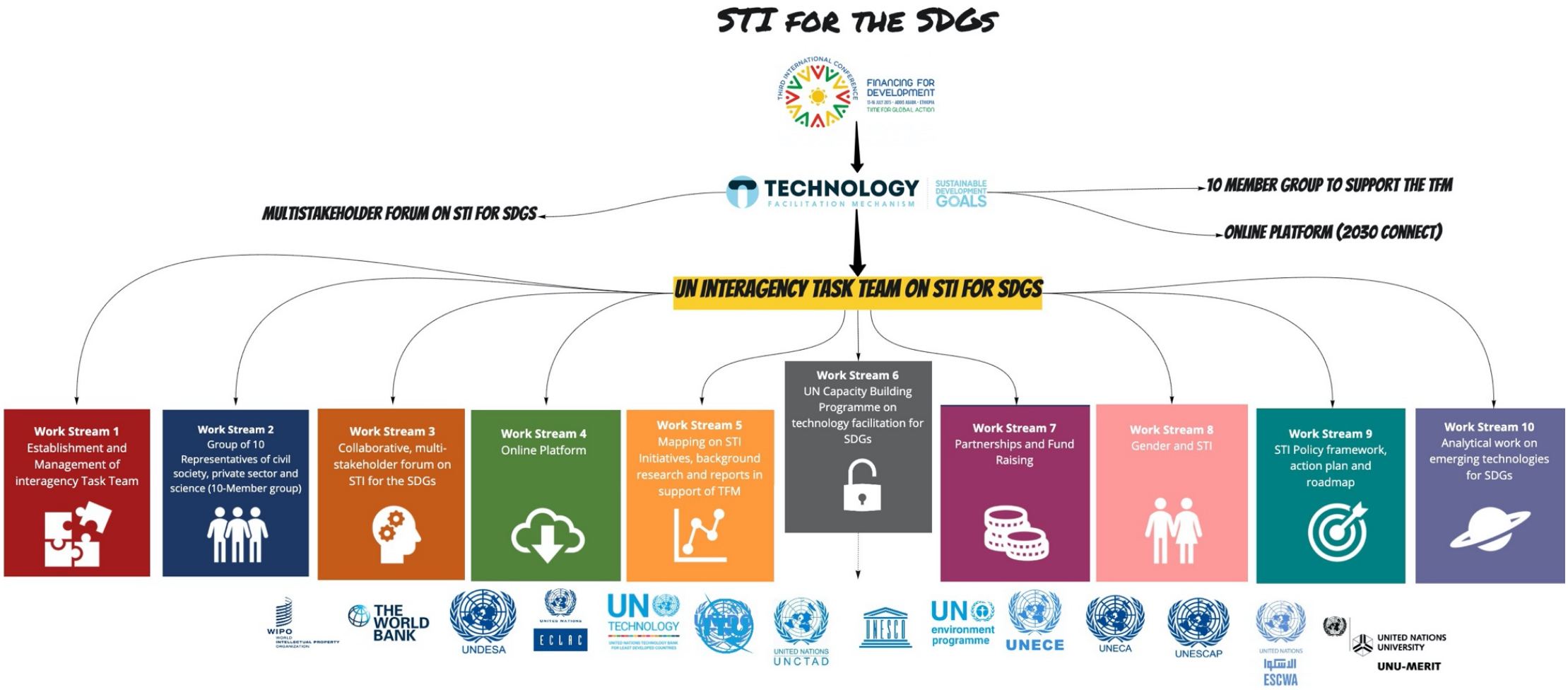
ANNEX D: DETAILS OF THE VARIABLES USED FOR MAPPING EXERCISE

Variable	Categories (if applicable)	Purpose & additional details
Organisation name		Ensures that the training can be uniquely identified according to the organisation.
Country of organisation		Allows the researchers to draw insights into the global landscape of capacity building initiatives based on geography.
Training provider	Academic institution Government agency Non-governmental agency Private organisation Other	Provides background on who the training is provided by, which could correlate with an organisation's agenda and priorities.
SDG connection	Low Medium High	It gives an indication of how closely STI policy capacity building initiatives are aligned with the SDGs. A 'low' SDG connection suggests there is no mention of the SDGs. The training may have some mention of sustainability, but this is a minor aspect. A 'medium' SDG connection indicates that sustainability may be a significant focus of the workshop, although there is little to no explicit connection to the SDGs. A 'high' SDG connection shows that the training is highly relevant to the SDGs and there should be an explicit connection made in the course title or description. The UN-IATT capacity building workshops may be used as a reference point for training with a high SDG connection.
Delivery method	In-person Online – Microsoft Teams Online – Zoom Online – Other Publication	Provides more detail on the platforms used to deliver course programme content.
Training type	Degree Workshop Short courses Massive Online Open Course (MOOC)	Ensures a greater understanding of the variety of formats used to deliver STI policy capacity building. Degrees refer to undergraduate and postgraduate courses. Workshops refer to meetings at which groups of people engage in intensive discussion and activity on a particular subject.

