Four Decades of RIS
Conceptual and Methodological Contributions

Volume II

RIS
Research and Information System
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विकासशील देशों की अनुसंधान एवं सूचना प्रणाली

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Zone IVB, 4th Floor, India Habitat Centre
Lodhi Road, New Delhi - 110 003, India
Tel.: +91-11-24682177-80; Fax: +91-11-24682173-74
E-mail: dgoffice@ris.org.in
Website: www.ris.org.in

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RIS INFRASTRUCTURE INDEX

Background

Quality infrastructure is a critical enabler of a country's economic growth and development. Adequate and well-planned investment in social and economic infrastructure, most importantly private investment, can bridge developmental gaps between the haves and the have-nots. Furthermore, trade-facilitating infrastructure like transport connectivity is fundamental in providing impetus to export promotion and regional economic integration.

Literature on the subject covers a vast range of issues encompassing interlinkages between physical infrastructure and economic growth of countries and regions (e.g. Aschauer, 1989; Easterly and Rebelo, 1993; and Gramlich, 1994; World Bank, 1994 for reviews), complemented by corroborative studies analysing how physical infrastructure determines patterns of foreign direct investment inflows (FDI) (e.g. Wheeler and Mody, 1992; Loree and Guisinger, 1995; Mody and Srinivasan,

1996; Kumar, 1998, 2000, 2002a, 2002b). Studies have also highlighted infrastructure as a critical determinant of ensuring high productivity of investments, which, in turn, catalyse FDI (Asidue, 2002).

In line with these developments, studies have asserted the inextricably positive linkage between trade and infrastructure. In fact, the prevalence of low trade networks and high transport costs owing to deficits in infrastructure has been observed in many African countries (Brun et al., 2005; Vijil and Wagner, 2012). This is especially true for landlocked countries that incur extremely high transportation costs. Another set of studies has tried to address the linkage between foreign aid, trade and infrastructure. Vijil and Wagner (2012) find that aid-for-trade strengthens the export performance of recipient countries through the positive contribution of foreign aid in augmenting the infrastructure stock of these countries. In fact, most of the aid-for-trade is allocated with the sole objective of enhancing the infrastructure capacity of recipients through various projects.

Yet, measurement and quantification of infrastructure remained an empirical challenge in the recent past. The root of this conundrum can be traced to the definitional and conceptual understanding of infrastructure. 'Infrastructure' as a concept is an umbrella term that encapsulates numerous sub-components, which underscores the need for a comprehensive methodological framework. In this context, the foremost bottleneck that confronted researchers was the absence of a standardised

framework to measure the availability of different infrastructure components objectively. These components are inclusive of facilities like transportation comprising of the road network, ports and airports, etc.; communication infrastructure covering telecommunication network; information infrastructure; energy availability, etc; and thus necessitate an overarching methodological framework. (see World Bank, 1994, for indicators of different aspects)

Hitherto, most methodologies in literature tended to exclude one or the other infrastructure components leading to oversimplification of the measurement frameworks of infrastructure. This greatly compromised the practical utility of these methodologies. For instance, a country may be strong in road infrastructure but may have poor telecommunication or information infrastructure. Therefore, a measure of either road transport infrastructure or telecommunication infrastructure would fail to capture the true essence of the overall availability and quality of infrastructure in the respective country.

In the absence of a single comprehensive indicator of infrastructure, faculty at RIS endeavoured to construct an Infrastructure Index (also known as the RIS Infrastructure Index) for 104 countries, comprising all EAS members for three points of time- namely 1991, 2000 and 2005. The index overcomes the aforementioned empirical challenges by incorporating a wide range of infrastructure components. Furthermore, it is capable of measuring the gaps in infrastructure development in

conjunction with the overtime performance of countries which ensures its practical utility for policy-related purposes in the inter-country context.

Review of literature

The literature pertaining to the methodological debate traces its origin to the World Economic Forum reports that provide country scores and rankings on infrastructure based on a plethora of indicators. However, the scores in the WEF reports suffer from various measurement-related limitations which obscure their utility for quantitative and comparative analysis. Overall, there are two major limitations highlighted by literature in the construction of infrastructure indices. Firstly, there is a distinct lack of a comprehensive and comparable measure for infrastructure that encapsulates all the relevant indicators and aspects of infrastructure for a large number of countries and over a long period of time. Secondly, the literature has also highlighted the problem of high collinearity among the various indicators of infrastructure, which exacerbates the problem of identification if all are included in a regression analyses (Donaubauer *et al.*, 2015). Serious efforts have been made to overcome these shortcomings over time.

Canning (1998) undertook a comprehensive study to analyse the specific indicators that comprise infrastructure for a large sample of countries over the period 1950-1995. Although his study focused on the comparison and reliability of six specific

indicators, it shied away from constructing an overall index of infrastructure. Furthermore, as highlighted above, most studies have either used a very restrictive working definition of infrastructure or limited their analyses to specific aspects of infrastructure. For instance, Röller and Waverman (2001) assessed the impact of telecommunication on economic development. Similarly, Hoffman (2003) examined the relationship between public infrastructure and international capital flows by taking into consideration limited specific indicators like international telephone circuits, total length of roads and the number of aircraft departures.

Some studies have tried to go beyond these narrow approaches by broadening the tools of measurement and capturing several aspects of infrastructure. Limão and Venables (2001) and Brun *et al*. (2005) sought to assess the links between infrastructure and transport costs by using simple averages of specific indicators and applying uniform weights to all the aspects of infrastructure. To tackle the problem of uniform weights, Kumar (2006) and Francois and Manchin (2013) used principal component analysis (PCA) using panel data for a specific set of countries. Kumar (2002a, 2002b) formulated an Infrastructure Index based on six indicators comprising of transport infrastructure, communication and information infrastructure and energy availability using principal component analysis (PCA) for a sample of 66 countries covering three time periods viz. 1982, 1989 and 1994. The index contributed to ascertaining the inter-country variations in the

patterns and quality of FDI inflows across sample countries owing to infrastructural gaps.

In the South Asian context, De and Ghosh (2003, 2005a) constructed a composite index of infrastructure development for South Asian countries and found that rising inequality in infrastructure is a key determinant of widening income gaps in South Asia. Studies have also analysed the inter-linkages of infrastructure facilities with other crucial variables like economic growth and regional trade, among others. For instance, De (2005, 2006) constructed infrastructure development indices for Asia and found evidence of a positive association between infrastructure facilities and economic growth in the region. As per the study, the quality of transport facilities-an important component of infrastructure- plays a key role in determining the magnitude of trade and transaction costs in the Asian region. Similar infrastructure indices have also been formulated by De and Ghosh (2004, 2005b) to study and enable a disaggregated analysis of infrastructure in Indian states in the sub-national context.

Methodological framework by RIS

In consonance with the theoretical narrative delineated above, and inspired by the work previously done at RIS, De and Kumar (2007) constructed an RIS Infrastructure Index (from here RII) using PCA for 104 East Asia countries, the methodology and findings of which have been described in the following sections.

Research Methodology

In view of the methodological challenges prevalent in estimating infrastructure availability, faculty at RIS constructed a comprehensive measurement framework for infrastructure access in the inter-country context. Despite the complementary nature of various aspects of physical infrastructure, such as telecommunication, transport and banking infrastructure (Canning, 1998), it was accepted that none of the components could exclusively capture the overall availability of infrastructure adequately. For instance, a country may be very well-equipped in terms of a wide road network but may suffer from deficits in the telecommunications sector. To overcome this limitation, the RIS Infrastructure Index uses the statistical technique of principal component analysis (PCA), which comes in handy in constructing a unique single index that encapsulates the variance or information contained in different variables, thereby capturing different aspects of infrastructure. As a statistical technique, PCA finds linear combinations of the original variables to construct the principal components or factors with a variance greater than any single original variable.

$$RII_{it} = \sum W_{jt} X_{jit}$$

Where RII_{it} = RIS Infrastructure Index of the i-th country in t-th time, W_{jt} = weight of the j-th aspect of infrastructure in the t-th time, and X_{jit} = value of the j-th aspect of infrastructure for the i-th country in the t-th time point.

To ensure the robustness of the index, each of the infrastructure variables is normalised for the size of the economy so that it is not affected by the scale. Furthermore, W_{jt} i.e. the weights applied, are estimated with the help of PCA.

The RII encompasses a plethora of components/aspects of physical infrastructure that add to its composite, comprehensive and objective nature. In general, transport infrastructure covers a wide spectrum of components, such as the availability and quality of roads, railways, air transport and ports. For the purpose of the RII, five indicators were selected to estimate the availability and quality of transport infrastructure. The same have been enlisted as follows:

Air transport: This is measured in terms of passengers carried per 1000 population and air freight in million tons per kilometres of area.

Road infrastructure: This is captured in terms of tele-density along with the density of computers and internet. Tele-density is measured by the total numbers of telephones (mobile phones and fixed line) per 1000 inhabitants. On the other hand, densities of computers and internet are measured by the number of personal computers per 1000 inhabitants and internet users per 1000 inhabitants, respectively.

Energy availability: Energy availability is estimated by the intensity of energy use viz., energy use (kWh) per inhabitant.

Banking infrastructure: The access to banking infrastructure is measured with respect to the domestic credit provided by the banking sector (as a percentage of GDP)

Thus, RIS's innovative approach encompasses a wide range of variables and a robust methodology that marks a discernible improvement in the estimation of the availability of quality physical infrastructure, especially in the inter-country context. By incorporating the diverse components of physical infrastructure in a composite index, RII overcomes the problem of under-representation of certain aspects of infrastructure, thus providing a more realistic measure of infrastructure availability.

Contribution of RIS's Infrastructure Index

The RII has been used to study the variances in the attainment of physical infrastructure in 104 East Asian countries for the years 1991, 2000 and 2005 using the methodology outlined above. The obtained index scores further enabled the ranking of these countries for a cross-country comparison. A distinct pattern can be discerned from the results, with some of the observations highlighted as follows:

Firstly, the top ten positions in infrastructure development are occupied by developed countries such as the USA (North America), Japan, Singapore (Asia) and seven countries from Europe comprise this list. The bottom ten positions are populated by least developed countries (LDCs) from Africa and Asia. Almost eight countries with the least RII scores are from

Africa, whereas Myanmar and Cambodia are from Asia. Quite expected, the middle order of the list is occupied by developing countries. As per the estimated ranks, it is evidenced that LDCs and land-locked countries suffer from the highest infrastructure deficits.

