REPORT : OVERVIEW

CHANGING DIRECTIONS

Steering science, technology and innovation towards the Sustainable Development Goals

strings
Steering Research and Innovation for Global Goals

REPORT : OVERVIEW

Adopted by the United Nations in 2015, the Sustainable Development Goals (SDGs) offer a globally shared opportunity to change the directions of science, technology and innovation (STI) to contribute to a better and more sustainable future for everyone.

STI can help address many SDG challenges, for example, by increasing access to safe and nutritious food, improving per capita economic growth, or enhancing access to transport systems. However, in doing so, STI can also undermine progress towards some of the goals, for example, through carbon emissions or the pollution of water basins.

Our research has highlighted that current STI funding and prioritization are poorly contributing to achieving the globally agreed goals. Since STI funding and prioritization are largely driven by the values and interests of a few companies, governments and financial institutions, these decisions often serve the needs of the most influential and privileged, and may not address pressing SDG challenges.

India, for example, is a lower-middle income country (LMIC) that faces major challenges related to several SDGs: SDG 2 (Zero hunger), SDG 5 (Gender equality), SDG 6 (Clean water and sanitation), SDG 9 (Industry, Innovation and Infrastructure), SDG 11 (Sustainable cities and communities), SDG 14 (Life below water) and SDG 15 (Life on land). However, besides SDG6, it prioritizes research only on SDG 7 (Affordable and clean energy) and SDG 12 (Responsible consumption and production). Evidently, there is a major disconnect between the problems it faces and the research it prioritizes.

Globally, in high-income countries (HICs), upper-middle income countries (UMICs) and LMICs such as India, between 60% and 80% of publications in the Web of Science (WoS) and between 95% and 98% of patented inventions are unrelated to the SDGs. In low-income countries (LICs), where most SDG challenges are worst, there is a higher share of SDG-related research (60%-80% is related to the SDGs). However, these countries produce an extremely low proportion of world research (0.2%) and patented inventions (0.02%).

So how can we steer STI activities towards solving, rather than exacerbating, SDG challenges? Just doing more R&D will not contribute to achieving the SDGs. Depending on the directions of the associated STI, it can, in fact, undermine progress towards them.

We need to change the directions of STI in order to address the glaring misalignment between research and innovation priorities and the SDGs. This is the only way to achieve our SDG targets and build a better, more sustainable world.

Our approach

Determining how to invest in research and development for the SDGs is not a simple task. There is no single definitive perspective or STI direction for addressing any particular SDG. Each SDG challenge can be viewed differently, according to diverse and plural understandings, values, interests and STI priorities.

To help understand and better address the challenges of investing in STI for the SDGs, while embracing the complex relationship between STI and the SDGs, we carried out a major global study to determine how and to what extent the world's STI priorities are aligned with the goals (Figure 0.1).

- We analysed scientific publications and patents data to gather quantitative information about global research and innovation priorities, and how these align with SDG challenges.
- We conducted a global survey of stakeholders to explore views about what types of STI are needed in the future to help achieve the SDGs. This allowed us to consider the alignment between current and desired STI priorities.
- We interviewed local STI users, including fishers, farmers and researchers, to explore how different actors, each with their own priorities, are shaping local STI pathways to tackle specific sustainability challenges. We then appraised stakeholders' views about how far each pathway aligns with sustainable development objectives.
- We produced data, mappings and case studies to gain a better understanding of STI priorities and to illustrate how such evidence and methods could be used in other contexts, according to plural interpretations of SDG challenges and STI pathways.

By combining these analyses, we gained deep insights into the way that particular STI priorities emerge both locally and globally, and how STI can be steered to improve alignment with the SDGs. Our results can help policymakers, research funders, academics, international organizations (INGOs) and aid organizations to make informed decisions about investing in research and innovation that will address the SDGs and ultimately create a positive impact on society.

Key findings

Problems of orientation and inequality

Current STI priorities in public and private R&D organizations are poorly aligned with the SDGs. Our analyses of SDG-related publications and patented inventions reveal that in HICs and UMICS – which dominate the global research agenda – just 20-40% of all published research, and only 2-5% of all patented inventions, relate to the SDGs (Figure 0.2). Moreover, 60% of this research is related to just one goal: SDG 3 (Good health and well-being), with a focus on diseases that are most prevalent in richer HICs and UMICs.

Meanwhile, in LICs (which face the most significant SDG challenges), 60-80% of research and 9% of inventions relate to the SDGs. However, their influence on the global research agenda is minimal, as these countries produce just 0.2% of all WoS research and 0.02% of all patented inventions (Figure 0.3).

To address local SDG challenges and inform policy decisions, countries need to build their own research and problem-solving capabilities. However, there are few opportunities for knowledge transfer and capacity-building in LMICs and LICs. This is due to the tiny fraction of academic research that is conducted in, or in collaboration with, these countries and the high proportion of research in these countries that relies on collaborations with HICs (Table 0.1). Where research collaborations between lower-income and higher-income countries exist, HIC research organizations tend to direct STI funding towards issues that they believe are, or should be, priorities in LICs.