	Guidebook Other	Usually lasting 1-3 days, they are designed to teach or introduce skills and knowledge related to STI policy. Short courses are formal training programmes, for which participants may receive certification. MOOCs refer to openly accessible online learning materials that can be referred to at any time. Guidebooks refer to a published set of instructions for STI policy.
Level of expertise	Basic Intermediate Advanced	This refers to the assumed knowledge of the participants and the level of detail that is covered in the workshop. The 'basic' category suggests that course material cover the very basics of policymaking. Barriers to entry are very low as no prior knowledge of policymaking is required. The 'intermediate' level covers the basics of STI policy. Some prior knowledge of policymaking is desirable for participation. 'Advanced' level content covers STI policy best practice, emerging issues in STI policy, case studies, how to track impact and indicators of success. The course is targeted at high-level actors with experience.
Duration	< 1 week < 1 month < 3 months < 6 months < 1 year 1 year +	Shows the time commitment required for these capacity building initiatives.
Locality	Regional Country-specific	Indicates the context of these initiatives and how localised or generalised they are.
Target audience location		Provides insights on where these initiatives are being targeted.
Topics	Analytic Methods Case Studies	Ensures that a comprehensive understanding of the topics covered by initiatives are brought to the fore. Indicates where the most topical interest is and where potential gaps exist.

	COVID-19 Decision Making Digitalisation Economics Education Emerging Technology Entrepreneurship Environment Foresight Funding Gender Healthcare Intellectual Property Interdisciplinary Research Monitoring and Evaluation Policy Implementation Policy Instruments Policymaking Political Environment Research and Development Risk Roadmap Science Advocacy Science Diplomacy SDGs Society and Culture Space Sustainable Development	

ANNEX E: DIAGRAM OF THE UN-IATT STRUCTURE



IATT WS6 MEMBERS: UNCTAD, UNIDO, UNESCO, UNU-MERIT, WIPO, UNDESA, UNEP,WB, ITU, UNESCWA, UNECA, UNECLAC, UNECE, UNTBLDC and UNESCAP.

ANNEX F: DETAILS OF THE INTERVIEW RESULTS

Participant Category	Key findings
Trainers and UN-IATT stakeholders	Workshop organisation and decision-making mechanisms <u>Working structure</u> • The UN-IATT is unique in the UN system. It is rare to see this level of coordination, collaboration and engagement. There is no formal governance structure for this, so the working structure is more informal. • In terms of support mechanisms, there are small working groups that work on different sessions of the workshop. Each group has a leader who is responsible for feedback to other colleagues. • The roadmaps have been identified as a complementary area, so workstreams worked more closely to present it as a way to design policy. • They had a lot of brainstorming sessions to discuss. <u>Previous experience</u> • The topics are based on previous experiences in other workshops, and there are also several iterations of the content. • Past experiences of other training workshops and literature around SDGs informed topic selection, although this became more difficult in online sessions. • The content of the training is based on the experience and previous work of different international organisations. <u>Participant selection</u> • In some cases, the UN-IATT had requested the specific ministry in charge of STI to nominate officials who would be in the best position. They select undesignated participants. • For the moment, they had actually delivered training sessions to invite participants to those that they had in some cases worked with. <u>Participant needs</u> • Based on the challenges of the region and countries, such as monitoring and evaluation. STI policy should have specific objectives. • Based on the needs of the region for developing STI for SDGs. • Collection of participant insights informs this. • In terms of tools, they are using Mentimeter which allows interactions online. So they can receive some instant answers and then they can directly present the answers online. • The UN-IATT Workstream 6 are also trying to use online Google surveys to get as many responses as possible, but they are also exploring to see if they would have other options in the future.