Secondly, coming to the East Asian countries (ASEAN+6), a broad pattern eludes owing to the heterogeneous nature of this grouping. A disaggregated look at the results makes it apparent that Japan, Singapore, New Zealand, South Korea and Australia make up the list of the top 16 highest-ranking countries. The middle group of 55 countries with moderate rankings is comprised of developing countries like Malaysia, Brunei, China, Thailand and India, whereas the bottom positions are allocated to six East Asian countries, namely Vietnam, Indonesia, Philippines, Lao PDR, Myanmar and Cambodia. On the face of it, the rankings of the countries based on RII seem to relate to their respective levels of economic development.

Thirdly, the improvements in the rankings over time can be judged by the fact that among 16 East Asian countries, 10 countries enhanced their global RII ranks between 1991 and 2005. At the same time, deceleration in the RII was noticed in the case of the rest of the six countries. The most remarkable stride in infrastructure attainment was noticed in the case of Vietnam, which jumped 31 places, i.e. from the 92nd rank to the 61st over the period of 1991 to 2005. Other countries that have evidenced an improvement in their ranking are the

Philippines, South Korea, China, Malaysia, and Lao PDR. At the same time, there is a collection of countries which has incurred deterioration in their RII rankings and overall infrastructure development between the same time periods. For instance, both Australia and Brunei suffered a loss by 9 places in the RII index. These findings are indicative of widespread variation and heterogeneity in infrastructure attainment across the East Asian group of countries. As per the authors, this behooves the initiation of a regional integration mechanism to plug the gaps in infrastructure in the East Asian region as a whole.

Fourth, when it comes to a comparison of the ranks between the most developed and the least developed countries in East Asia, it is observed that the infrastructure gap has widened more over time. In fact, the gap has widened from 5-100 in 1991 to 2-98 in 2005. From the perspective of policy planning, it is therefore suggested that resources should be scaled up to plug these substantive gaps. For the same, the authors opine that regional economic integration can be a crucial driver to collate these resources for the benefit of the region. This will require a significant quantum of financial resources for which necessary regional mechanisms will have to be devised. As per the estimates of RIS (2007), developing countries in Asia, including LDCs will need to expend an estimated total of US$ 412 billion per annum between 2007 and 2012, which is roughly equivalent to about 7.3 per cent of the combined GDP of developing Asia and LDCs. Furthermore, these resources will have to be

concentrated on infrastructure development in sectors such as roads, railways, airways, ports, and electricity. In the context of India, RIS estimated that it would have to invest about US$ 410 billion in six infrastructure sectors, i.e. roads, railways, ports, power, aviation and urban infrastructure from 2007 to 2012. This estimate far exceeds the relatively conservative estimate quoted by the erstwhile Planning Commission of India, which is to the tune of US$ 384 billion (Government of India, 2007). In the pan-Asian context, overall resources needed for meeting infrastructure requirements are at least US$ 200 billion per annum (RIS, 2007).

Additionally, the study contends that the resources for infrastructure development in Asia can be scaled at the required level provided an appropriate regional framework/mechanism is devised for its mobilisation. Hitherto, the savings and excess foreign exchange reserves from Asia have been channeled outside the region with negligible and sometimes negative real returns (for e.g. US treasury bonds). The RIS study argues that harnessing resources through a regional framework at the pan-Asian level could be an effective approach (see, RIS 2007).

Thus, it can be concluded that although the EAS region has surplus resources for meeting the challenge of infrastructure development, the challenge lies in fostering these resources to produce positive spillover effects and narrow down the gaps in infrastructure availability. This will help in boosting demand-led growth in the poorer countries of the EAS region which will

add to the dynamism and resilience of the region as a whole. Furthermore, it will encourage self-reliance and balanced economic growth in the region, thereby reducing its dependence on the West.

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2

WELLNESS INDEX

Background

Over the years, several measurement tools have been employed to quantify a country's socio-economic development. Gross Domestic Product (GDP), developed by Simon Kuznets in 1934, has been the most widely used single metric to capture economic growth in countries across the world. Moreover, the reliance on per capita GDP as an indicator of individual wellbeing has continued to remain a dominant policy tool for the past several decades. As per the (United States. Office of Business Economics, 1935) "GDP capture all economic production by individual, private, organization and government to bring into a single measurement which moves upward and downward during boom periods and bearish period respectively". GDP was extensively used by the USA to justify policies and budgets aimed at bringing the country out of the Great Depression of 1929 (Costanza, 2009). The concept was further standardised and strengthened in the Bretton Woods conference in 1944 and further strengthened through the Washington Consensus. Although Kuznets, in 1934, warned the

United States Congress not to focus too narrowly on GDP (United States. Office of Business Economics, 1935), the GDP continues to be used as a benchmark by many policymakers for measuring the overall development of an economy. Its computation is based on a well-established methodology and ease of computation has allowed GDP for cross-country comparison and therefore serves as a tool for economic prosperity.

However, research over the period has established that the relationship between happiness and wellbeing is not associated with rising income levels as measured by the increase in GDP. (Easterlin, 2014). In fact, studies have empirically shown that the relationship between the two is complex as an increase in income after some threshold level no longer adds to happiness, the Easterlin paradox (A.EASTERLIN, 1974). Moreover, GDP fails to account for externalities such as biodiversity loss, carbon emissions, climate change etc. Also, it fails to provide a more holistic picture when a country is faced with sudden catastrophes such as geopolitical conflicts or pandemics.

Thus, there is a growing understanding among thinkers and policy practitioners to go beyond GDP and adopt a more comprehensive indicator to capture a country's wellbeing or wellness. According to SDG 17.19, a wellbeing measurement tool needs to be developed that do not discard GDP but complements it.1 RIS have been steering toward wellbeing or wellness approaches for benchmarking development by inculcating the factors of economic,

environment and social approaches of development. RIS steered the same in the Bhopal Declaration of January 2023.2

Review of Literature

The review of literature is divided into three parts: i) GDP limitation in capturing the overall wellness of the society, ii) various initiatives and measurement tools developed through country level, regional and international level to measure wellness or wellbeing and iii) methodologies developed to measure wellbeing.

Before we proceed, it is important to note that there is no unique definition of wellbeing as it consists of multidimensional aspects of society's overall development. Various literature generally uses words like 'happiness', 'wellness', and 'wellbeing' interchangeably. (Kumar, et al., 2023) However, it is important to note that two conceptual measures of wellbeing research are being dominated in the field of Wellbeing. The objective measures approach largely originates from Amartya Sen's work in welfare economics about how to measure poverty and inequality, and its extension to the capabilities individuals should have to live fulfilling lives. (Western, 2016). The subjective approach emphasises subjective wellbeing, that is people's own evaluations of their lives, especially their life satisfaction (a cognitive evaluation), happiness (a positive emotional state) and unhappiness (a negative emotional state). (Diener, 1997).

The Debate around divergence in utilising GDP as wellbeing measurement tool to more holistic tool for measuring overall development is not new. John F Kennedy at at the University of Kansas in 1968, questioned the GDP metric, stating that, "GDP measure everything but except that which makes life worthwhile". In the early 2000s, the use of GDP was justified in many Developing countries of East and Latin America, where more income and higher well-being, are measured by the consumption levels of food, shelter, clothing, health care. However, as countries started to develop, the differences in "wellbeing" mattered more on the changes in social and environmental factors, diverging from the norms of capturing differences through changes in income. Thus, the myopic focus on GDP may block the development and utilization of appropriate decision-support tools that can help societies, industries, and universities to develop and implement multi-decade and multi-generational planning processes. (Giannetti, 2015).

In recent times, the World has been grappling with the COVID-19 pandemic and consequent health crisis, unequal burdens on LDCs, uneven growth across countries, supply-chain disruptions, climate change, environmental degradation, etc. This has necessitated discussions on how to further recognise the multidimensional nature of development in relation to policy options available. For example, GDP fails to account for digital inequality leading to learning losses in COVID-19, effecting the rural region more significantly. Similarly, (World

Bank, UNESCO and UNICEF, 2021) estimated that the present generation of students lost close to $17 Trillion in their lifetime earnings. Also, GDP as a tool for measuring the overall growth of the economy fails to take into account the losses due to environmental degradation, climate change, different kinds of pollution and Biodiversity loss. (COSTANZA R., 1997) in 1997 estimated that the world's ecosystems, on average, provided benefits of US$33 trillion per year and was significantly greater than the total global GDP at that time. It also disregards the negative consequential of short-term exploitation of natural resources, effecting a country's sustainable development path in many ways. (Giannetti, 2015).

From the above, we can infer that there has been a growing acknowledgement of the need to complement purely consumption-based GDP with alternative measures of societal progress. (World Forum on Statistics, Knowledge & Policy, 2007). Various indices under the concept of Multi-dimensional wellbeing indices have emerged. These indices capture a more holistic development of society encompassing various economic, social and environmental factors and aligning with SDGs and in fact beyond SDGs. The 2008, commission set up on the Measurement of Economic Performance and Social Progress was set up by Nicolas Sarkozy to identify the limitations of GDP as an indicator in measuring economic and social progress. This was followed by a report (Stiglitz, 2009) (Stigilitz-Sen-Fitoussi Report) focussing on assessing the current well-being

and its sustainability in the future. The report emphasises that well-being is multi-dimensional, encompassing the following dimensions: (i) Material living standards (income, consumption and wealth); (ii) Health; (iii) Education; (iv) Personal activities including work; (v) Political voice and governance; (vi) Social connections and relationships; (vii) Environment (present and future conditions); and (viii) Insecurity, of an economic as well as a physical nature.

The UNDP in 1990 launched the first Human Development Report presenting a new measure of development viz. Human Development Index (HDI). The HDI draws upon Sen's 'capabilities' approach to understanding human well-being, which emphasizes the importance of ends (like. decent standard of living) over means like per capita income (Sen, 1985). The Human Development Index (HDI) is a summary measure of achievements in three key dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. However, HDI has its own limitations as it is focused on limited socio-economic factors and pays no emphasis on environmental factors and other wellbeing dimensions.

The European Union (EU) "Beyond GDP" initiative, launched in 2007 by the European Commission, European Parliament, Club of Rome, OECD, and WWF, aimed to redefine measures of societal progress beyond GDP and outlined a comprehensive "five actions plan". It proposed complementing GDP with a Comprehensive Environmental

Index, improving the Quality-of-Life Index, ensuring near real-time environmental and social data for informed decision-making, addressing distributional inequalities, enhancing sustainability measurement, and integrating National Accounts with environmental and social factors. (European Commission, 2013) This initiative responded to growing concerns from citizens, media, and policymakers about the limitations of GDP as a sole metric for societal well-being. Despite notable progress, the EU has yet to finalize specific indicators and methodologies. The EU 2020 Strategic Foresight report recognized the need for metrics beyond GDP, and the 2021 Porto Declaration welcomed a proposal to supplement GDP with alternative indicators by European Social Partners. These developments reflect an ongoing commitment to expanding the assessment of societal progress in the European context.