Figure 0.1 / The STRINGS project: a multi-method, multidisciplinary study

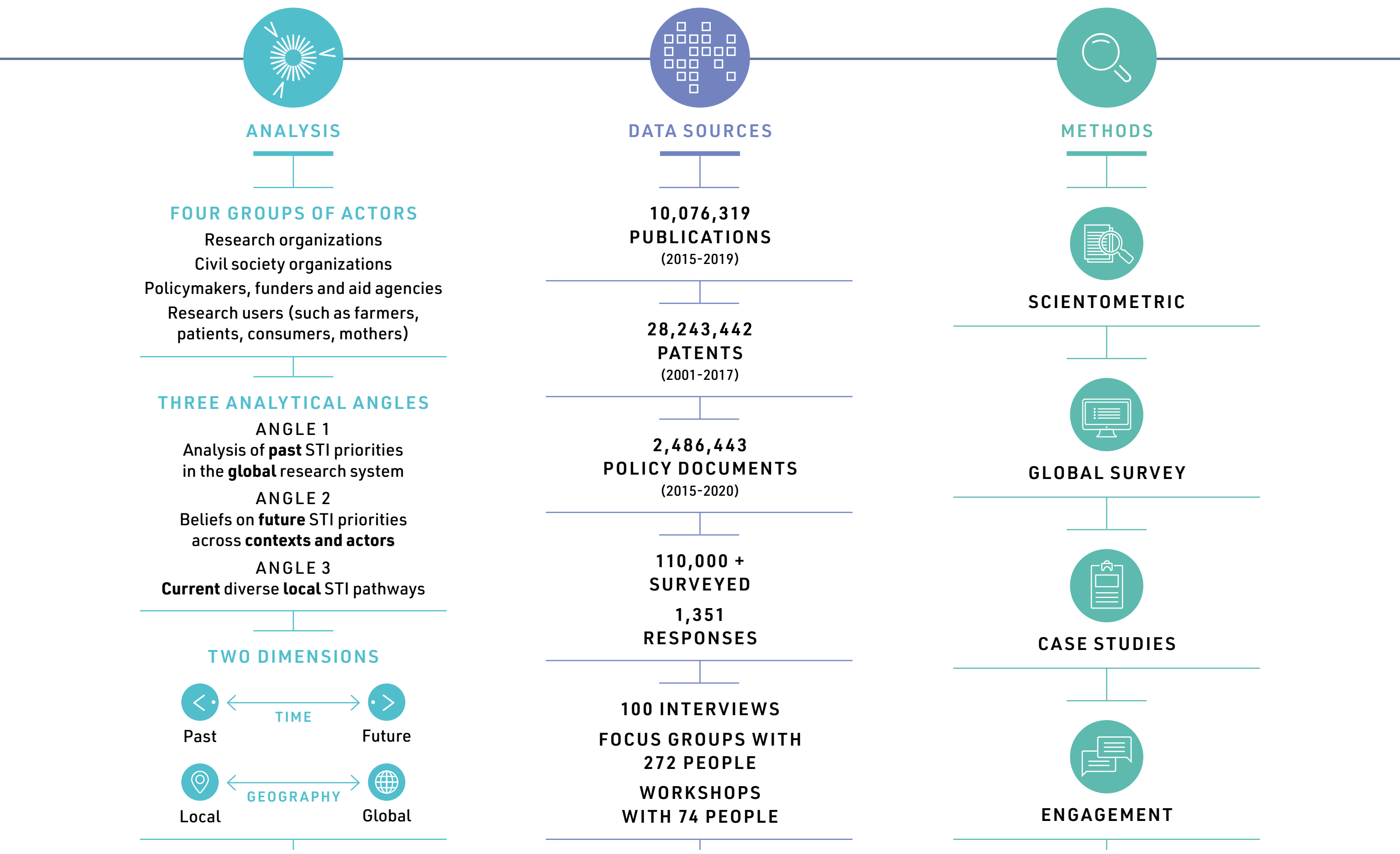
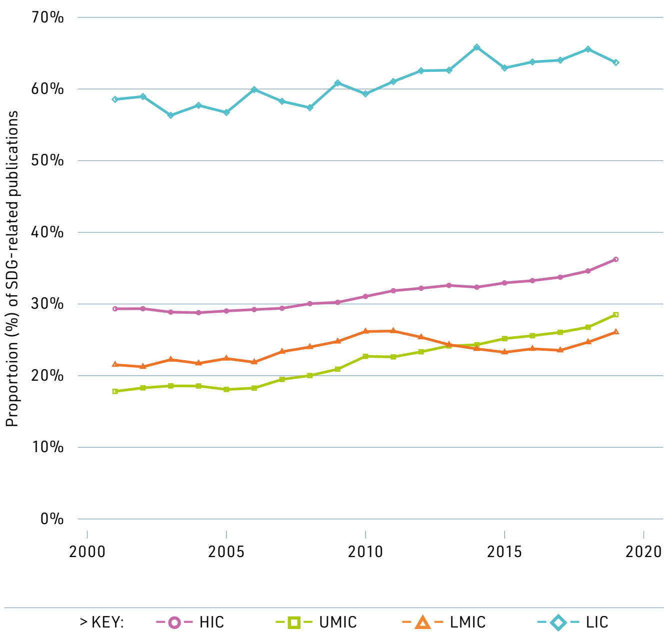


Figure 0.2 / SDG-related publications in different country income groups (2001-2019)



The graph shows the proportion of publications that relate to any of the SDGs (1-16). It is based on the total number of publications in countries in each of the four World Bank income groups (2021 definition): high-income countries (HIC); upper-middle-income countries (UMIC); lower-middle-income countries (LMIC); low-income countries (LIC). Based on strict interpretation of SDG-related research. See Appendix 2, Figure A.2.1 for a figure based on the loose interpretation.

See Chapter 4 of the main report for more details.

Figures based on Web of Science data. Centre for Science and Technology Studies (CWTS) version.

Table 0.1a / Collaborative SDG-related publications within and between each country group (as a percentage of global collaborations)

COUNTRY GROUPS	HIC	UMIC	LMIC	LIC
HIC	66.32%			
UMIC	3.65%	18.69%		
LMIC	1.19%	0.28%	3.78%	
LIC	0.24%	0.04%	0.06%	0.30%
TOTAL	3,121,395 (71.40%)	990,797 (22.66%)	231,707 (5.30%)	27,607 (0.63%)

Table 0.1b / Collaborative SDG-related publications within and between each country group (as a percentage of a country group's total collaborations)

COUNTRY GROUPS	HIC	UMIC	LMIC	LIC
HIC	92.89%	5.12%	1.67%	0.33%
UMIC	16.12%	82.48%	1.23%	0.18%
LMIC	22.43%	5.25%	71.27%	1.04%
LIC	37.65%	6.31%	8.75%	47.29%

1a: This shows what proportion of all global collaborative publications occurred within (diagonal) and between (off the diagonal) country groups. For example, a publication co-authored by authors in the USA and the UK (both HICs) would contribute to the percentage in the top left cell. A publication co-authored by authors in the USA and Brazil (between HIC and UMIC) would contribute to the second row of the first column). The sum of all cells equals 100%.

1b: This shows what proportion of the collaborations within each country group occurred within and between country groups. For example, the first row shows the country groups involved in all collaborative research undertaken by HIC. The row total sums to 100%.

See Chapter 4 of the main report for more details.

HIC: High-income countries; UMIC: Upper-middle-income countries; LMIC: Lower-middle-income countries; LIC: Low-income countries.