	STI framework • Educating participants about STI frameworks, their components and the linkages between the different components. Case studies • The training workshops bring in case studies to ensure more of a contextual understanding. • The participants have many comparative experiences and they also share experiences in different countries and cities to link to real-life issues and challenges instead of highbrow concepts. Stakeholder engagement • There is now more of a move for UN agencies to collaborate. • Regional and national institutions are sometimes invited to workshops to give an understanding of their own local perspectives and connect people with local case studies. • They involve other UN agencies that have regional experiences to know the country and the stakeholders and to narrow down the topics for the capacity building. • Through interactions with partner institutions, trainers present list of subjects and themes they train and ask for advice. • Selection of topics: use past experiences; follow the policy cycle; consult partner organisations and regional organisations; pre- and post-workshop questionnaires, communicate with the Member States in sub-regions. • Trainers work with regional commissions to ensure that trainings can meet contextual needs of the countries and set up a different committee for steering and a working group with different stakeholders. • For online sessions, they decided to focus more on basics, e.g., the policy cycle. • They have a fairly broad palette of topics, and the participants have not yet been asked by any counterpart to include or exclude content. Usually the counterparts are happy with most things they include. • Some workshop participants were not part of the decision-making process but were invited to train on their areas of expertise.
	Challenges Contextual challenges • Many governments do not have the mechanisms to systematise the SDGs. • The participant countries are not at the same development levels, therefore, contexts in countries are different. • The SDGs are complex. • Sensitivity to countries' developmental stages. • It’s difficult for UN-IATT trainers to find a balance between general topics and more specific topics required by participants.

Lack of participants' knowledge

- Most of the participants don't have an objectivist and realist mindset.
- The majority of people who work in policy are not educated in economic policy.
- Participants have limited STI policy knowledge, so it is difficult to discuss other concepts when participants lack basic knowledge.

Number of participants

- The number of participants they invited is not enough to make changes in the country. More training for middle-level decision-makers is needed.

Level of participants' seniority

- Some of the trainees are middle-level decision-makers. They do not have enough power to make strategic decisions and to make the policy.
- Level of participants' seniority is unclear, and some of the participants are unclear about when the stage of implementation is.
- It may not be practical for lower-level policymakers to formulate a policy.
- It's hard to suit everyone's needs and different levels of expertise.
- Policymakers have different levels of STI understanding.

Lack of resources

- Participants do not have any other resources, and they are under-resourced.
- There are no dedicated resources for the UN-IATT workstreams.

Time constraints

- Time constraints mean that only basic concepts are covered.
- There is not enough time to work on workshops and it is difficult to get the timing right.
- Voluntary work is difficult to keep up momentum.
- Challenges are mainly logistical, e.g., finding a venue, choosing an appropriate time, etc.
- Time constraints mean that peer learning is more limited for online training.

Interactivity

- Online training sessions are less interactive, so it is difficult to keep people engaged.
- Digitalisation of workshops has posed a logistical challenge.

Practical application

- Participants want practical answers and trainers need to learn how to make the training highly applicable to their contexts.
- Participants are more interested in the practical elements of policymaking (e.g., implementation), which is better suited for experiential discussions, rather than theories and concepts.

Knowledge limitations of UN-IATT trainers

- It is difficult for UN-IATT trainers to bring in emerging issues because of a lack of expertise.
- Due to institutional specificities within the UN-IATT, knowledge capacities within the UN-IATT can be limited.
- Trainers have gaps in knowledge, especially with country-specific knowledge.
- Government agencies sometimes have a limited understanding of the concept of STI.

Links to other workstreams

- Trainers find it difficult to design policy and relate it back to STI/SDG roadmaps – capacity needs to be built in this area too.

Evaluation of workshops

- There is no specific mechanism to test the impact of the training.
- Many participants find implementation and monitoring and evaluation challenges. They ask many concrete/practical questions on how to design instruments and policies.

Value for participants

Upskilling policymakers

- Upgrading skills and creating employment opportunities through human resource development and improving capacities.

Diversity of knowledge and expertise

- Participants can see the perspectives of different UN agencies, and benefit from interactions with people from the UN system, who are seen as being more distant actors.
- The collaboration between so many UN organisations means participants get a range of expertise in one workshop and raises awareness of what the UN system already works on.

First interaction with STI policies for SDGs

- Many participants are not well educated in STI policy and have different academic backgrounds, like business.
- STI training can be rewarding as it may be difficult for them to access training and it is an opportunity for them to do something outside of their job.
- STI training gives them an opportunity to get exposed to the most current theories around STI policy.

Peer learning

- It is good for countries to share their own experiences to enable peer learning, and they benefited a lot from the discussion between the different decision countries.