The OECD promoted the idea of wellbeing measurement way back in 2004 when the first World Forum on Statistics, Knowledge and Policy was held. A key initiative, "Measuring the progress of Societies", emerged from the 2004 Forum and was discussed further in the second Forum on Statistics, Knowledge and Policy by OECD in Istanbul in 2007. It was proposed to foster the development of sets of key economic, social and environmental indicators to provide a comprehensive picture of how the well-being of a society is evolving. (OECD, 2018c).

In 2011, the OECD launched its Better Life initiatives and developed Better Life Index (BLI) as a part of these initiatives.

It provided a comprehensive representation of internationally comparable measures of wellbeing pertaining to developed countries. The index allows citizens to compare lives across 34 countries, based on 11 dimensions- housing, income, jobs, community, education, environment, governance, health, life satisfaction, safety and work-life balance-giving their own weight to each of the dimensions. The OECD also regularly publishes a comprehensive well-being report called How's Life?, which includes separate measures of well-being inequalities, and of the sustainability of well-being over time (across environmental, economic, human and social resources or "capitals").

The Social Progress Index (SPI) measures and assesses various facets of economic and social performance through the following methodological choices: (i) non-economic dimensions of state performance and (ii) an Evaluation approach based on outcome indicators, rather than input measures. SPI calculates an overall index comprising 60 social and economic indicators, which is based on tiered levels of scoring that include measures of health, safety, education, technology, rights and more (Stern, 2022).

Lastly, various country-level wellbeing measurement initiatives have been developed. Several G20 countries have also adopted initiatives of this sort (e.g. Canada, France, Germany, Italy, Japan, Korea, Mexico – and the recent intention announced in the Australian Budget). Outside the G20, Sweden has developed a national initiative for wellbeing that uses a set of 15 indicators

at the national level. Similar national multidimensional "beyond GDP" or well-being frameworks have also been developed in countries such as Austria, Bhutan, Belgium, Chile, Ecuador, Finland, Iceland, Israel, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Slovenia, Spain, and Switzerland. Moreover, the emphasis given to sustainable lifestyles by India could also serve as an indication of how the World could be engaging in discussions related to well-being and sustainability.

Various methodologies have been developed to calculate wellbeing indices. However, it is important to note that a single measure of well-being may not be the most desirable way to go. Indexes and single measures have long been criticized – the most well-known being the critique of GDP. Agreeing on a single indicator may also be difficult as countries by nature are heterogeneous in terms of economic and social priorities, culture, values, levels of development, etc. On the other hand, a single indicator or index allows for easy policy making decisions. Thus, various methodologies have been developed to develop a common consensus between the aforementioned points of debate. One of the most popular statistical tools utilised to capture multidimensional aspects of wellbeing and decomposing them into a single index is the Principal Component Analysis (PCA). PCA can be used to proxy for an unobserved variable using variance in related indicators. The intuition behind the technique is that it leverages the variance in variables that are correlated to the unknown to produce an ordinal ranking in the unobservable

dimension of interest. For example, in (ADB, 2021) one of the pillars is physical wellness which measures the quality of health in a country. While we are unable to measure physical wellness itself, we do have variables that capture information that may be correlated to physical well-being. It is reasonable to assume that those with "high" physical wellness, for example, would have a lower incidence of disease. PCA uses such related indicators and finds the linear combination that captures the most variance in the sample across countries. This linear sum allows to create an ordinal ranking that is correlated to physical wellness; the higher the PCA values, the higher the relative position of a country. An alternative method of creating an index would be to identify indicators of interest and then take weights subjectively. While the selection of any weighing method, including PCA, is subjective, PCA chooses weights in a way that captures the most variance in the data and places more weight on indicators that have higher variance in the sample.

Novel Methodological framework developed by RIS

In past, RIS has devoted attention to develop alternatives to HDI to measure economic progress complementing GDP. In 1992, RIS study on 'Basic Needs' came up with an Aggregate Development Index (ADI) to capture wider dimensions of development, including the Basic Needs Index (BNI) and other aspects of development like productivity, structural changes,

urbanisation, dependency rates of the population, trade openness, energy consumption, and so on.

(RIS, 2016)In 2016, RIS developed a wellness Index for the BRICS (Brazil, Russia, India, China and South Africa), which laid an emphasis on the wellness of people in their domestic development strategies, together with other relevant measures. This emphasis came as a result of the challenges of growing inequality and environmental degradation associated with high growth in those countries which stressed the limits of national income-based metrics. The Wellness Index ponders on two fundamental dimensions of development. First, it explores the narrative on traditional knowledge, concept and philosophy of wellness in BRICS. It tries to redefine the contemporary relevance of such systems and attempts to connect them with modern economic processes for greater effectiveness and adoption as a strategy of development. Second, it proposes a new framework for wellness measurement in BRICS not only to guide policymaking but also to gather new momentum for integrated approaches to development at the level of citizens.

BRICS Wellness Index proposed four indices for BRICS comprising a set of indicators to determine these, based on indicators currently being used as well as some new and emerging areas of focus. The four proposed indices are: Aggregate Material Well-being Index (MWI); Human Proficiency Index (HPI); Composite Health Index (CHI); Sustainability Index (SI). The

below table show the indicator framework that was proposed by RIS for BRICS wellness Index.

The **Aggregate Material Wellbeing Index (MWI)** aims to capture material well-being of citizens in terms of inequality, regional disparity, inclusiveness, economic opportunities, living standards and connectivity in BRICS. It is well established that human skills drive economic growth and facilitates individual well-being based on personal capabilities to engage in gainful economic activity. Likewise, the **Human Proficiency Index (PWI)** captures the quality of skill development services being offered, individual capabilities and technical/professional skills that shape human proficiency levels at the country level. The **Composite Health Index (CHI)** captures the centrality of human health in connection with natural environment stands. This Index also captures traditional health systems in the context of preventive and curative health. Lastly, the **Sustainability Index (SI)** proposed focus on dimensions that account for environmental and sustainability factors such as biodiversity protection, renewable and clean eergy, etc, that are equally important for quality of human life as well as for meeting the expectations of environment protection.

(RIS, 2016) RIS (2016) proposes to use PCA to make linear combinations of transformed variables in a model, defined for each index. However, the absolute value of an index may not explain much about the levels of contribution of variables, but the distance between any two observations can explain this

aspect. This would provide some direction about the positioning of various countries in the accomplishment of an index. Later, some potential indicators were identified for Wellbeing Metrics. When selecting the indicators, care was taken that these are relevant to policy making, covering various dimensions of well-being, and are aligned with the SDG framework. Efforts were also made to include such indicators in the proposed wellbeing framework that are conceptually clear, for which regular quality data is available and have established standard statistical methodology for compilation. Further, as wellbeing is an outcome of policies, outcome indicators have been preferred over input indicators.

Consequently, a set of wellbeing indicators evolved consisting of pillars like Economic Wellbeing, Quality of life and Sustainability associated with domains such as Income and Wealth, Housing, Work and Job Quality, Physical and Mental Health, Knowledge and Skills, Environmental Quality, Civic Engagement, Digital Wellbeing, Subjective wellbeing and Sustainability aspects (Human Capital, Natural Capital and Economic Capital). National governments need to find resources for adequately investing in the official statistical systems for improving the capacity of the systems for collecting data of good quality for compilation of identified indicators and to support policymakers for designing good policies for the upliftment of deprived sections of the society and improving wellbeing.

Figure 1: Indicator framework for BRICS Wellness Index (BWI), Source (RIS, 2016)

Aggregate Material Wellbeing Index (MWI)	Human Proficiency Index (HPI)	Composite Health Index (CHI)	Sustainability Index (SI)
Income and Inclusiveness • GDP per capita • Poverty Head Count Ratio • Regional Disparity* • Unemployment Rate • Women Labour Force Participation Rate **Living Standards** • Electric Power consumption per capita • Proportion of urban population living in slums, informal settlements or inadequate housing	**Access to School Education** • Primary and Secondary Enrolment • Secondary Drop-out rates • Enrolment among girls **Quality of School Education** • Numeracy Skills at primary level • Pupil-Teacher ratios* • Basic Infrastructure in School* • IT Education	**Mortality and Morbidity** • Health adjusted Life Expectancy • Index of life threatening diseases* **Preventive Health** • Proportion of Population with access to safe drinking water • Proportion of Children covered under immunisation • Number of registered traditional health care professional (doctors and therapists) per 1000 population* • Proportion of population using safely managed sanitation services	**Renewable and Clean Energy** • Renewable energy share in the total final energy consumption • Proportion of population with primary reliance on clean fuels and technology **Sustainable Infrastructure** • Eco-friendly designs for buildings* • Disaster resilient infrastructure* (type of building/roofing material)

Physical and Digital Connectivity • Proportion of villages connected through all season, motorable roads • Inland, waterways and seaways transportation infrastructure* • (length of rail lines/ rail passenger traffic/ freight and passenger movement through waterways) • Digital connectivity* • (mobile cellular subscription per 100 people/internet users per 100 people)	**Access to Vocational Education/ Skill Development** • Proportion of vocationally educated workforce **Access to Professional Education** • Proportion of professionally educated workforce (STEM/ non-STEM)*	**Curative Health** • Number of Registered Medical Practitioners per 1000 Population • Number of hospital beds per 1000 population • Number of Registered Traditional Therapists per 1000 population* • Drug Price Index* **Maternal and Child Health** • Infant Mortality Rate • Maternal Mortality Rate • Prevalence of Stunting Mental Health • Drug Addiction among youth • Concentration of rehabilitation and counselling centres • Reported Suicide Rate **Health Hazard** • Annual Number of Deaths in Road Accidents • Homicide rate	**Waste Management** • Volume of untreated industrial waste* • Recycling capacities* **Biodiversity Protection** • Proportion of protected terrestrial and freshwater biodiversity zones

RIS' contribution

In recent years, RIS has contributed immensely to the idea of wellness. During India's G20 Presidency, RIS led the Task Force 3 (LiFE, resilience and values for well-being) of the Think-20, an Engagement Group of the G20. The G20 leaders called for support to mainstreamnew well-being measurement frameworks and incorporate ecological, biodiversity and multi-dimensional human development metrics. Efforts should be directed towards highlighting the inadequacies of national income-based growth measures and, therefore, the rationale for looking beyond Gross Domestic Product (GDP). Human and technical capacities of statistical institutions need to be enhanced to design and deliver on such new indicators.

