



Public Goods and STI Policy

Introduction

Public Goods, whether they are Global Public Goods (GPG) or Regional Public Goods (RPG) are crucial for the well-being and sustainability of the society. The key role of international STI co-operation in providing, promoting and protecting GPG is widely recognised. In this Policy Brief we discuss how STIP can contribute to this and also point out that India plays a key role in protecting, promoting and providing RPG and such a role will provide many advantages. On the other hand, many activities in development co-operation are directly or indirectly linked to Public Goods including RPG. STI has a role and it can be expanded. This Policy Brief discusses GPG and RPG and points out how STIP can play an important role regarding them. It calls for creating a synergy among policies and programmes and makes suggestions for Science, Technology and Innovation Policy on dealing with Global Public Goods and Regional Public Goods

Public Goods, Global Public Goods and Regional Public Goods

He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me.

—Thomas Jefferson

The concept of Public Good (PG) is based in what Paul Samuelson articulated in his famous article published in 1954. A public good refers to goods that are non-rival and non-excludable where as private goods can be used/consumed by excluding others. What are all the public goods is difficult to define or decide as over the years this concept has been used in different contexts to underscore different points.¹ The table 1 gives an idea on different types of goods and how they can be classified in terms of excludability.

A well-known example of a public good is Light House and benefit derived

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¹ For reasons of space we will not go into details or give a review of the major ideas in this topic. Suggested readings include

Thomas Laudal 2020 A New Approach to the Economics of Public Goods London: Routledge

C. Leigh Anderson & Travis Reynolds 2016, Global Public Goods, EPAR Research Brief #325, Seattle: University of Washington

Samuel Cogolati 2016, GLOBAL PUBLIC GOODS OR COMMONS AS A LENS TO DEVELOPMENT? A LEGAL PERSPECTIVE , Working Paper No. 179 Leuven Centre for Global Governance Studies and Institute for International Law, University of Leuven (KU Leuven)

² Dana Dalrymple 2003, Scientific Knowledge as a Global Public Good: Contributions to Innovation and the Economy in The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium. Esanu JM, Uhlir PF, (Editors), Washington DC : National Academies Press

³ Sachin Chaturvedi, Mustafizur Rahman, and, Krishna Ravi Srinivas 2019, Leveraging Science, Technology and Innovation for Implementing the 2030 Agenda , G20 2019 Japan/T20 Japan, Tokyo <https://t20japan.org/policy-brief-leveraging-science-technology-innovation-2030/>

⁴ For example: Taylor L. 2016 The ethics of big data as a public good: which public? Whose good? Phil. Trans. R. Soc. A 374: 20160126. <http://dx.doi.org/10.1098/rsta.2016.0126>

by one ship is not the cost of the other. It has also been pointed out that science itself can be considered as a (Global) Public Good². Similarly, Knowledge can be considered as a public good while it has been argued that international agricultural research is also a public good.

The non-rivalry and non-excludability aspects of public goods results often in under provision or under supply of them on account of free-rider and collective-action problems. This makes them a case for market failures and hence the common argument is that supply and provision of public goods and services cannot be left solely in the hands of markets. Given the inherent free rider problem, intervention by the state is necessary to ensure that they are available. This does not mean that the state should provide all of them on its own. But the issue is complex than that because transforming knowledge into something or harnessing science for innovation are not simple. According to Chaturvedi, Rahman and Srinivas, drawing on ideas on Stiglitz on knowledge as global public good, point out that Archibugi and Filippetti's position that knowledge as a public good implies normatively that greater public investment and global co-operation is necessary.³ They call for greater utilization of STI for provision of Global Public Goods and cite examples like CGIAR to argue that such global initiatives have played a key role in agriculture.

On the other hand, environmental/ natural commons like air, biodiversity, and the oceans can be considered as examples for public goods. Often natural commons are consumed indiscriminately and poorly maintained resulting in damages to them, and, reduction in terms of quality and quantity. As it can be noticed public goods need not be tangible or physical goods, nor they need to be quantifiable or reduced to monetary value. Over the years the definitions and categorization of public goods has expanded and in recent years knowledge/science-based goods such as weather data, geo-spatial information, health data and internet have also been considered as public goods.⁴

Having said these we should also point out that such an expansive definition of public goods has enormous implications for science, technology and innovation and for policy and governance of Science, Technology and Innovations because digitisation is impacting in a major way science is done, and information is shared.⁵