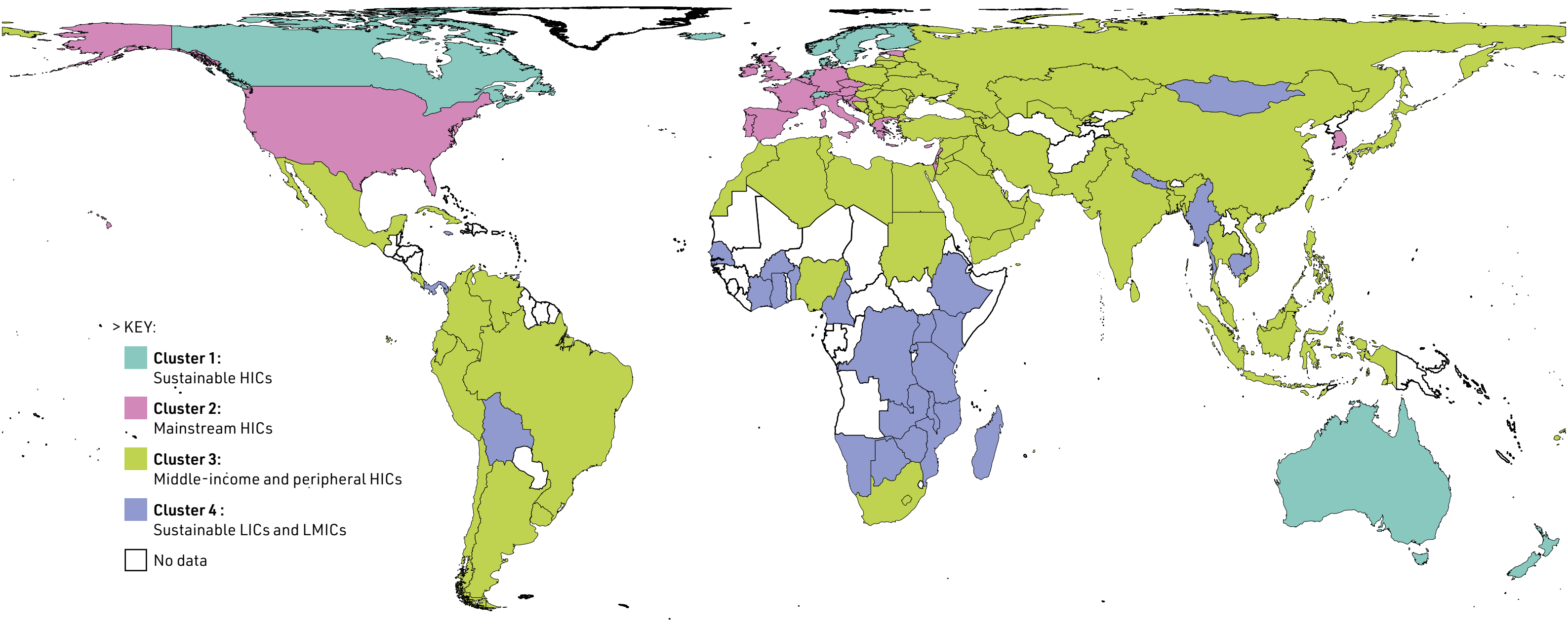
Figures are based on WoS data (CWTS version), 2015-19.

Problems of focus and knowledge siloes

We discovered that there are fewer efforts to address complex underlying social issues, such as deprivation, inequality and conflict (related to SDGs 1, 4, 5, 10 and 16), than to develop technological responses to more immediate challenges, such as access to energy (SDG 7) or drugs (SDG 3). And there is little research that interrogates how technological responses relate to these complex underlying social issues (Figure 0.4). For instance, research related to building STI capabilities (such as in SDG 9) is carried out more frequently in connection to research on technological solutions related to SDG 7 (Affordable and clean energy), SDG 8 (Decent work and economic growth) and SDG 12 (Responsible production and consumption (SDG12) than it is to the complex underlying social issues, such as SDG 4 (Quality education), SDG 10 (Reduced inequalities), SDG 1 (No poverty) or SDG 16 (Peace, justice and strong institutions).

Focusing mainly on technological interventions in isolation undermines our capacity to investigate synergies and tensions between STI and several SDGs.

Figure 0.3 / Country clusters based on publications and research capacity



Cluster 1

SUSTAINABLE HICs

This group comprises the most research-intensive HICs.

Publications per capita: **3.6**

2021 SDG Index ranking*: **80.2**

Proportion of SDG-related publications **38%**

They have an ***above average*** share of publications related to:

- **SDG 4** (Quality education)
- **SDG 9** (Industry, innovation and infrastructure)
- **SDG 10** (Reduced inequalities)
- **SDG 12** (Responsible consumption and production)
- **SDG 13** (Climate action)
- **SDG 14** (Life below water)

Cluster 2

MAINSTREAM HICs

Countries in this group, with the exception of Lebanon, are all HICs.

Publications per capita: **1.79**

2021 SDG Index ranking*: **78.6**

Proportion of SDG-related publications **32%**

They have an ***above average*** share of publications related to:

- **SDG 4** (Quality education)
- **SDG 8** (Decent work and economic growth)
- **SDG 9** (Industry, innovation and infrastructure)
- **SDG 10** (Reduced inequalities)

They have a ***well below average*** share of publications on the environmental SDGs.

Cluster 3

MIDDLE-INCOME AND PERIPHERAL HICs

This is the largest group, combining those UMICs (47%) and HICs (26%) with a below average number of publications per capita, alongside those LMICs (22%) with a low number of publications per capita.

Publications per capita: **0.3**

2021 SDG Index ranking*: **70**

Proportion of SDG-related publications **29.5%**

Most countries in this group have a ***high*** share of publications related to:

- **SDG 6** (Clean water and sanitation)
- **SDG 7** (Affordable and clean energy)

UMICs and HICs in this cluster also have a ***high*** share of publications related to:

- **SDG 8** (Decent work and economic growth)
- **SDG 9** (Industry, innovation and infrastructure)
- **SDG 12** (Responsible consumption and production)

Cluster 4

SUSTAINABLE LICs and LMICs

This group is composed mainly of LMICs (52%) and LICs (30%).

Publications per capita: **0.06**

2021 SDG Index ranking*: **58.7**

Proportion of SDG-related publications LMICs **55%** LICs **73%**

They have a ***high*** share, particularly in LICs, of publications related to:

- **SDG 1** (No poverty)
- **SDG 2** (Zero hunger)
- **SDG 3** (Good health and well-being)
- **SDG 5** (Gender equality)
- **SDG 6** (Clean water and sanitation)
- **SDG 16** (Peace, justice and strong institutions)

They have an ***above average*** share, particularly in LMICs, of publications related to environmental SDGs.

*The SDG Index measures each country's progress towards achieving the SDGs

Notes on the map: Each colour identifies one cluster of similar countries. A strict interpretation of SDG-related research was used. Countries with less than 500 total SDG-related publications between 2015-19 were not counted because their share of publications per SDG is extremely volatile.

See Chapter 4 of the main report for more details.

Figures based on Web of Science data (CWTS version).

Figure 0.4 / Research synergies across SDGs

Each node identifies one SDG (the size of the node is proportional to the number of publications relating to that SDG). Each colour identifies one cluster of SDGs.