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3

ENVIRONMENTALLY SENSITIVE GOODS: RIS's NOVEL METHODOLOGICAL APPROACH

Background

The theoretical debate concerning rising non-tariff barriers has gained immense importance in recent times. With environmental concerns taking the lead in multilateral forums, trade liberalisation frameworks across the globe have adopted a visibly cautionary approach. This especially holds true in the context of environmentally-sensitive goods (ESGs), which have dominated the traditional trade export baskets of many developing countries, especially in South Asia. In fact, ESGs are regarded as a fundamental part of the long-term development strategy to boost trade performance in most developing countries. Naturally, the issue of linking trade agreements to environmental measures and standards has become a matter of immense concern for developing countries whose comparative

advantage in specific goods, especially ESGs, is rendered vulnerable. Literature across the board has highlighted the prevalence of inconsistent approaches to environmental management, which has called into question the righteousness of using trade as a tool of environmental management (Robert, 1999). In fact, many countries in the South are unnerved by the increasing incidence of stringent environmental standards put forth by the North. This especially relates to the direct rise in technical standards and regulations that are usually considered synonymous with non-tariff barriers in the South. To make matters more complicated, there is no formal mechanism to transfer environmentally sensitive technologies (ESTs) to developing countries to provide a springboard for enabling effective compliance with these measures. Despite meager empirical evidence on this count, many developing countries have reported experiencing losses in exports in compliance with these stringent environmental measures. Specific studies on trade in ESGs by Low and Yeats (1992) and Xu (1999) attempted to study the trade performance of developed and developing countries in ESGs. As per the findings of Low and Yeats, developed countries are specialised in the ESGs emanating from the manufacturing sector, whereas developing countries' ESGs are majorly restricted to the agriculture sector.

In this context, it becomes important to analyse the trend in trade of ESGs which underpin the long-term export strategies of many developing countries and are also a key source of

foreign exchange for them. To proceed with the same, defining, delineating and enlisting these ESGs is a crucial preliminary step. A perusal of the literature makes it apparent that there is an absence of a universal definition of environmentally-sensitive goods. In the past, several attempts have been made to follow a list-based approach to facilitate multilateral trade negotiations in WTO. However, in most cases, the principles outlined to identify ESGs were restrained by limiting assumptions and considerations. For instance, the conventional approach, based on the estimation of abatement expenditure per unit output, has been the most avidly used definitional framework for ESGs with many arguable conceptual limitations. Additionally, the entire process has been marred by views of interested parties with little or no consensus among all stakeholders in the past.

In line with the aforementioned issues, it became imperative to devise a novel methodological approach for the conception of ESGs that can be incorporated as a handy tool in trade negotiations. Thus, RIS formulated its own list-based approach to identify key ESGs that characterise the trade landscape globally. Additionally, the ESGs were categorised as per the technology-intensity inherent in the products for a more granular understanding of the variations among these goods.

Review of Literature

A perusal of the literature concerning ESGs makes it clear that the methodological approach towards developing a framework

for identifying ESGs can be sub-divided into five categories. The same are presented as follows:

The first category encompasses the 'Abatement Cost' approach, which categorises industrial activities as per the pollution intensity based on abatement and control costs. Under this approach, some of the highly polluting industries comprise those producing cement, chemicals, pulp and paper, ferrous and non-ferrous metals, petroleum refineries, etc. In the context of the USA, Tobey (1990) defined a pollution-intensive industry as one in which the pollution abatement cost was 1.85 per cent or more, of the total cost; whereas according to the definition proposed by Low and Yeats (1992), ESG-based industries refer to those industries in which the pollution abatement and control expenditure costs account for roughly 1 per cent or more of the total sales.

Under the 'Emission Intensity' approach of classification, industries and activities are categorised as per the actual emission intensity such that those with high emission intensity are labeled as highly polluting. With this line of thought, the World Bank, in collaboration with the UN Environment Protection Agency and the US Census Bureau, identified some sectors as pollution-intensive in the USA, using the actual emission-intensity method (Mani and Wheeler, 1999). The study cautioned that the regulatory gap between developed and developing countries could exacerbate the prevalence of 'pollution havens' in low-wage countries, especially developing and under-developed

countries. Furthermore, Mani and Wheeler identified pollution-intensive industries as those with low elasticities of substitution between the use of the environment and other productive factors. Similarly, Lucas et al. (1992) shortlisted dirty industries such as metals, cement, pulp and paper and chemicals on the basis of aggregate toxic releases per unit of output. Likewise, the results achieved by Letchumanan (1998) reiterated the previous results using the toxic release date disseminated by the US agencies. Some South Asian countries like India and Pakistan have also identified pollution-intensive industries. In fact, India classified 64 polluting industries in the red category on the basis of a variety of determinants such as emissions, discharge of pollution potential or generation of hazardous wastes. Similarly, Pakistan's Environmental Standard Committee classified domestic industries into three main categories based on the hazardous nature of these industries.

Other supplementary approaches have utilised the effects of industrial products on the degradation of natural areas or loss of biodiversity as the primary criteria for identifying hazardous industries (World Bank 1998). As per the criteria set by this approach, products like timber and wood, fish and other seafood along with endangered species, are identified as environmentally sensitive. In another study, Jha et al. (1999), using this approach, singled out marine products, wood and timber products as some of the ESGs in need of regulation. The third classificatory framework i.e., the multiple criteria approach, pertains to the

products the production of which may affect the balance of plant species and biodiversity of wildlife. This dilemma is most dominant in the case of genetically modified plants and foods. There are two main issues that have arisen in the context of GM foods in the recent past. For instance, one issue is in the context of whether GM products should be regarded as 'like products'; another issue arises in the context of the Bio-safety Protocol, wherein some countries have sought strict labeling practices. In this regard, some countries are in favour of labeling standards that are consistent with the WTO rules on the grounds of public health concerns; on the other hand, another set of countries argues that such labeling requirements may have a debilitating impact on their exports. In fact, in recent times, countries such as EU nations, South Korea and Japan have actually blocked the entry of such products on grounds of consumer safety and sensitivity (Chaturvedi, 2003).

The fourth approach, often identified as the 'Offer and Request' approach, was first incorporated in the proposal submitted by Brazil to WTO in 2007. As per this proposal, countries could request tariff cuts on specific products and thereafter extend these cuts to all WTO members on the MFN-basis.

The evolution of the 'List based' approaches- the fifth category- can be traced to the two lists of ESGs submitted in response to the Committee on Trade and Environment (CTE) in WTO. One list of the two was submitted by the OECD and another was submitted by the Asia Pacific Economic Cooperation (APEC)

countries. At the individual country-level, India and Argentina submitted an integrated project-based approach for project goods in the WTO (Kumar and Chowdhury, 2005). Developed countries also jointly brought forth the so-called 'Friend's list' also known as the 9M-List. This list contained a collection of 411 products drawn from various individual developed countries. Drawn in 2010, the products in the list are distinctly those in which developed countries have a substantive comparative advantage in trade (Balineau and De Melo, 2013).

Research literature has highlighted numerous limitations with regard to the aforementioned approaches to ESGs, especially the 'dirty industry' approach. The limitation of the dirty industry approaches (comprising of abatement cost, emission intensity and multiple criteria approaches) lies in the differential level of technology embedded in the products falling under the different 'dirty industries' highlighted by these approaches. Additionally, the level of pollution abatement cost also varies from product to product, making the categorisation of ESGs based on dirty industry-based approaches all the more dubious. Simply put, an industry may produce products that may have different pollution intensities. This makes generalised categorisation faulty and methodologically untenable. As per some studies, there are many products that do not fall under the category of ESGs despite their industries being recognised as 'polluting industries' (Mohanty and Manoharan, 2002). Thus, identification of a product as per the dirty industry approach

may lead to overestimation of ESGs as some of these goods may not qualify as environmentally sensitive. Lastly, in the previous approaches, the categorisations have not been linked to any specific international trade classification. This greatly limits their ability to guide policymakers to steer negotiations in various trade-based multilateral forums.

Coming to the issue of the technology intensity of ESGs, it has been accepted that there is an absence of trade classification based on the technology intensity of these products. In fact, the current level of literature is limited in its understanding of the technology-intensity of tradable ESGs. At the same time, owing to the wide-ranging importance of the technology content of ESGs in governing the trade of these products, it is imperative to reassess these products accordingly. In the past, a handful of studies have endeavoured to classify products as per their technology-intensity. For instance, Lal (2000) classified products in terms of ten technology intensity groups using Standard International Trade Classification (SITC) Revision 3. However, over time trade classification has undergone a sea change. In the present era, the Harmonised System (HS) of trade classification is the core tool used during trade negotiations. Although the classification pioneered by Lal (2000) was extended by Mohanty (2003) to incorporate technology-based classification using the HS framework, an alternate form of trade classification based on technology-intensity of ESGs was of paramount importance.

With this background, it became imperative to evolve a list of ESGs that effectively tackled the trade-related issues and the novel environment-based challenges confronting developing countries across the globe. Thus, the Research and Information System for Developing Countries (RIS) formulated a list of ESGs with a methodology that underpins the treatment meted-out exports of developing economies in terms of environment-related NTMs.

Development of Novel Methodological Framework by RIS

Research Methodology

In line with the limitations highlighted above, RIS evolved its own novel methodological framework for a list-based approach for delineating environmentally-sensitive goods that could come in handy for trade negotiations in the future, especially for developing countries like India.

The methodology proposed by RIS rests on two analytical tools, which have been mentioned as follows:

- To identify a new set of ESGs based on a new definition of the product category, and
- To experiment with the new classification of products linking disaggregated tradable items with their embodied technology in the South Asian region

To operationalise this new approach proposed by RIS, two criteria were used:

- The RIS approach uses a product classification based on the harmonised system (HS) which makes it more versatile for usage in multilateral and regional trade negotiations.
- Further, the approach identifies those ESGs which have been subject to environment-based NTMs by at least one of the major global trading powers.

The framework uses the Trade Analysis and Information System (TRAINS) database, which provides information regarding the products subject to a plethora of NTMs in a large number of countries. The database lists all the products at their national lines with the nature of the NTM for each product provided separately. Furthermore, for a sub-regional analysis of ESG trade in South Asia, the Personal Computer Trade Analysis System (PC-TAS) has been used. To compensate for the lack of data for Bangladesh and Pakistan, data-mirroring technique was used by taking a series of bilateral trade data on 150 countries and making suitable adjustments in this series. To assess the NTMs, the new taxonomy developed by UNCTAD was referred to for assessing the environment-based NTMs used for reported countries in a standardised fashion.

The methodology for identifying ESGs from TRAINS data is based on some key assumptions, which have been enlisted as follows:

- It is assumed that the environment-based NTMs have been applied on the basis of scientific evidence concerning human, animal and plant health.
- Further, as per the 'law of transitivity', it is assumed that any NTM based on scientific findings adopted by one or the other industrialised country will also be adopted by other countries.