	• They found it very useful to share experiences with the policymakers and exchange information with colleagues for formal peer learning. And it also gives them access to colleagues in other regions and provides them with extra learning and networking opportunities. • They can learn from other governments and listen to the different perspectives of other countries/administrations. <u>Case studies</u> • Participants require a lot of examples of good practice or case studies from different places. • Case studies are used to tailor the workshops to specific regions. • They are now focusing on green transformation, the ministries of environment, and how STI can help with economic transformation. <u>STI framework</u> • There is no other group of people or organisations that can offer such comprehensive framework for the STI for SDGs.
	Future areas of development <u>Entrepreneurship and innovation</u> • Innovation is a very complex system where a lot of players must come together. Understanding the innovation ecosystem and players in a country and bringing those people together would be difficult but useful. • STI policy for SDGs, can succeed in developing world only through entrepreneurship. Public policy should be more supportive of the entrepreneurs in developing countries. <u>Conceptual understanding</u> • They should avoid taking a highbrow perspective and provide a better understanding of the real issues. <u>Gender and STI</u> • Policy work on STI has to significantly move away from discussing specific technologies. • One of the major problems is inequality, especially gender inequality in many countries. <u>Training format & resources</u> • The best format for delivering training is uncertain. • Development of a MOOC with UNESCO and the EU JRC is underway. • Development of a 'small booklet' to accompany the training sessions and PowerPoint slides to allow participants to refer to something that is more detailed was recommended.

- They need to seek a more harmonized approach to address environmental and social-economic challenges.

Environment

- The policy environment on energy is a huge problem from an STI perspective.
- They need to focus on green transformation and green energy in the future.

Contextualisation

- The emerging issues are not always a priority for these administrations.
- The inclusion of emerging issues is dependent on where someone is based.

Intellectual Property

- Intellectual Property (IP), is the thread that runs through everything in innovation, or perhaps the oil that lubricates the system, it promotes and encourages people to create.

COVID-19

- They need to learn how to improve resilience amid the COVID-19 pandemic.
- They need to enhance efforts to build resilience and increase the preparedness of the COVID-19 pandemic and future disasters.

Implementation and Monitoring & Evaluation

- Address more implementation challenges and have more practical sessions on implementation.
- Modules on implementation and monitoring and evaluation have been made in response to participants' requests to focus more on these topics.
- The social support structures are extremely important for STI policy for SDGs.

Complimentary workshops

- Dedicated session for high-level decision-makers which has more bilateral meetings or convince them to complement the current training workshops.
- Regional workshops should be complemented with national workshops to target decision-makers at a national level where they have specific challenges for each country.
- Could also provide complimentary workshops according to specific sectors.

UN-IATT working structure

- They need to collaborate more with other workstreams in the UN-IATT. The mechanisms are not formalised and a wider discussion needs to be had to integrate different workstreams.

Digitalisation

- What digitalisation means for policymakers and demystifying it, e.g., digital transformation, Industry 4.0, artificial intelligence, etc.

Collaboration

- Address the collaboration and linkages between ministries or institutions of different sectors.

Value of STI for SDG workshops

Peer learning

- Through the workshops, they can learn from their colleagues and policymakers at different levels in different countries.

Enhance development

- STI for digital and green transformation.
- STI driving development.
- Technical capabilities improvement.
- Understanding of technologies.
- Having STI policy training for the SDGs can enhance the capacities, especially to policymakers, but also mid-level technicians.
- Emphasising the systemic nature of STI policy instruments.
- Reviewing the implementation of the STI policy for SDGs.
- It is important to organise trainings, especially for policymakers, to keep them updated.
- Participants who find this opportunity can open the scope of their work.

Further UN agenda

- Enabling the UN to deliver on the SDGs, which is an unfinanced mandate.
- Alignment to national development priorities and SDGs.
- Understanding that everyday life connects to larger goals and strategic goals, not only nationally, but as part of a global agenda.

Raising awareness

- The holistic approach is lacking in general, so it is important to raise the level of STI in the policy role.
- Raising awareness about STI for the SDGs and the language surrounding it, this awareness and engagement can then 'trickle down'.
- Raising awareness about the importance of an enabling environment or the ecosystem for making science and technology.

Collaboration

- Bring in stakeholders and increase synchronisation or the collaboration among these stakeholders
- Interdisciplinary collaboration between different stakeholders.