Defining Global Public Goods (GPG) is difficult and there are many definitions, Inge Kaul and her colleagues define GPGs as 'outcomes (or intermediate products) that tend towards universality, in the sense that they benefit all countries, population groups, and generations'

Like typical public goods GPG are non-rival and non-excludable. The under

Table 1: Types of Goods

	Excludable	Non-Excludable
Rivalrous	Private Goods Food, Clothing, Cars, Parking Spaces	Common Goods Fish stock, Timber, Coal
Non-Rivalrous	Club/Toll Goods Cinemas, Private Parks and Satellite Television	Public Goods Free to air Television, air, National Defence

Source : C. Leigh Anderson & Travis Reynolds 2016, P2 .

provision by market is also one aspect of GPG that merits interventions at global level as a single state alone will not be able to address this. Goods or resources that occur across border involving two or more countries can be considered as GPG. But as pointed out earlier now GPG includes resources such as data and information also. Recognising this UN has recently has talked of initiatives in Digital Public Goods including Digital Public Goods Alliance and suggested that countries should promote open source software, open data and open content.

⁶Global Commons are GPG. A useful framework to understand them is based on the concept of ‘Planetary Boundaries’ In 2009, by Stockholm Resilience Centre. It identifies nine areas of ‘Planetary Boundaries’ as : Stratospheric ozone depletion, Loss of biosphere integrity (biodiversity loss and extinctions), Chemical pollution and the release of novel entities, Climate Change, Ocean acidification, Freshwater consumption and the global hydrological cycle, Land system change, Nitrogen and phosphorus flows to the biosphere and oceans, and, Atmospheric aerosol loading.⁷ Basically the Boundaries are closely tied with Global Commons and hence when the boundaries are breached it affects us, irrespective of who or what caused it.

According to Bodansky, “Global public goods involve externalities writ large, and thus raise the familiar problems associated with externalities. To the extent that a good provides uncompensated benefits to the international community, it tends to be under-provided. Since states cannot be excluded from receiving the benefits of a global public good, whether they contributed to its creation or not, they are able to free ride on the efforts

of others. Conversely, to the extent that a global public good is bad – to the extent that it produces negative rather than positive externalities – then it tends to be over-provided.” (P 658).⁸

Thus, it is also a case for states to co-operate or not to co-operate among themselves and one with another to protect and nourish the GPG, particularly the global commons. In fact, a strong case for such a co-operation has been made by Scott Barrett⁹

How successful human kind has been in protecting the global commons is a matter of dispute. Despite significant victories, we cannot claim that our future is secure as we have adequately protected global commons. But there is more to this than we assume. According to Bodansky, GPG come in different types, with different ‘production technologies’. He further points out that different types of GPG raise different governance issues. So, unless this is taken into account specific solutions cannot be arrived at.

In the recent times GPG are understood in a very broad sense including mechanisms, institutions and frameworks. According to OECD

“GPGs are in this context understood as certain measures or mechanisms of a non-rival and non-excludable nature, such as institutions, frameworks or resources provided through (co-operative) policy to achieve sustainable levels or values in the global commons. More precisely, *GPGs are the technologies; knowledge, institutions and framework conditions that can help sustain the global commons. Science, technology and innovation policy will have a key role to play in delivering GPGs that can help countries in their efforts to tackle many of the SDGs such as a cleaner environment, global public health and poverty reduction.*¹⁰ (*italics in original*)

⁵ OECD (2020), The Digitalisation of Science, Technology and Innovation: Key Developments and Policies, Paris: OECD <https://doi.org/10.1787/b9e4a2c0-en>.

⁶ United Nations 2020, Road map for digital cooperation: implementation of the recommendations of the High-level Panel on Digital Cooperation A/74/821, Seventy-fourth session Agenda item 14

⁷ (<https://www.stockholmresilience.org/research/planetary-boundaries/planetary-boundaries/about-the-research/the-nine-planetary-boundaries.html>).

⁸ Daniel Bodansky, 2012, What’s in a Concept? Global Public Goods, International Law, and Legitimacy EJIL 23 (2012), 651–668

⁹ Scott Barrett 2007, WHY COOPERATE? The Incentive to Supply Global Public Goods, Oxford: Oxford University Press

¹⁰ OECD 2019, Concept Paper, STP Workshop on STI for Global Public Goods, 6-7 June 2019, Oslo, Norway Concept Paper and Draft Agenda, Oslo. Paris: OECD

This perspective combined with the ideas that Science and Knowledge could be considered as Public Goods, gives an idea that GPG can also be intangible resources that can be designed and developed and more importantly can be adopted/adapted. The implications for STIP from this are enormous and a good combination of resources, institutions and frameworks can make a difference in the situation regarding public goods, global or otherwise. STIP can play a key role in this and can facilitate developing such a combination.