For the purpose of analysis, the study assessed the trade practices of six major economies, i.e., Australia, Canada, the EU, Japan, New Zealand and the USA, in terms of their usage of non-tariff measures. The assessment of their trade practices suggests that environment-based NTMs, in general, can be divided into 4 types which are i) prior authorisation relating to CITES, ii) Montreal Protocol, iii) prohibition for environmental protection and iv) product characteristic requirements on grounds of health. With these major environment-based NTMs delineated, a final list of ESGs at the six-digit HS level codes was prepared.

The study also tried to extend the trade classification by incorporating the technology intensity of ESGs for more streamlined trade negotiations, especially for developing countries. The classification of ESGs based on technology-intensity was preceded by a study by Mohanty (2003) in which Lal's (2000) classification of tradable products was extended to the Harmonised System (HS). The study undertaken by RIS further extended the classification by Mohanty (2003) to cover a wide range of ESGs. This revised classification played a crucial

role in understanding and examining the size of sub-regional markets for a plethora of ESGs. It also helped in assessing the extent and dynamics of the scope of intra-sub-regional, regional and global trade in ESGs. Accordingly, technology-intensive ESGs have been classified under the following broad heads:

- Primary products
- Resource-based products
- Low technology products
- Medium technology products
- High technology products

RIS's Contribution

As per the methodology suggested by RIS, ESGs are defined as those globally tradable products which are subject to one or more environmentally-sensitive NTMs in industrialised countries. Based on the definition proposed by RIS, around 1,053 ESGs were identified. Most of them are traded globally and are subject to one or the other environmental NTMs. In the sub-regional context, trade-in ESGs in South Asia has been gaining a lot of importance. In fact, the region has displayed explicit comparative advantages in the production and trade of ESGs. Applying the methodological framework of identification of ESGs and supplementing the analysis by studying the technology-intensity of ESGs, RIS sought to study the pattern of intra-subregional trade in ESGs in South Asia. Further, the study also incorporated an analysis of the contours of trade

liberalisation in ESGs under the South Asian Preferential Trade Agreement (SAPTA).

Empirical results suggest that ESGs account for a significant portion of trade among South Asian countries. The findings make it obvious that ESGs comprise a widespread portion of exports and imports in South Asia. In fact, the contribution of ESGs to the total exports of the sub-region was 21.1 per cent, while to imports it was 17.3 per cent in 2002. Furthermore, the share of ESGs in total trade has shown wide variations across the sub-region. For instance, Maldives trade is widely dominated by ESGs, whereas countries like Bangladesh and Bhutan have shown low dependence on ESGs in comparison. In the context of imports, the dependence of the region has been relatively lower. As per the findings, a large share of imports from South Asian countries, other than India, consists of ESGs.

At the intra-subregional level, the South Asian region evidences high intra-subregional trade in ESGs, with the ratio of intra-subregional trade rising close to 10 per cent. The corresponding ratio of total trade amounts to only 5 per cent. The reason for this high intra-subregional trade in ESGs is suggested to be driven by the rapid liberalisation of trade through the SAPTA process.

Albeit, there is no extra provision for the liberalisation of trade for ESGs under SAPTA, the results of the empirical findings are suggestive of an underlying pattern of liberalisation of ESG trade. Hitherto, 3,612 products have been liberalised

under SAPTA at the 6-digit HS level; out of these, around 653 products have been classified as ESGs based on the definition and methodology evolved by RIS. There is also evidence of individual countries receiving inequitable market access for ESGs under the first three SAPTA rounds, with India and Sri Lanka achieving better market access for ESGs under the first round, followed by Maldives and Pakistan in the second round and Bangladesh, Bhutan and Nepal in the third round. Notwithstanding these findings, it can be concluded that trade liberalisation in ESG trade in South Asia has yet to come full circle. As per the estimates of the study, only 21.5 per cent of the intra-subregional trade in ESGs has been liberalised under the first three rounds of SAPTA. Consequently, the study recommended taking the SAFTA process forward to unleash the potential of comprehensive trade liberalisation in South Asia.

Results of the study by RIS also point towards widespread variation in the technology intensity of ESGs. The largest ESG market in South Asia consists of resource-based products followed by primary products. These two categories comprise 71 per cent of the total market of ESGs in the South Asian region. At the same time, the market of high and medium technology-intensive ESGs is also large enough to approximate 22 per cent of the total ESG market in South Asia. Among the individual countries, the market size of technology-intensive ESGs differs from one country to another in the South Asian context. In terms of imports, India leads its South Asian neighbours, followed

by Bangladesh, Pakistan and Sri Lanka. Among the different categories of ESGs, the demand is seen to be the highest for resource-based products, with India leading the market for these products. For medium-technology products as well, the demand is substantive in most South Asian countries. However, for low-technology ESGs, the demand is uniformly spread across all the countries of the sub-region. On balance, Bangladesh, India, Pakistan and Sri Lanka have more or less similar market sizes for primary, resource-based and low-technology ESGs, whereas Bhutan, Maldives and Nepal have relatively small markets for ESGs in general.

The methodology proposed and discussed above highlights the often ignored aspects of international trade and environmental management, which have only grown with time. RIS's methodology and framework of a list-based approach identifying more than 653 ESGs proposes a novel mechanism for delineating ESGs from a trade perspective. Further, the approach is supplemented with a disaggregation of ESGs based on their varying technology intensities, which typifies them under five broad heads. Using these methodologies, RIS analysed sectoral trade in ESGs at the sub-regional level with a special focus on technology-intensive ESGs. With ESGs dominating India's and the rest of South Asian countries' trade baskets, the methodology proposed by RIS played a pivotal role in deepening the understanding of ESG trade in South Asia. Last but not the least, the methodological framework proposed by

RIS also serves as a practical tool to international trade policy-makers who seek to negotiate and discuss the implications of ESGs' trade in the global arena.

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4

QUALITY OF FOREIGN DIRECT INVESTMENT

Background

Globalisation of economic activity has led to a significant expansion in cross-border transactions of technology and direct investments, particularly since the mid-1980s, which has been accompanied by significant reorganisation in the global production pattern, resulting in the expansion of technology, trade, and investment. This trend is evident, with the annual magnitude of FDI flows surging from approximately US $55 billion in the early 1980s to US $1271 billion in 2000, and the annual flow of technology transfers surpassing US $60 billion in 2000, escalating from US $7-8 billion in the early 1980s (Kumar, 2002). In 2021, the global FDI flows reached US $1815 (OECD, 2022). I It is also important to note that the impacts of this expansion in FDI flows are not the same across regions, countries and sectors. While some countries and regions have seamlessly woven themselves into the fabric of the global economy, as evidenced by increasing inward and outward FDI flows and

other cross-border transactions, others have lagged behind, despite liberalising their investment regimes (Dunning, 1998). Rivalry among countries to attract FDI has been intensifying among both developed and developing nations. Through the adoption of more lenient policy frameworks, the provision of tax breaks, and the offering of investment incentives, governments are actively competing with one another. Their drive stems from the expectation of obtaining a greater volume of FDI inflows, which offer several corresponding benefits, such as increased access to markets, technology transfer, and improved organisational skills.

The competition for FDI has become so fierce that the actual quantity of FDI attracted has emerged as a crucial indicator for assessing the effectiveness of a government's economic policies. This noticeable emphasis on the quantity of FDI inflows is evident at annual events such as the World Economic Forum in Switzerland, where leaders and policymakers from many developed and developing nations attend to court multinational enterprises (MNEs) (Kumar, 2002). Nonetheless, there is a genuine concern that in a rush to maximise the quantity of FDI inflow, the 'quality' of these investments may be inadvertently overlooked. This concern is especially important for developing nations, which often find themselves compelled to join this race to attract FDI due to the fierce competition on a global scale and the decreasing availability of other sources of external development finance (Kumar, 2002). While it is widely acknowledged that

host governments' policies play a critical role in leveraging the benefits derived from FDI for their own development, a more thorough and accurate analysis of the relative efficacy of different policy measures in influencing the patterns of FDI inflows, both in terms of quantity and quality, is still missing (Kumar, 2002). This lack of analysis suggests that the government might not be fully aware of the strategies that work best for them when it comes to attaining their goals regarding foreign investment.

Review of Literature

There is a substantial body of literature that shows the varying impact of FDI on development. Some studies, such as Blomstrom *et al*. (1992), contend that FDI can boost local businesses' competitiveness, based on evidence from Mexico and Indonesia, while others, such as Smarzynska (2002), found positive spillovers from FDI in Lithuania through backward linkages to local suppliers. Caves (1996) and Borensztein *et al*. (1998) assert that countries seek FDI for prospective benefits like increased productivity, technology transfer, managerial skills, and access to external markets, with Borensztein *et al*. (1998) highlighting the superiority of FDI-induced technological spillovers for economic growth. Emphasizing technology transfer, Findlay (1978) contends that FDI accelerates technical progress in host countries through advanced technology spillovers to local firms. However, Moran (1998) examined a number of studies that present conflicting results about how FDI affects development.

These studies suggest that FDI can have both positive and negative effects on a host country's development prospects. Levy and Nolan (1992) and Fry (1993) demonstrated in their respective studies that FDI can be immiserising under certain conditions in some countries. According to Lipsey (2002), there are benefits associated with FDI, but there is no reliable correlation between FDI stock and economic growth. Additionally, according to Hirschman (1958), the sector in which FDI occurs can influence its impact on the economy, which can be positive or negative; and also noted limited positive effects in agriculture and mining.

Literature also explores how FDI flows evolve in different stages of a country's development. Porter (1990) delineates four stages in the competitive development of nations: factor-driven, investment-driven, innovation-driven, and wealth-driven, where, each stage is distinguished by various patterns of investment and sources of competitive advantage. Ozawa (1992) uses the transformation of the Japanese economy as an example to provide a stages-based evolutionary development of FDI. This constant evolution of the economy leads to the development of new comparative advantages, as countries move from less technologically developed, low-productivity products to more sophisticated industrial activities with higher productivity. The Investment Development Path developed by Dunning (1981) connects a country's net foreign direct investment position to its stage of development, as estimated by GDP per capita.

The literature further delves into the factors that motivate foreign affiliates to undertake FDI. The Eclectic Theory (OLI) by Dunning (1977) posits that firms engage in FDI when the advantages of Ownership, Location, and Internalisation coincide to make FDI an appealing option. This theory further introduces the concept of a 'seeker' (Dunning & Lundan, 2008), which is a company or individual motivated by natural resource seeking, market seeking, efficiency seeking, or strategic asset seeking. Another factor that encourages foreign affiliates to invest in a particular country or sector is the presence of agglomeration economies (Eaton et al., 1994), also mentioned in the New Location Theory (Krugman, 1991). Empirical studies conducted by Braunerhjelm and Svensson (1996), as well as by Head et al. (1994), have also observed the importance of agglomeration economies in determining FDI patterns.