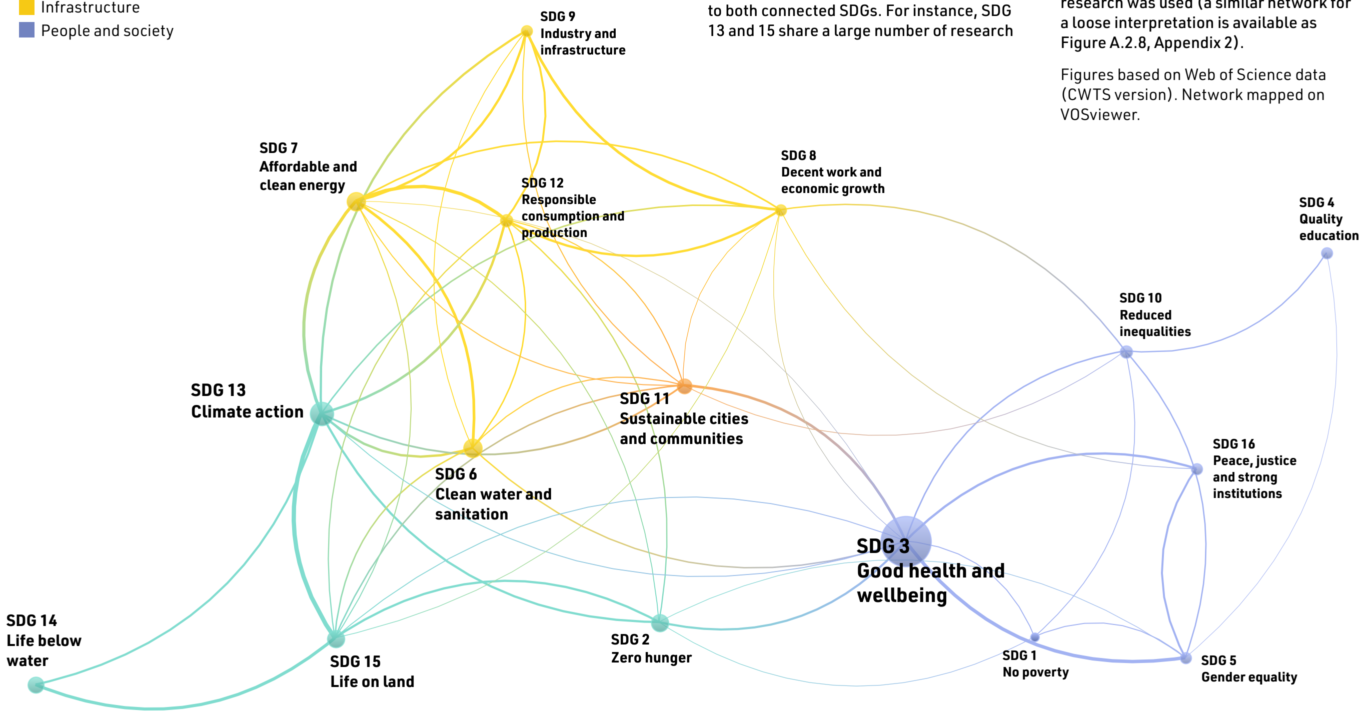
The lines connect SDGs that are studied by a number of research areas. The thicker the line, the more research areas are related to both connected SDGs. For instance, SDG 13 and 15 share a large number of research areas and publications, while SDG 4 shares only a small number of research areas and publications with SDG 10.

See Chapter 4 of the main report for more details.

Strict interpretation of SDG-related research was used (a similar network for a loose interpretation is available as Figure A.2.8, Appendix 2).

Figures based on Web of Science data (CWTS version). Network mapped on VOSviewer.

> KEY:
- Natural environment
- Infrastructure
- People and society



GREEN

A cluster of SDGs related to: the natural environment

SDGs 13 Climate action

SDG 14 Life below water

SDG 15 Life on land

These are connected to the lilac cluster via:

SDG 2 Zero hunger

YELLOW

A cluster of SDGs related to: economic growth, infrastructures and technical solutions

SDG 6 Clean water and sanitation

SDG 7 Affordable and clean energy

SDG 8 Decent work and economic growth

SDG 9 Industry, innovation and infrastructure

SDG 12 Responsible consumption and production

LILAC

A cluster of SDGs mainly related to: people and society

SDG 1 No poverty

SDG 4 Quality education

SDG 5 Gender equality

SDG 10 Reduced inequalities

SDG 16 Peace, justice and strong institutions

And the main bridge to the other clusters:

SDG 3 (Good health)

SDG 11 (Sustainable cities and communities) connects to research in all three clusters.

> KEY: **Sustainable Development Goals**

- **SDG 1** No poverty
- **SDG 2** Zero hunger
- **SDG 3** Good health and well-being
- **SDG 4** Quality education
- **SDG 5** Gender equality
- **SDG 6** Clean water and sanitation
- **SDG 7** Affordable and clean energy
- **SDG 8** Decent work and economic growth
- **SDG 9** Industry, innovation and infrastructure
- **SDG 10** Reducing inequality
- **SDG 11** Sustainable cities and communities
- **SDG 12** Responsible consumption and production
- **SDG 13** Climate action
- **SDG 14** Life below water
- **SDG 15** Life on land
- **SDG 16** Peace, justice, and strong institutions
- **SDG 17** Partnerships for the Goals