	• Collaboration and linkages between institutions, universities, industries, ministries, and NGOs. STI policy knowledge • It makes clear that STI policy has to be developed for a purpose (directionality). • It provides knowledge and a practical way to apply that knowledge. • Simplifying STI and its different applications to the field.
Trainees	Preconceptions of the training & reasons for joining Building capacity • Opportunity to build capacity. Strengthening network • Opportunity to strengthen networks. STI policymakers • Workshops are designed for those in the STI ecosystem. Institutional will • They were invited by their government. • Institutional will enabled them to attend STI training workshops. Involvement in other IATT activities • It was a requirement to attend due to involvement in pilot projects.
	Salience of training to contextual needs Useful • The knowledge and information gained from the workshop was useful in helping with STI for SDGs roadmap process in their country. Not useful • Workshops and meetings are not effective. Initiatives they wanted to build did not happen. • Lack of implementation.
	Outcomes/impact of training on work • It worked as a platform for sharing STI information and implementation. • It enriched knowledge on STI for SDGs roadmaps as a policy tool. • It helped to create a Gender Unit for STI on capacity building in their country. • It helped to create initiatives for robotics competitions.

	Areas for improvement Support materials/training methods • Virtual training should have more in-depth materials to support the trainees. • Trainees would like to have face-to-face training to have physical contact and the opportunity to ask more questions and do more networking and peer learning. Feedback mechanism for co-creation • There should be an established feedback loop (long after the training sessions / follow up sessions) • There should be a platform to extend materials and the resources to co-generate knowledge. Implementation and M&E • More tools needed to come up with very practical indicators for monitoring and evaluation aspects. Enhancements for trainers • Content is too abstract to understand, and it should be broken down into more usable forms. Contextualisation • Need to demystify STI and go more in-depth (more relevant to the local context) • Also include more local resources/people. Addressing issues of funding • Issues about funding should be addressed • Ways to mobilise funding for STI activities and strategies.
Academics	Value of STI policy for SDGs training Alignment • When it comes to aligning STI policy to SDGs, it depends on the context. STI policy is context-driven for different regions and countries and is timebound. • Alignment is a continuous process and is a challenge in the STI field • There is not one specific way in which alignment is achieved, so it is a very difficult process. Using STI as a means for SDG achievement • It is important to appreciate the role of STI policy in development goals in developing countries. There should be training on how they can link with other sectors. • STI has not generally been seen to benefit the people.

	• There is no sufficient STI policy workshop for SDGs, but there are good programmes about integrating SDGs into the national development agendas. • SDGs has a lot to gain from STI alignment. But it is not usually the case at all because most STI initiatives are not related to the SDGs and the production of scientific publications is scarce in LMICs.
	Emerging issues <u>Misalignment on what works in different contexts</u> • Misalignment on the idea of entrepreneurship, in the context of sub-Saharan Africa, where the economic profile is different from Silicon Valley. <u>Integration and linkages</u> • One of the persistent issues and also one of the emerging issues is the need to have integrated capabilities in STI; you cannot look at it in isolation or silos. <u>Emerging technologies</u> • In the future, there will be more focus on emerging technologies, AI, IoT, advances in robotics, etc.
	Ideas on manifesting change <u>Context</u> • Creating a clear link between STI policy and society. • Influence people in academia to ensure the technology has an impact on society. • Exploring how the profile of science and innovation that currently exists relates to SDG challenges in country-specific contexts. • Look at the demand side and the institutions that deploy and utilise STI in industry, government, and different stakeholders or players that are brought together. <u>Localisation and capacities</u> • Look holistically at the whole STI system, including universities and how they can contribute. • There is a need for policy design to be more advanced from the perspective of a policymaker.
	Academic contributions <u>Alignment</u> • Creating critical thinkers and implementers. • Rethinking continuously between different layers of global and local nexuses. Generic resources do not always work in country-specific contexts. <u>Innovation system</u>

	• One of the academics' current projects involves understanding universities interacting with other actors in emerging innovation systems and focusing on capabilities within the innovation system. <u>Monitoring and evaluation of the trainings</u> • Monitoring the impact of training is important. Countries sign up to increase impact in their countries.

ANNEX G: ANONYMISED REFERENCE CODES FOR INTERVIEWEES

Stakeholder group	Code name	Date of interview
Workshop Trainers (WT)	WT1	6/7/2021
	WT2	5/8/2021
	WT3	12/7/2021
	WT4	23/7/2021
	WT5	16/7/2021
	WT6	26/7/2021
Training workshop attendees (TWA)	TWA1	30/7/2021
	TWA2	26/7/2021
	TWA3	29/7/2021
Academics (A)	A1	22/7/2021
	A2	28/7/2021
	A3	3/8/2021
Other WS6 Stakeholders (OWS)	OWS1	4/8/2021
	OWS2	25/8/2021
	OWS3	3/8/2021