Regional Public Goods (RPG)

The concept of Regional Public Goods has gained attention in the last two decades, particularly in Asia and Latin America. Co-operation in GPG is often difficult and it needs efforts at global level to do this and contribute to GPG. Moreover, provision of PG can be made across spatial categories and efforts at different levels can be complementary and mutually reinforcing. For example, if countries in a region voluntarily decide to reduce Co2 emissions more than what they have committed, it benefits the region as well the global commons. From a funding and collaboration perspective regional efforts are relatively easy to organise. In case of STI organisations like ASEAN have significant programmes in STI co-operation. On the other hand, the literature on RPG deals with broad issues within the region and also on financing for RPG, role of RPG in sustainable development, and, how investing in RPG can contribute to regional development.¹¹ OECD defines RPG as “an International Public Good which displays spill-over benefits to the countries in the neighborhood of the producing country, in a region which is smaller than the rest of the world.”¹²

Justifying the need to focus on RPG, Antoni Estevadeordal Brian Frantz, and, Tam Robert Nguyen, write: “The conceptual boundaries of providing public goods require some rethinking, especially in the context of aid and development. First, the potential benefits of many so-called “global public goods” such as clean air are actually “regional” in nature, and a promising way to supply such goods may lie in regional solutions. Second, from a pragmatic point of view, the provision of regional public goods may present fewer challenges to overcome, such as reduced transaction costs associated with multi-country coordination or achieving consensus and agreement on priorities, compared to the provision of many global public goods” (P13)¹³

The Inter-American Development Bank defines RPG as

“The Initiative defines regional public goods (RPGs) as goods, services or resources that are produced and consumed collectively by the public sector and, if appropriate, the private, non-profit sector in a minimum of three borrowing member countries of the IDB. The Initiative focuses on RPGs that have the potential to generate significant shared benefits and positive spillover effects. Spillover effects can be expressed in terms of scope (benefits extend beyond the originally targeted sector in each country) and/or scale (benefits extend beyond the original group of countries).”¹⁴

Thus, RPG can have spill over effects or benefits that go beyond the specific countries/regions. If we consider this in terms of Regional Commons it will be obvious that any such spill over or benefits will in turn have a positive impact on Global Commons or GPG. But if policies on RPG result in safeguarding Regional

¹¹ See for example Antoni Estevadeordal and Louis W. Goodman (editors) 2017, 21st Century Cooperation: Regional Public Goods, Global Governance, and Sustainable Development London: Routledge

Asian Development Bank 2018, TOWARD OPTIMAL PROVISION OF REGIONAL PUBLIC GOODS IN ASIA AND THE PACIFIC CONFERENCE HIGHLIGHTS 10–11 May 2018 • Tokyo, Japan OCTOBER 2018, Metro Manilla : ADB

¹² OECD Development Centre, 2004 . Financing Global and Regional Public Goods through ODA: Analysis and Evidence from the OECD Creditor Reporting System. *Development Centre Working Papers*. No.232 Paris: OECD

¹³ Antoni Estevadeordal, Brian Frantz, Tam Robert Nguyen (Editors) 2004, Regional Public Goods From Theory to Practice , Inter-American Development Bank <https://publications.iadb.org/publications/english/document/Regional-Public-Goods-From-Theory-to-Practice.pdf>

Commons at the cost of Global Commons then it will have different implications. For example, if a region decides not to cause marine pollution within the region but shifts it elsewhere by dumping in oceans that are beyond its territories this is at the cost of Global Commons. Still this is not a good strategy because Regional Commons and Global Commons are connected.

In the last two decades or so, while the scholarship on GPG has expanded, the idea of RPG and using various means to advance and protect RPG have also gained prominence as institutions like ADB, World Bank and UNIDO evinced interest in it. Another reason has been that regional co-operation has expanded significantly in the last two decades and regional alliances like ASEAN, CARICOM have been working on issues related to environment, S&T etc. So, it makes sense to pay attention to RPG.