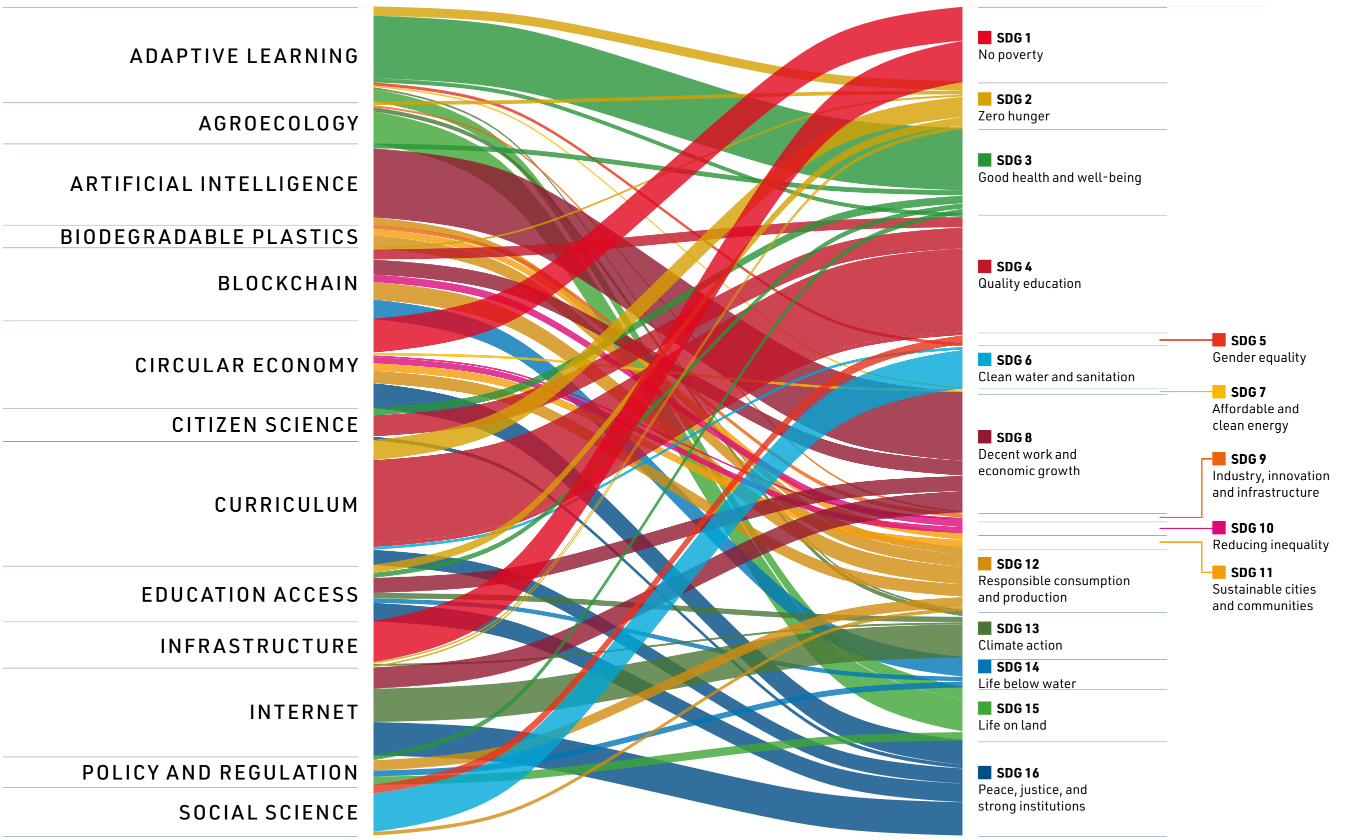
Our global survey (Chapter 7) confirmed that the development of one STI may positively support one SDG target but negatively affect the progress towards another (Figure 0.5). For example, blockchain technologies can not only speed up access to financial services (SDG 8.10), improve waste management (SDG 12.5) and address marine pollution (SDG 14.1), but can also support trafficking and sexual exploitation (negatively impacting on SDG 5.2) and is energy intensive (with a negative impact on SDG 12.2).

Focusing on technological interventions in isolation is also unlikely to deal with the underlying issues behind many SDG challenges. For instance, despite the fact that education and governance are important in tackling neglected diseases such as Chagas, in our Argentina case study, we found that research related to SDG 4 (Quality education) and SDG 16 (Peace, justice and strong institutions) was infrequently carried out in connection with research on SDG 3 (Good health and well-being). In our Kenya case study, we found that access to resources below water and on land (SDGs 14 and 15) is deeply connected to peace, justice and institutions (SDG 16), but research on those SDGs at the global level is rarely connected (Figure 0.4).

Social science research is needed to complement research on technical solutions so as to better address many of the underlying social issues. Isolating social research from research relating to the environment, infrastructure and growth SDGs creates 'social blindspots' in the research agenda. And it prevents us from understanding the extent to which technical research can address the underlying social issues – or potentially not exacerbate them.

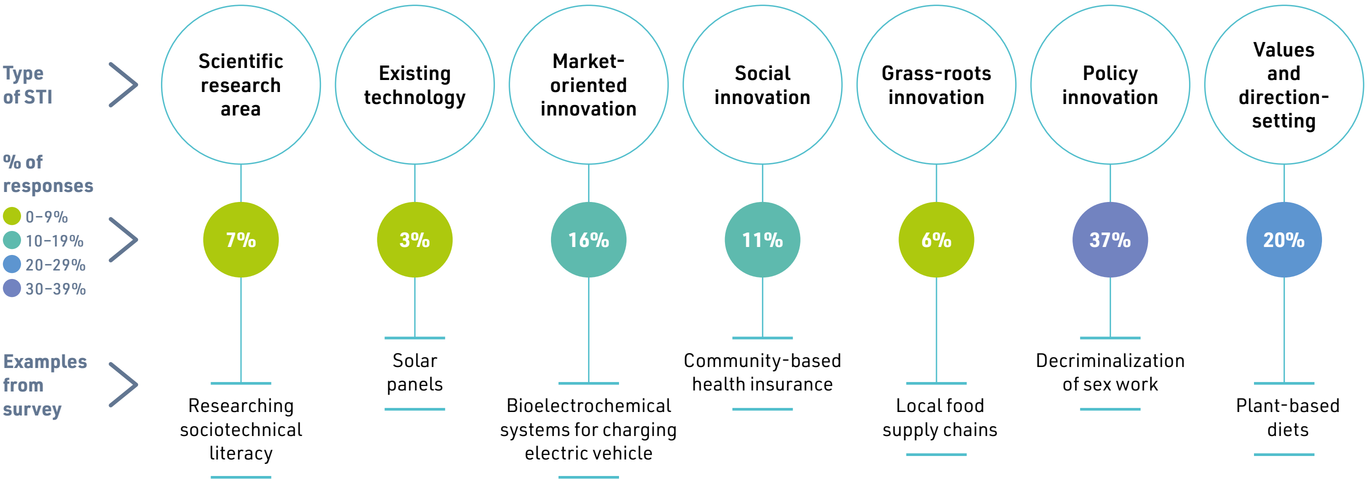
Our analyses show that SDG-related research on underlying social issues is more multidisciplinary and more likely to be used in policy and reported in the media than research on energy or on climate change. Despite this, and the fact that it is at least as highly rated by standard quality metrics as the average WoS publication, it does not benefit from the same level of collaborations across countries and is the least funded area of research (Chapter 4).

Figure 0.5 / STI synergies across the SDGs



Our survey (see Chapter 7 of the main report) identified 13 STI areas as synergistic – linking to three or more SDGs. The figure shows the links to various SDGs for these STI areas. Line colours reflect a specific STI area. Line thickness is proportional to the number of survey responses that identified a specific STI-SDG link. Figures based on our Delphi survey data.

Figure 0.6 / STI priorities identified in the STRINGS survey



We asked stakeholders to propose the types of STI they believe could help achieve the SDGs by 2030 (see Chapter 7 of the main report). The figure shows what percentage of survey responses suggested each type of STI, together with some examples of each type, drawn from the responses. For analysis purposes, we assigned only one STI type for each response. In practice, an activity can fit multiple innovation types. Figures based on our Delphi survey data.

The direction of current STI differs greatly from stakeholder priorities. Through our global survey (Chapter 7), we gathered a range of perspectives about the potential future contribution of STI towards the SDGs. Responses prioritized policy innovations (37%), social and grassroots innovations (11% and 6%, respectively), and values and direction-setting (20%), rather than the more conventional scientific research and market-oriented innovations (16%), which are currently the focus of a significant proportion of global STI (Figure 0.6).