Numerous indices have been developed to measure and rank the relative performance of countries in attracting FDI. In 2002, UNCTAD developed a quantitative index to benchmark success in attracting FDI. The 'UNCTAD Inward FDI Performance Index' takes the ratio of a country's share in global FDI flows to its share in global GDP. This index helps identify whether countries receive more or less FDI than expected based on their economic size (UNCTAD, 2002). Other similar indices like the 'FDI Confidence Index' (Kearney, 2001), the 'FDI Sustainability Index' (UNCTAD, 2002), and the 'Transnationality Index'

(UNCTAD, 2007) provide additional perspectives on FDI performance.

Policy-makers in many host countries have recognised the importance of the quality of FDI inflows and have implemented measures to improve it. These measures include selective policies, performance requirements for foreign affiliates, and incentives to attract high-quality investments. For instance, some East Asian countries like South Korea have in the past directed FDI into high-technology and export-oriented sectors using various policy instruments (Kumar, 2002). Moran (1998) has verified that governments in Mexico, Brazil, and Thailand have employed performance requirements to stimulate export-focused investments in the auto industry. It is not only the developing countries, but the developed nations have also implemented measures to maximise the benefits derived from FDI inflows. For instance, the European Union (EU) has imposed various regulations and protectionist policies, aimed mostly at Japanese businesses operating in Europe to improve the domestic content of foreign enterprises' output (Belderbos, 1997), while the North American Free Trading Agreement (NAFTA) includes strict rules of origin for the same purpose. The U.S. Congress, Office of Technology Assessment (1994) highlights the varying benefits of FDI in the US economy, emphasizing the hierarchy of FDI quality in different sectors, with the high-technology industries receiving the most beneficial investments in the country.

Therefore, the quality of FDI inflows can vary significantly in the host countries, depending on the type of FDI received. The differing findings in studies about the role of FDI in development across different countries could be attributed to variations in the quality of FDI inflows received by them (Kumar & Siddharthan, 1997). Chudnovsky and López (1999) identified key characteristics influencing the quality of FDI, such as the type of FDI (market-resource-efficiency or asset-seeking), the life-cycle stage of the relevant product/sector, export propensity, the role of affiliates in the global corporate network, entry mode (greenfield or takeover, with or without a local partner), the country of origin of FDI, and the sector in which FDI is flowing into. They argue that the impact of one dollar of FDI on growth and sustainable development varies based on these factors and host country characteristics (Chudnovsky & López, 1999).

While the literature acknowledges that different FDI inflows could have varying impacts on host economies, it also emphasise that a more precise empirical analysis of the quality of FDI inflows and their determinants is lacking. In this context, Professor Kumar (2002) introduced the concept of Quality of FDI, defined its different indicators and measurements, and developed models to analyze the determinants of quantity and quality of FDI inflows received by a panel of 74 countries across seven sectors of manufacturing from two major sources of FDI namely the United States and Japan. The work on the quality

of FDI was updated when Kumar and Pradhan (2005) analyzed the patterns of effect of FDI inflows on domestic investments for a panel of 100 countries over 20 years. The analytical model developed by Kumar (2002) has been explained in detail in the next section.

Development of Novel Methodological Framework by RIS

Seeking to enhance the current body of literature on FDI, RIS commissioned a study to develop analytic models with structural, geopolitical, and policy factors as determinants to explain the patterns of quantity and quality of inflows from the perspective of a developing nation. The quantity of FDI inflows was measured in terms of foreign affiliate output, using net sales as a proxy. On the other hand, the quality of FDI was captured by the positive externalities connected to the affiliate's sales or output in a developing host country, which was measured along multiple aspects. These include the degree of localisation of affiliates' output, FDI contribution to the development of modern industries, extent of export-orientation, and R&D activity of affiliates.

The analytical framework for the study was developed by considering the various theoretical propositions put forward by Dunning (1977, 1981), Porter (1990) and Ozawa (1992), that implied possible differences in the patterns of FDI inflows across countries, due to locational advantages or different stages

of development. An extended model of the location of foreign production was developed, covering the demand factors as well as the supply factors determining the patterns of affiliate location. The demand or gravitational factors that affect the output or sales of foreign affiliates in the host country include income, country-size, distance, and other factors like cultural proximity and extent of urbanisation. The supply side factors that give rise to differences across the host countries include quality of infrastructure, labour, and economic policy regime followed by host countries.

While the previously outlined model effectively analyses the inter-country pattern of affiliate output, it falls short in providing a rationale for expecting variations in the patterns of such distribution between modern and traditional industries. To address this gap, the model was further extended, drawing insights from The New Location Theory (Krugman, 1991). This extension stresses the significance of host countries' created assets or intellectual capital and the specialisation of agglomeration economies in shaping the comparative advantage of nations in attracting foreign affiliate production across different industries. Moreover, the model posits that FDI in newer and more technologically complex industries may be inherently more desirable than investments in traditional industries, as a result of the anticipated favourable spillover effects associated with advancements in newer technologies that are novel to the host countries. The reasoning here is based on the notion that

industries characterised by sophisticated technology have a larger potential to produce positive externalities and significantly contribute to the economic growth of the host country.

Export-oriented production by MNE affiliates is a very important indicator of the quality of FDI. Another model was developed to explain the determinants of the outward orientation of foreign affiliates and whether their exporting activity was geared to their home countries or third countries. It helped to distinguish whether foreign affiliates served as the production platform for the home country or for the global value chains. Finally, an analytical framework was constructed to elucidate the R&D intensity exhibited by MNE affiliates within host countries. The model encompasses various factors that could prompt an MNE affiliate to engage in R&D activities, including the imperative to tailor products to meet local market conditions, capitalise on cost-effective and abundant R&D resources abroad, to absorb spillovers of R&D activity in other countries, as well as policy variables in the host countries.

This framework was further used to empirically analyse the quality of FDI across countries. For this purpose, two of the main sources of FDI in the world, the US and Japan, were selected. Data regarding the operations of affiliates belonging to the US and Japanese MNEs in 74 host countries (both developing and developed), of which 44 are reported by both the home countries, was collected for three comparable years: 1982, 1989, and 1994 for the U.S. affiliates, and 1983, 1989, and 1993 for Japanese

affiliates. This data was obtained through Benchmark Surveys conducted by the respective countries. Apart from overall statistics encompassing all industries and manufacturing sectors, the data on affiliates in each host country was disaggregated into seven major manufacturing sector categories.

The data set for this study was taken from the Global Technology and Economic Development (Glob-Ted) database, the core of which is based on the aggregated information detailing the nature of operations by foreign affiliates of the US and Japanese MNEs in sample host countries. This database incorporates four key dimensions: a home country dimension (the United States or Japan), a host country dimension, a sectoral dimension, and a time dimension spanning three points of time between 1982 and 1994. Suitable models for explaining cross-country difference with respect to a specific measure of quality was developed.

RIS' Contribution

The quantitative analysis done by RIS helps to ascertain the factors influencing the quantity and quality of FDI inflows from the US and Japanese affiliates and brings attention to key distinctions in this regard. Notably, the US affiliates show greater sensitivity to market size, prioritize different factors when selecting a location, and adopt a more globalized approach in conducting offshore production compared to their Japanese counterparts. Conversely, Japanese affiliates place

greater emphasis on geographical and cultural proximity, assign greater importance to the quality of infrastructure, and display a greater degree of localisation in production. These nuanced variations highlight the diverse strategies and priorities of the US and Japanese MNEs in their international operations. The analysis conducted, therefore, has significant implications for the economic assessment of FDI and MNE activities.

RIS was also able to draw certain policy implications for developing countries. It was found from the analysis that the quality of FDI in most developing countries is low, except in the export sector. As FDI tends to be drawn to locations with minimal unfavourable distortions, advanced countries, already equipped with sophisticated technologies, are favoured by MNEs for technology-intensive operations and innovative activities. Therefore, developing and underdeveloped nations should stop waiting for FDI to start the process of development and instead prioritise improving its economic structure and focus on establishing stable macroeconomic conditions for development so that FDI can flow in automatically. This pioneering attempt brought out several policy trade-offs; some policies, such as selective investment policies and performance requirements, among others, made a country seemingly less attractive destination for FDI, but those that came had a deeper commitment to the country in terms of value addition and localisation of production. Similarly, the effects of trade policies, IPR policies, tax policies, and investment incentives on the

quantity of FDI and its quality were different. These models and analyses can help policymakers in developing countries to optimize the inflows of FDI and their developmental impact according to their objectives, stage of development, comparative advantages and resources.

While developing countries are increasingly recognising the importance of the 'quality' of FDI, there is still a tendency to attract FDI unconditionally for the purpose of development, primarily emphasising 'quantity' over 'quality', due to the existence of various political and policy bottlenecks. Leveraging existing domestic capabilities and resources is key to find a balance between attracting FDI and maximising its beneficial spillovers into the domestic economy. A conducive investment climate encourages both domestic and foreign investment. Policymakers should adopt measures to attract FDI, after considering the host country's capacity and ensuring optimal conditions for maximising the benefits.

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5

EMERGING POLICY LANDSCAPE OF BLUE ECONOMY: CONTRIBUTION OF RIS TO THE ESTIMATION OF SECTORAL GDP

Introduction

The Blue Economy's emergence as a novel development paradigm represents a significant shift in global economic strategies, especially since the post-war era's focus on reviving economies and maintaining full employment. During that period, the implications of resource scarcity were overlooked, with a primary focus on optimising scarce resources like labour and capital (Mohanty, 2023). This perspective underwent a fundamental change at the 2002 Global Earth Summit in Rio, where sustainable development was proposed to achieve high growth with minimal resource utilisation. However, a decade later, little progress was observed in development strategies, with critical issues like poverty alleviation and resource efficiency remaining unresolved.

In response to the challenges, the Blue Economy has been recognised as an innovative approach, blending growth-oriented and sustainable development strategies, a concept that emerged at the 2012 Rio Earth Summit. This approach is gaining global acceptance across both developed and developing countries. Blue Economy not only promises high growth and extensive employment opportunities across various sectors but also emphasises sustainability as a core criterion (Katila et al., 2019). However, realising these opportunities requires hard decisions in areas such as investment, technology, and human resource planning. The lack of a comprehensive methodology to measure the sector-specific contributions of the Blue Economy adds to the complexity. The economic potential in littoral countries is known, but the variability in natural endowments complicates the predictability of the contribution of the Blue Economy of a country based on the experiences of other economies. Therefore, assessing the contribution of the Blue Economy to its GDP is essential for undertaking sector-level planning (Turschwell et al., 2022).