Role and Relevance of STI and STIP in Global and Regional Public Goods

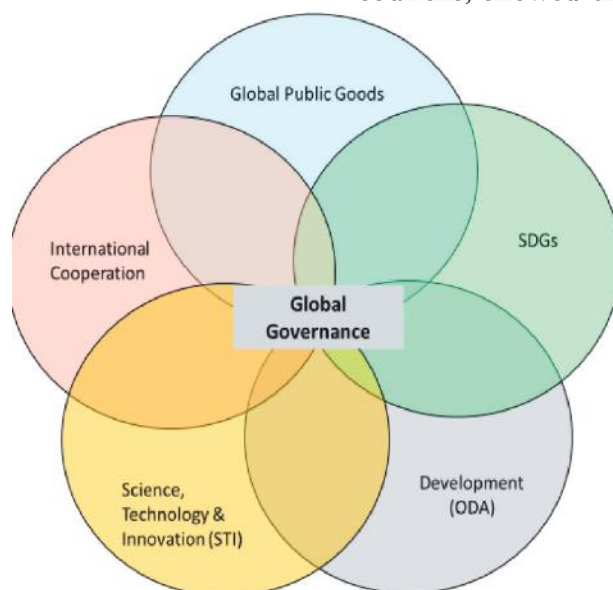
It is obvious that Science, Technology and Innovation have direct relevance for PG/GPG/RPG and hence documents that link

SDGs with STI also discuss GPG on one hand, and, the issues on using STI for GPG related matters on the other hand. In other words, as the diagram below shows STI is at the key linkage position in any plan on GPG.¹⁵

In light of discussions on SDGs, and, Global Commons, the role of STI in protecting Global Commons on one hand, and, its role in providing PG/RPG at national and regional levels is significant. This looks fine in theory, but is the international co-operation in STI is adequate in this? One method is to see how much countries are spending/investing in international co-operation for SDGs. According to OECD

“The challenge for countries is how to balance their national priorities and goals (e.g. competitiveness and research excellence) and engage in coordinated and concerted action at the international level to solve global public-good problems.”

Recent OECD analysis based on sample data from ÜberResearch’s Dimensions for Funders database, which gathers data from national funding councils, showed that research projects



Source: OECD 2019, P3.

¹⁴ <https://www.iadb.org/en/sector/trade/regional-public-goods/characteristics#:~:text=The%20Initiative%20defines%20regional%20public,member%20countries%20of%20the%20IDB.>

¹⁵ OECD 2019, Concept Paper, STP Workshop on STI for Global Public Goods, 6-7 June 2019, Oslo, Norway Concept Paper and Draft Agenda, Oslo. Paris: OECD

that could relate to one of the 17 SDGs represented only about 11 per cent of the total number of projects funded in 2015. International co-operation occurred in about 2 per cent of these projects, meaning that international co-operation for SDGs represents about 0.2 per cent of all STI projects (OECD, 2017).¹⁶ (P 106)

Thus, within STI projects the co-operation for SDGs is very less, and is insignificant. Hence while the rhetoric of STI for Global Commons are all fine, more needs to be done at the level of countries and global level. But the reality is not that encouraging, particularly if we look at how countries are responding to commitments under Paris Agreement and despite all promises, it is becoming more and more evident that we are nowhere near the targeted reduction in emissions.

On the other hand, the recent thrust on STI for SDGs through Road Mapping Exercises and Pilot Projects indicates that the relevance of STI in production and distribution of Public Goods will be understood better and more emphasis on STI in production and distribution of PGs of different types will be given.

India is a party to various global agreements on environment and is also an important contributor to UN and its agencies. For example, in case of WHO, India is emerging as a key donor, that benefits from WHO and also contributes to its global agenda and action plans. India is committed to meeting its national targets in reduction of greenhouse gases. Globally India was a key player in negotiations under Montreal Protocol on finding and funding technological solutions and in promoting technology transfer. Similarly, India has played a key role in setting up Technology Facilitation

Mechanism and operationalising it. In addition to these, it is also contributing to STI for SDGs by undertaking Pilot Programme, and, is playing a major role in pushing for importance of STI in SDGs and for SDGs. Thus, India is doing a lot in terms of contribution of resources or otherwise for GPG.

India's bi-lateral and multi-lateral engagement in development co-operation also contributes to global public goods, national public goods and regional public goods. Similarly, India's bi-lateral, multi-lateral engagement is significant in terms of knowledge production, innovation, frameworks that enable production of public goods. Directly or indirectly STI is an important component in India's development co-operation. India's co-operation with countries in the South Asia region is significant. India through sharing of weather data, tsunami warning system and by various other means contributes in a major way in protecting regional commons and livelihoods. By capacity building initiatives and various programmes, it contributes to RPG. In India's engagement with regional alliances such as BIMSTEC and ASEAN, the STI dimension is important.