Even scientists, researchers, and technology developers (who in total comprised 69% of survey respondents) believe that developments in traditional scientific research alone are not sufficient to achieve the SDGs. While the survey uncovered a wide diversity of opinions, there was more positive agreement about policy innovations than about the use of technologies. By focusing on scientific research and market-oriented technologies, existing STI overlooks other types of innovations that are crucial to address the complexity of the SDGs by 2030.

A problem of regional misalignment

Countries focus to a limited extent on research related to their major SDG challenges.

When countries specialize in research that is unrelated to their main sustainability challenges, there is a misalignment between research priorities and the SDGs. In Argentina, for example, major challenges exist in relation to SDG 9 (Industry, innovation and infrastructure), SDG 10 (Reducing inequality) and SDG 15 (Life on land). Despite this, besides SDG15, it prioritizes research on SDG 2 (Zero hunger), SDG 13 (Climate action), and SDG 14 (Life below water). Only SDG 15 appears in both lists (see Chapter 6).

Meanwhile, HICs – which have the most unsustainable consumption patterns, generate more CO_2 emissions and contribute the most to climate change – do not specialize in research on the major environmental challenges relating to SDG 12 (Responsible consumption and production), SDG 13 (Climate action) or SDG 15 (Life on land).

In both examples, the countries' research priorities are not aligned with their most pressing SDG challenges. This is the case for most SDGs (see Figure 0.7). In the few cases where countries specialize in research related to their biggest challenge, this is usually the result of past research specialization (in the case of LICs, often linked to foreign funding), rather than a realignment of priorities following changes in SDG challenges.

Figure 0.7 / Alignment between SDG challenges and SDG research

The charts show the relationship between SDG challenges (2008-2017) and SDG research priorities (2015-2019) for SDGs 2, 4, 6 and 13. See Chapter 6 of the main report for more details.

Countries are shown in different colours based on their income group.

The y-axis represents the research specialization of a country in a certain SDG (> 0 indicates that a country is relatively specialized in research related to that SDG. < 0 indicates less specialization in this area than the world average).

The x-axis represents SDG challenge scores. A score of 1 indicates a major challenge (country furthest away from the frontier in this SDG), and a score of -1 indicates a country at the frontier in this SDG. Each dot indicates a country.

Figures based on Web of Science data (CWTS version) and on the SDG Index data.

> KEY

- High income
- Upper-Middle income
- Lower-Middle income
- Low income

---- Linear regression

---- 95% confidence interval

A problem of closing off relevant STI pathways

There is no singular, self-evident, 'most aligned' STI pathway, even for the most specific of SDG-related challenges. How pathways are prioritized depends on how a diverse set of individuals, organizations and stakeholders frame their values, interests and priorities.

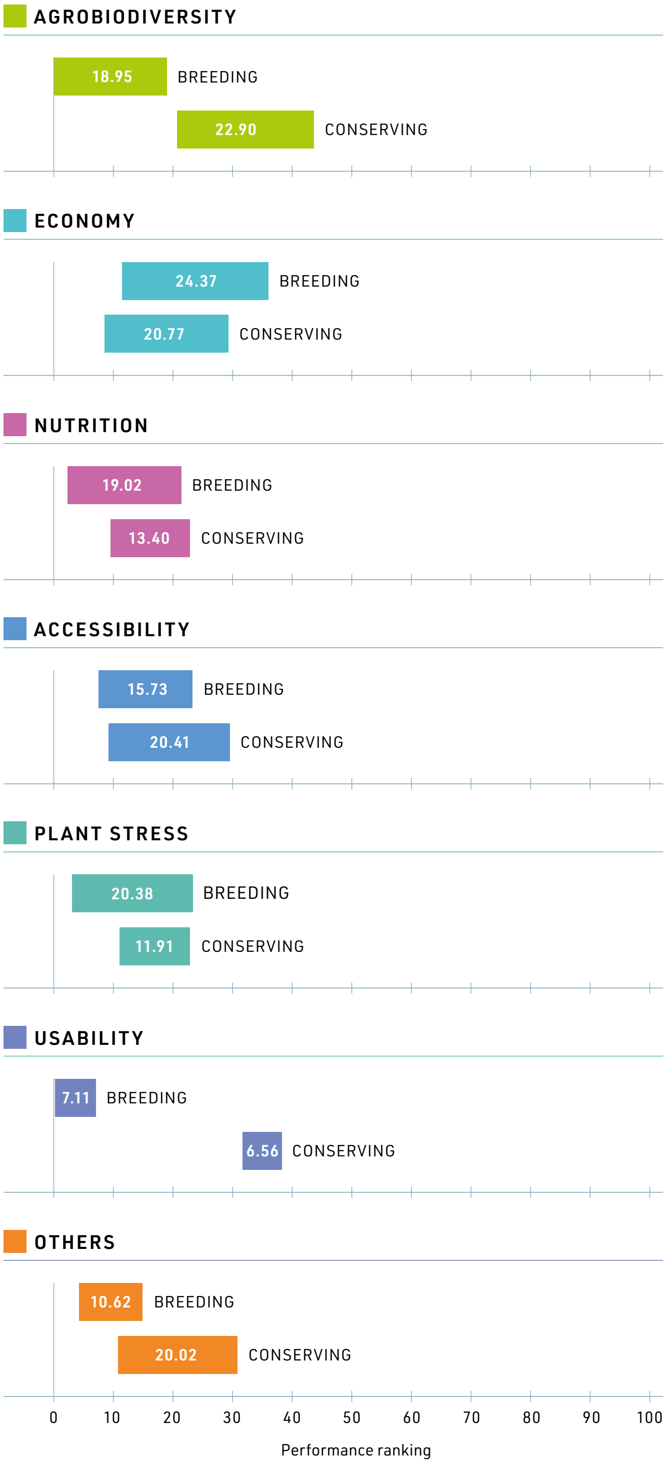
Our case studies (Chapter 8) illustrate how particular pathways can become dominant, sometimes closing down alternative ways to achieve the SDGs. In India, for example, we explored two distinct STI pathways to develop and access rice seed varieties that are resilient to the challenges of climate change: (1) breeding new seeds in laboratories, and (2) conserving and exchanging seeds from indigenous plant varieties. To what extent each pathway is prioritized depends on the actors involved and their influence.

While many relevant STI pathways exist, a few individuals, organizations and stakeholders tend to be in control of STI decisions and one (or a few) pathways will dominate in terms of funding and policy attention, even when they are not the most supported by wider society. This is the case in the Indian case study. There was strong agreement among the various stakeholders involved in our research that the conservation pathway (which involved local civil society organizations, seed champions and seed conservationists) was the better performing in terms of agrobiodiversity and usability (Figure 0.8). However, unlike the breeding pathway (which involved government institutions, universities and private firms), the conservation pathway has received little support or investment from public institutions.