The Blue Economy approach focuses on economic activities derived from marine sectors and also addresses the negative impacts of over-exploitation, ultimately measuring the net contribution of the sector to a country's GDP (Patil et al., 2018). The potential of ocean resources often surpasses land-based stocks, but challenges such as over-exploitation of ocean resources exemplify the need for sustainable practices. One notable

issue is over-exploitation of fisheries, which needs sustainable harvesting to allow balanced resource utilisation (Mohanty et al., 2017). Placer minerals, crucial for Industry 4.0, are abundant in coastal regions like India, yet remain underutilised due to undeveloped or non-existent domestic value chains in certain segments. Marine energy, both renewable and non-renewable, holds the promise of meeting extensive energy needs for decades. The growth of the Blue Economy and employment drivers include marine manufacturing and services, with Blue Trade likely to enhance external sector performance (Fernandez-Macho et al., 2015) MSME sectors in countries like the US, Germany, France, and Japan are increasingly contributing to the GDP, creating diverse employment opportunities. For optimal performance, collaboration between the private sector and government is crucial. Experiences from several littoral countries indicate that the development of Blue Economy initiatives can enhance economic welfare and sustainable development in ocean-dependent economies.

State of Blue Economy in the World

Emerging evidence suggests the Blue Economy could be a catalyst for economic growth, particularly for coastal nations. In both developed, emerging and developing countries, Blue Economy sectors cover existing areas such as tourism, ports, and transport, as well as emerging sectors like marine biotechnology, biopharma, and bio-food additives. These sectors hold significant

employment potential, catering to rising global import demands and offering a range of blue and white-collar job opportunities. For the Blue Economy to exploit its full potential, private sector participation is crucial, complementing the efforts of the state in these areas (Tirumala & Tiwari, 2022). Collaborative efforts between the government and the private sector can maximise production, employment, blue trade, and capital formation. The success of Blue Economy initiatives in countries like China, Mauritius, Singapore, Malaysia, etc., provides valuable insights about the sector. The experiences of countries demonstrate the ability of the sector to enhance economic welfare, suggesting possibilities for sustainable and inclusive economic development.

The conceptualisation and coverage of economic activities led to the use of various terms like Marine Economy, Ocean Economy, and Blue Economy, which despite their recurrent interchangeable employment, are not the same (Park, 2014). Different nations adopt different terminologies: the US prefers 'Ocean Economy', Mauritius uses 'Blue Economy', and the UK, among others, opts for 'Marine Economy'. While they broadly refer to the ocean's economic influence, the scope of the sector varies across countries, leading to divergent interpretations. In Asia, countries like China, Japan, and South Korea use local terms equivalent to 'Ocean Economy'. This diversity in terminology reflects differences in sectoral coverage; some countries include a broader range of sectors, while others are more selective. The lack of a comprehensively accepted definition and accounting

framework for ocean-related economies poses challenges in comparing estimates across countries. Controversies arise over which sectors to include, especially when distinguishing between land-based and marine-based activities (Failler et al., 2021). This ambiguity extends to the inclusion of defence activities like the Navy and Coast Guard, which are part of national income accounting but may or may not fit within the Blue Economy framework. Discussions continue on whether coastal or hinterland activities should be included, highlighting the need for a consensus on a universally acceptable definition of the Blue Economy. While a comprehensive definition was not agreed upon, there has been some progress in evolving an alternative development framework with a set of homogeneous ocean-based sectors.

It is evident that the Blue Economy presents vast and sustainable growth opportunities, contingent on the development of an innovative strategy tailored to individual countries. The success of marine manufacturing clusters in China, for instance, highlights the potential of sector-specific development with medium-term planning (Zhao et al., 2014; Zhao, 2013). This approach is adopted by the European and Scandinavian countries, where maritime clusters form a significant part of the manufacturing sector. Strategic sector development necessitates medium and long-term investment planning, largely dependent on predictable domestic policies. In this regard, innovations in 'Blue Tech' are crucial for advancing marine clusters,

complementing sectors like biotechnology, pharmaceuticals, and cosmetics, which are integral to a blue economy model (PEMSEA, 2015; Vega & Hynes, 2017; FICCI, 2017).

Financial planning is crucial, especially in high-risk areas of modern blue sectors, where foreign investment can supplement domestic funds (Wenhai, 2019). In developing countries, identifying priority sectors is key for effective blue economy accounting and policy planning. The Blue Economy, focusing on ocean-related activities and environmental conservation, is increasingly recognised as a driver of economic growth, particularly for littoral countries. However, a lack of consensus on its definition and sectoral classification persists. To optimise investment and prioritise sectors, countries must understand their specific blue economies, as seen in India's Sagarmala and Deep Sea Mission projects, and Indonesia's Maritime Hotspot project. However, a comprehensive policy planning approach, integrating blue investment, innovation, technology, and advocacy, is essential for harnessing the full potential of the Blue Economy.

RIS Contribution to Methodology

It is crucial to understand the evolution and diversification of the Blue Economy concept. The Club of Rome's 1972 report on 'limits to growth' first brought to light the sustainability concerns associated with high economic growth, and proposed technological interventions to maintain sustainable

consumption. The Rio Earth Summit in 2012 marked a significant shift in development thinking, recognising the Blue Economy as a vital paradigm linking ecosystem productivity with ocean health. The Blue Economy, along with its variants like Marine Economy, Coastal Economy and Ocean Economy, encompasses activities directly or indirectly influenced by the ocean. These terms, while broadly homogeneous, exhibit heterogeneity in sector coverage (Park, 2014). For instance, the 'Ocean Economy' is prevalent in the US and Ireland, the 'Marine Economy' in the EU and Australia, and the 'Blue Economy' in India and Mauritius. Recognising specific industries as constituents of the Blue Economy within an economy is a fundamental requirement, not just an option. This is due to the critical role these industries play in shaping the country's Blue economic structure. For example, the exploration of hydrocarbon from Bombay High is part of the Blue Economy but not from Digboi exploration from Assam. Production functions vary significantly from land-based operations to ocean-based operations in any industry. These complexities hinder the development of a universally accepted definition of the Blue Economy, though recent years have seen progress towards a more standardised understanding (PEMSEA, 2015).

Establishing a transparent, credible, and predictable accounting framework is essential for accurately estimating the Blue Economy. This realisation in industrialised economies has led the US and EU to evolve regional classifications like

NAICS, NACE, and SIC, capturing the full spectrum of Blue Economy activities. However, the current global approach to estimating the Blue Economy is not consistent due to the lack of comprehensive definitions and activity classifications (Axon & Collier, 2023). In the absence of a global consensus in the coverage and estimation procedure, cross-country comparisons remain scientifically unreliable. The diversity in methodologies to estimate satellite accounts through the value-added approach of blue industries or input-output frameworks further complicates the appropriateness of Blue Economy estimation. Further, factor endowments in the Blue Economy sector vary significantly from one country to another. In this situation, the estimation of the contribution to GDP for each country is essential by following proper estimation procedures rather than guesstimating it for a country by observing similar conditions existing in another country. This is not possible because there are no 'stylised facts' existing in the Blue Economy sector. To lend support to the assertion that there are no 'stylised facts' for the estimation of the Blue Economy, a few empirical studies were undertaken in the past (Mohanty, 2018; 2023). These studies argue that the guesstimate can be based on certain indicators such as length of coastline, size of GDP, level of capita income, coverage of land and coastline-to-land ratio. Taking into account estimates of 48 littoral countries, these studies observed that there are no 'stylised facts' in the Blue Economy sector, using these macro indicators. Therefore, it is essential to estimate the contribution

of the Blue Economy by using the common practice of a value-added method with the support of identified blue industries (Colgan, 2016).

There has been significant discussion about the relevance of the Blue Economy in recent decades, with challenges in quantifying its contribution to GDP due to the lack of an appropriate accounting framework (Turschwell et al., 2022). Numerous country studies have shown that the accuracy of Blue Economy accounting heavily depends on correctly identifying industries and their activities. Classifying ocean sector industries, both goods and services, is key to accurately estimating the Gross Value Added (GVA) of the Blue Economy. In India, a detailed approach is used, classifying industries at a 5-digit level (NIC98) to ocean-related activities. The contribution of each industry to the sector is considered in detail, with partial contributors being assigned weights based on surveys and studies (Choudhary et al., 2021). This detailed accounting method helps in presenting a more precise estimate of the GDP of the Blue Economy.

India uses the National Accounts System (NAS) aligned with the System of National Accounts, UN (1993) for GDP estimation, adapted to assess the Blue Economy using the NIC-1998, based on ISIC Revision 4. The NAS classification helps in identifying 159 Blue sector industries at 5-digit NIC98, and their contributions are accounted to estimate the contribution of India's Blue Economy to GDP (Mohanty, 2018). The Prime Minister's Economic Advisory Council (PMEAC) in 2019 adopted a similar

approach to identify a comparable number of blue industries under the 5-digit NIC98 for GDP estimation.

Blue Trade, emerging in the Blue Economy context, is outpacing traditional GDP and trade growth rates. It encompasses both the blue merchandise trade (products with ocean-sourced inputs or outputs) and services trade originating from oceans, rivers, or water bodies. Precise understanding and accounting of Blue Trade are vital for maximising the potential of the Blue Economy. To assess the Blue Economy's size, analysis must progress from sectors to industries, then to activities, and finally to products. This approach helps in comprehensively capturing the economic activities within the sector. For quantifying Blue Trade, a study by Mohanty (2019) identified 780 specific products using the 6-digit HS code from 159 industries classified under the 5-digit NIC98, aligning with ISIC Revision 4. Additionally, this study and a subsequent one by Mohanty and Gaur (2023) estimated the global scale of sectoral Blue Trade in goods, covering 169 countries from 2002-2022, thereby underscoring the growing importance of Blue Trade in the global economic landscape.

State of Research in RIS

The growing significance of the Blue Economy in India's GDP is evident from various sectoral initiatives taken in the sector. In 2016, the Blue Economy contributed 4.1 per cent to the national GDP, with the primary sector accounting for over

half of its value-added (PMEAC, 2019). A study by Mohanty, Dash, Gupta, and Gaur (2015) delineates three key concepts: the ocean economy, dependent on ocean inputs for coastal and non-coastal production; the coastal economy, encompassing all economic activities near the coast; and the Blue Economy, a comprehensive framework incorporating all ocean-related activities and their environmental costs. India's commitment to the Blue Economy as an alternative development strategy is gaining momentum, particularly in alignment with Sustainable Development Goal 14. Under the current political leadership, initiatives like 'Sagarmala' and 'Mausam', and international collaborations with Indian Ocean island nations, underscore this focus. The 'Deep Ocean Mission', a significant $1.6 billion project, exemplifies efforts in deep-sea research and desalination. RIS, NITI Aayog, and MOSPI's collaborative framework for Blue Economy accounting adopts the ISIC industry classification to evaluate contributions to GDP.