India attaches much importance to South-South Co-operation and this is translated into action in its development co-operation and other programmes in Africa and other regions of the world. As the foot print and scope of India's engagement with world increases, the key role of STI in this and its role on PG is obvious.

If we take all these into account it becomes clear that India contributes in a major way to PG at national levels, RPG at regional level and GPG at global

level. Although it is difficult to quantify this there is no doubt that India makes a significant contribution to PG at different levels.

From a STIP perspective we need to revisit these for building synergies among various programs and in ensuring that India benefits from its contribution to PG at different levels and in different scales. It is also important to develop a STI perspective on PG in different modes and means of engagement.

Conclusion

In this policy brief we have pointed out how STI can contribute to Global Public Goods and Regional Public Goods and why an engagement with them is necessary for STIP.

Policy Recommendations

- There is need to form a working group to assess contribution of India to different categories of Public Goods at different levels and evaluate whether we have adequate data on this and the impacts of this contribution at the global level, national and regional levels.
- A group should also be established to understand the importance of Indian STI for Public Goods at the national level, regional level, and global level, in terms of contribution and impacts. The group should also look at the multiplier impacts/effects of STI for production, consumption and protection of Public Goods
- There is a need to create synergies among programmes and initiatives that are directly or indirectly related to STI and Public Goods. This is important particularly among Development Co-operation, South-South Co-operation and S&T Co-operation Programmes

- As Regional Public Goods are getting more importance and since India has a distinct advantage in designing, developing and making them available, and, as STI has an important role in this, it is suggested that a strategy for RPG with a focus on STI can be prepared. In this context, as the definition and perspectives on RPG have expanded, India should think beyond South Asia. India can help other regions in their programmes on RPG and leverage its strength for it. To do this, DST and MEA should map the field, take note of recent developments and explore opportunities that may open up. But it is also important to do a SWOT analysis of India's engagements in Regional Public Goods and what lessons can be learnt from experiences in that. It is also important to understand how STI can be leveraged better in matters related to RPG.
- India's contribution to Global Public Goods has been important. India as Party to many global environmental Agreements, Treaties and Conventions has played a major role in bringing in the voice of developing countries in them. Whether it is biodiversity or climate change or issue of ozone layer, India has helped the global discourse and policy in many ways. Thereby, it has directly and indirectly contributed to Global Public Goods and Global Commons. But we need an analysis of India's contribution and experience to Global Public Goods and Global Commons so that a better strategy can be formulated.
- The role of STI in this should be studied so that in future India can leverage STI better in negotiations related to Global Commons and Global Public Goods. Based on this a strategy can be developed

that creates synergy between STI policy and policy on Global Commons and international environmental law.

- India is committed to Sustainable Development Goals (SDGs). Many SDGs are related to provisions of Public Goods and in this role of STI is crucial. India is also part of the Global Pilot Programmes. It is time to look at this from a Public Goods perspective and examine how STI can make better contribution to provision of Public Goods and sustain this. The SDGs can be analysed from a Public Goods perspective to understand in which SDGs are Public Goods have a crucial role and how STI can be leveraged for this. It is true that all SDGs have linkages with Public Goods, but in some SDGs, Public Goods have a crucial role. In other words, achieving them depends greatly on providing Public Goods. And as STI has an important role in it, understanding the nexus between Public Goods and STI in the context of SDGs will help in better leveraging of STI in this.
- Whether it is Development Co-operation or South-South Co-operation in STI, the Public Goods dimension and STI has to be studied. This is important to develop a plan that can enable India to understand better the emerging opportunities as well as identify and deploy India's unique strengths in STI.
- There is also a need to develop a specific strategy on Public Goods and STI and this can be done for different types of Public Goods and the overall strategy should ensure that there is synergy and if that is not possible complementarities are created.
- That strategy should come out of Science, Technology and Innovation Policy and for that the Policy should recognise first that we have to get a better understanding of linkages between Public Goods of different types and STI in different programmes and initiatives (including Development Co-operation and South-South Co-operation and North-South-South Co-operation)
- Finally, DST and other Ministries/ Departments should explore the challenges and opportunities that will arise on account of better engagement in Public Goods in future and ensure that they are prepared for them.

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