Likewise, our case studies in Argentina, India and Kenya illustrate how certain pathways are more successful than others in aligning diverse STI pathways with priorities and challenges within the SDGs (Chapter 9).

Our analysis has revealed several opportunities for policymakers, national and global funders and NGOs to steer STI activities towards solving, rather than exacerbating SDG challenges.

Figure 0.8 / Appraisals of seed pathways in Odisha, India



We gathered stakeholders' views about how well two STI pathways in India could address various sustainability issues (see Chapter 9 of the main report). Each bar represents the range from the average optimistic score to the average pessimistic score ascribed to a pathway by different groups of participants in our case study research. The difference between these two scores is a measure of uncertainty, shown as the number inside each bar.

Ways forward: our recommendations

For STI to make a substantial contribution to address SDG-related challenges within regions, nations or at a global level, we have provided recommendations and tools to inform effective policy actions and encourage active and inclusive debates.

Increase funding for SDG-related research and innovation and improve alignment between STI portfolios and SDG priorities

Research funders, aid organizations involved in research funding, INGOs and the academic community should:

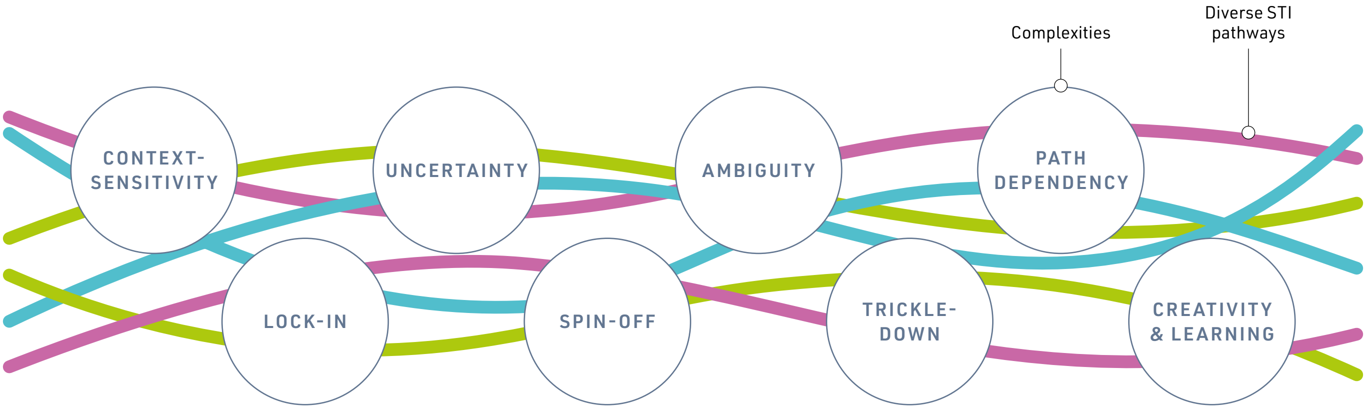
Ensure STI funding and research is directed towards SDG-related issues by:
- directing funding in HICs and UMICs with unsustainable consumption and production patterns towards research that addresses environmental issues
- ensuring that national and international funding frameworks support SDG-related research that involves a leading role for research organizations based in LICs
- regularly reviewing priorities for research funding based on consultations across different disciplines and sectors of society, in order to support shifting local and national sustainable development priorities
- overcoming historical and ingrained patterns of funding and responding to national and local challenges to guide decisions in funding R&D portfolios
- enabling open and plural decision-making, including identifying and implementing funding priorities through participatory processes with civil society organizations and research users

Increase funding of research into underlying issues of deprivation, inequalities and conflict by:
- increasing funding for research and innovation that focus on the complex social, historical and political determinants of sustainability, related to inequalities and conflicts
- steering public funding to complement, rather than follow, private funding directed at technological solutions

Focus on research areas that connect to several SDGs by:
- funding more research that explicitly investigates tensions and synergies between different aspects of sustainability
- connecting research on deep-seated issues of deprivation, inequalities and conflict with research on more technical solutions

Involve a more diverse set of actors in research funding decisions by:
- directly funding research institutes in LICs and including researchers and stakeholders from these regions in the research and decision-making processes
- ensuring that collaborative projects are equitable partnerships, thus creating more opportunities for equitable knowledge transfers and capacity-building
- including LIC researchers and stakeholders in the advisory and management committees of funders, to ensure their views are considered in planning, defining and evaluating research agendas

Figure 0.9 / Addressing complexities through deliberate diversification



A diverse research or innovation portfolio offers a more robust approach than conventional policy appraisals (see Chapter 10 of the main report).

Adopt a more holistic approach to research funding design and evaluation by:

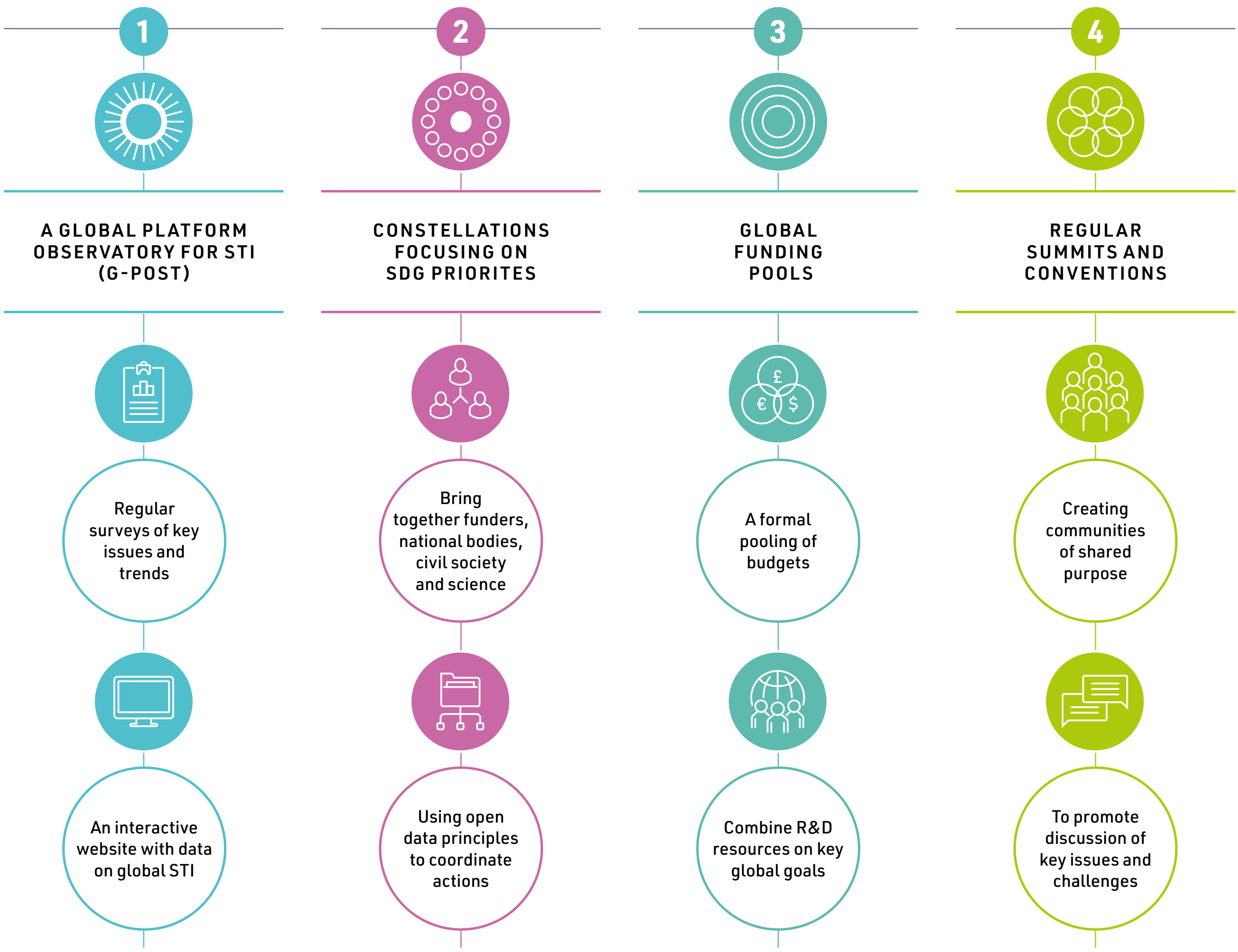
- providing greater support for interdisciplinary and transdisciplinary research, to improve the understanding of synergies and tensions between socioeconomic, environmental and infrastructure-related SDGs
- increasing the involvement of users from across policy, industry and civil society – including marginalized knowledge producers such as small farmers, water conservationists and informal organizations – in the design, conduct and evaluation of formal research and social innovations, to address the complex, interwoven challenges of the SDGs
- adopting research evaluation measures that promote and value the production of knowledge in multiple arenas beyond formal science and technology, including social innovations and 'indigenous' knowledge
- considering the positive and negative impacts of research on society as perceived by different stakeholders

Promote a rich diversity of STI pathways to address the diverse SDG challenges (Figure 0.9)

Policymakers, governments, civil society and aid organizations should:

- Encourage debates involving and including a diverse set of actors to help steer STI in more balanced ways.
- Ensure decisions about which STI pathways to prioritize involve the stakeholders affected by those decisions, to allow more democratic representation of a wide range of values and interests around different SDGs.

Figure 0.10 / How global governance of research and development can support the SDGs



- Put in place processes and mechanisms, such as public consultations or talking with diverse actors, to question how STI pathways are analysed from diverse perspectives.

Research funders and aid organizations involved in research funding should:

- Compare how different STIs address different challenges, rather than focusing on advancing specific STIs.
- Maintain a diverse and balanced portfolio of R&D to address challenges, particularly those that are sensitive to different contexts.
- Promote diversity in research and innovation to counterbalance specific R&D interests that might emphasize singular directions.
- Ensure transparent communication of research findings, participatory involvement, open accountability and democratic governance.

Design accountable initiatives that strengthen STI governance and support open and inclusive processes of deliberation and prioritization (Figure 0.10)

Policymakers, INGOs, civil society organizations and aid agencies should:

- Establish a global platform observatory to conduct regular surveys of international R&D, its diversity, inclusion, scale, locations, purposes and impacts (the platform would work closely with the International Science Council, the International Network for Government Science Advice, OECD, UNESCO, as well as civil society, business, universities and other users of STI).
- Bring together a 'constellation' of funders, civil society, business, universities and science policy decision makers to replicate the type of exercises undertaken by the STRINGS project, to align research to potential challenges by using open data, open coordination and engagement of users.
- Organize regular gatherings to create communities of shared purpose and understanding, as well as encouraging wider social deliberation over the steering of policy.

Research funders should:

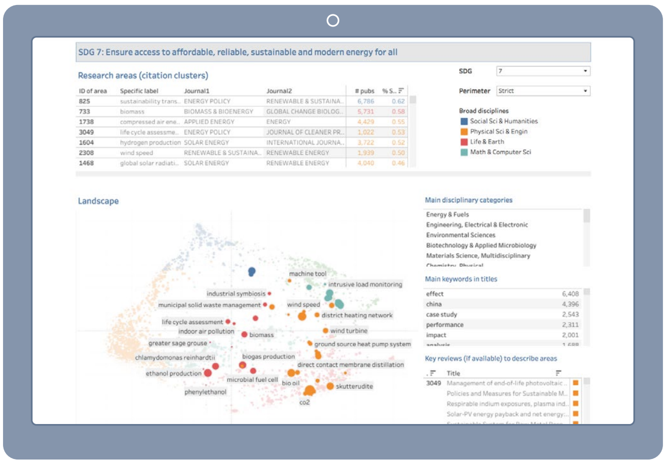
- Establish formal global funding pools to combine R&D resources on key global goals established through open and inclusive deliberations in the global platform observatory.

Empower stakeholders to express different interpretations of what counts as SDG-related STI

Research funders, the academic community and aid organizations involved in research funding should:

- Develop and maintain open analytical tools (such as visualization platforms – see Chapter 12) that can be adapted and scrutinized by users in collaboration with policymakers and civil society organizations. The tools should enable different stakeholders to decide which research and innovation areas are most appropriate for addressing an SDG, according to their contexts, needs, values and aspirations (Figure 0.11).
- Develop databases to capture STI activities in social sciences, in applied fields and in LIC and LMICs. This includes publications in diverse languages; research outputs other than publications and patents; adaptations of existing technologies; and incremental innovations, social innovations, policy innovations and grassroots innovations outside the formal sector.
- Improve the internal consistency, comparability and overall quality of data, especially in LICs and LMICs. For example, among the 388,792 data points to measure progress in the SDGs over 2000-2021 for 193 countries (Sachs et al. 2021), 221,426 are missing (57%); and these are mainly from LICs and LMICs.

Figure 0.11 / Interactive visualization of the research landscape for SDG 7 (affordable and clean energy)



The STRINGS interactive tool (see Chapter 12 of the main report) enables users to create their own mapping of scientific research to the SDGs. Users can adjust settings to identify research areas that are potentially relevant for each SDG.