This framework initially encompasses 9 sectors, further dissected into 159 sub-industries under 33 industries. While some sub-industries fully align with Blue Economy activities, others only partially contribute. The current classification, covering 8 per cent of NIC 2008 lines, is evolving to include newer industry-specific activities, reflecting the dynamic and expanding scope of India's Blue Economy. This comprehensive, nuanced approach is pivotal for accurately assessing and

fostering the Blue Economy's role in sustainable, inclusive economic growth (Mohanty, 2018).

The diverse and often unpredictable nature of the Blue Economy's contribution to national GDPs is striking (Mohanty, 2023). Timor-Leste's Blue Economy, for instance, constituted an unprecedented 87 per cent of its GDP in 2015, a stark contrast to the global range, which spans from 87 per cent in Timor-Leste to a mere 0.01 per cent in Austria. This variation raises questions about the factors influencing the size of a country's Blue Economy. Our analysis of 48 countries reveals no direct correlation between a nation's coastline length, GDP, per capita income, or landmass and its Blue Economy's GDP contribution. For example, Japan, the USA, New Zealand, and India, despite their extensive coastlines, have less than 5 per cent Blue Economy share. Similarly, countries with high GDP or per capita income, like Canada and China, show significant Blue Economy contributions, while others, such as the US and Germany, do not contribute much in relative terms. This inconsistency extends to littoral countries with large land masses. The United States, France, and Spain have low Blue Economy contributions despite their size, whereas Indonesia, Thailand, Tanzania, and Canada have high contributions. These studies indicate that there are no standardized "stylized facts" to accurately estimate the Blue Economy's contribution to a nation's GDP. Each country's unique marine resources, economic structure, and sectoral diversity necessitate individualised estimation without reliance on global

generalisations. For instance, the agricultural sector dominates Brunei's Blue Economy, hydrocarbons are significant in the EU, and marine services are predominant in the US. The disparities underscore the need for tailored national frameworks to accurately assess and strategise the Blue Economy. International collaboration and a unified 'blue voice' are vital in addressing definitional and methodological inconsistencies to foster a coherent global understanding of the Blue Economy. This approach will enable countries to develop effective national and regional action plans, leveraging their specific marine and economic resources.

It is imperative to analyse the evolution and potential of the Blue Economy, a sector that has been a focal point of research for the past fifty years. The Blue Economy literature primarily centres on identifying and categorising sectors, industries, and activities. A novel area of research has emerged, focusing on the expansion from activities to products. Some studies have made significant efforts by identifying various products of goods and services within the Blue Trade (Mohanty, 2019, 2023, Mohanty and Gaur, 2023). These studies estimated the blue merchandise trade for 169 countries and the global economy from 2002 to 2022. The results revealed a rapid increase in global Blue Trade, rising from $770 billion in 2002 to a peak of $3.2 trillion in 2015, before declining to $2 trillion in 2020. This fluctuation reflects the impact of global economic challenges, including the global recession and the COVID-19 pandemic. Specifically, the Blue

Trade witnessed substantial turbulence during the second phase of the global recession, followed by a brief recovery in 2017. Re-emergence of the recession led to a downturn again in 2019, exacerbated by the onset of the pandemic in 2020. Focusing on India, the findings of the studies indicate that the nation's goods and services trade in the ocean sector is a notable contributor to its economy. The current trends suggest that if sustained, the Blue Trade could become a significant growth driver for India. This insight is crucial for stakeholders and policymakers, highlighting the importance of nurturing and investing in this sector to leverage its potential for economic growth and sustainability.

India's Blue Economy has shown considerable growth, with its GDP rising from $70.82 billion in 2011 to $85.19 billion in 2016. This growth is even more pronounced in local currency units, jumping from INR 3305.4 billion to INR 5724.3 billion over the same period. Despite exchange rate fluctuations affecting its dollar value, the Blue Economy's contribution to India's GDP remained stable at around 4 per cent. A notable aspect of India's Blue Economy is the underestimation of its diverse sectors, which include a range of activities from port services to satellite navigation for fishermen.

The Blue Trade, distinct from the broader maritime trade, has been a pivotal growth driver within the Blue Economy, contributing over 10 per cent to India's overall trade. In 2022, India's Blue Trade stood at $223.6 billion, with the goods sector

dominating. Since 2003, India's blue exports and imports in the goods sector have increased twelve-fold, showing the sector's resilience and growth potential. Trade openness within the Blue Economy has consistently outpaced India's overall trade openness, indicating the sector's significant role in the country's economic trajectory. India's Blue Trade, particularly in services, has maintained a consistent trade surplus, which was especially pronounced during the global economic recession of 2008-22. This resilience highlights the sector's potential as a key driver of future economic growth in India. Overall, while the Blue Economy accounts for around 4 per cent of India's GDP, Blue Trade shares 10 per cent of the country's overall Value Added.

Technology is key to the advancement of the Blue Economy, particularly in emerging sectors where it is still developing. Policy intervention in technology creation is crucial for countries at all stages of economic development, aiming to invigorate marine sector activities. Industry 4.0, driven by digital technologies like AI, IoT, big data, and cloud computing, is transforming traditional industries and enabling new business models focused on productivity and efficiency. Several gaps in the ocean sectors can be addressed by technology, as discussed in SDG-14 (Mohanty and Gaur, 2017). This revolution is instrumental in bridging global inequalities, aligning with the Sustainable Development Goals (SDGs), especially SDG-14, which is supported by the UN Decade of Ocean Science for Sustainable Development (2021-2030). India, a significant player in the Blue

Economy, is the world's third-largest fish producer and second-largest in aquaculture but still performs below its potential in fish landing. Modernising traditional fishing techniques and focusing on innovations in aquaculture are imperative. In the context of coastal and deep-sea mining, India, recognised as a 'pioneer investor', faces the challenge of balancing technological advancements with ecological preservation. The global shift from non-renewable to renewable energy sources to mitigate climate change impacts highlights the potential of the Blue Economy in the energy sector. Despite technological advancements in areas like placer mineral processing and satellite fabrication, more innovation is needed in renewable energy exploitation and environmental protection in the shipping sector. The shipbuilding industry, part of the blue manufacturing sector, is rapidly adopting technologies like IoT, automation, and 3D printing, necessitating evolved governance structures for indigenous technology development.

Governance of the Blue Economy poses a significant challenge globally due to its capital intensive across various economic sectors, necessitating coordination among multiple ministries and levels of government. In industrialised countries like the U.S. and Canada, the Blue Economy is often overseen by the highest executive authority, with many countries adopting National Blue Economy Policies and budgetary allocations to promote ocean sector activities. For instance, Canada and Australia have established hierarchical structures at both

federal and provincial levels for Blue Economy management. In India, the Ministry of Earth Sciences (MoES) is leading the development of a National Policy on Blue Economy, with the proposed formation of the National Blue Economy Advisory Council comprising representatives from relevant ministries, coastal states, and industry sectors. India has initiated various programs for coastal development under the Blue Economy framework. The 'Sagarmala' program focuses on port and infrastructure development, while 'SAGAR' aims at fostering international cooperation in the sector. Additionally, India is investing in digital platforms like 'Sagar Manthan' and Marine Spatial Planning (MSP) to integrate data systems and manage coastal resources effectively. The 'Deep Ocean Mission' reflects India's commitment to developing ocean technologies, including underwater robotics, renewable energy technologies, and offshore desalination techniques. India's advancements in ocean technology, such as the development of the manned submersible 'Samudrayan', highlight its strategic role in exploring marine resources sustainably. To create frontier technologies, MoES must secure financial autonomy and establish a commercial arm to promote indigenous technology development in the Blue Economy sector. India's evolving Blue Economy policy, awaiting parliamentary ratification, reflects the recognition of the sector's potential to drive the domestic economy and create jobs across a spectrum of industries, from traditional to emerging sectors.

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6

COST OF NON-COOPERATION IN SAARC REGIONS

I Background Issues

Regional Cooperation can harness countries' strengths and help overcome the challenges of globalisation, such as the widening of the wealth gap.1 Regional cooperation in areas such as trade, transport and ICT can help to bridge that gap by strengthening the ability of countries to realize the benefits of globalization (UNESCAP, 2004). Although considered a "second best" policy,2 it offers a middle path between complete self-reliance at the one end and complete openness on the other. Regional Cooperation brings many of the same benefits multilateralism but on a smaller scale. Firstly, it enables participating countries to overcome the small size of their domestic markets and achieve economies of scale and greater specialisation in production, thus increasing the competitiveness of their products. Secondly, access to a larger market enables developing countries both to expand existing industries and to set up new export industries, diversifying exports and reducing their vulnerability to setbacks in a specific

product market. Thirdly, regional cooperation can enhance the capacity of developing countries to meet emerging challenges, including the application of new technologies. Fourthly, it is increasingly clear that regional trade facilitation measures offer significant benefits by reducing the costs of transactions across international borders and removing non-border obstacles.

One of the subregional groups in the Asia Pacific region that underlines the regions' enormous political and economic diversity and the challenge of trying to promote broader regional integration is the South Asia region. The South Asian Association of Regional Cooperation (SAARC) was set up as an organisation to build a connected and integrated South Asia with the larger aim of promoting the development and progress of all countries in the region. It was established on 8th December 1985 by seven countries, namely Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka. After the inclusion of Afghanistan at the 13th summit held at Dhaka in 2006, there are now eight members.[3] Its Secretariat is based in Kathmandu, Nepal.

As of 2021, The SAARC comprises 3 per cent of the World's land area, 21 per cent of the World's population and 5.21 per cent (USD 4.47 trillion) of the global economy. The South Asia as a region with geographical contiguity, cultural, social and historical ties, has good potential for emerging as a strong, efficient and dynamic region. With this, an important policy initiative of the South Asian Free Trade Area (SAFTA) was

implemented post-2006 after the succession of the 1993 SAARC Preferential Trading Arrangement (SAPTA). SAFTA signatory countries are Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.4

However, economic collaboration within the region has been limited even with regard to full implementation of SAFTA, due to a lack of awareness regarding the potential benefits of cooperation (RIS, 2015). The eighteenth SAARC summit held in Kathmandu on 26-27 acknowledged in 2014 that the SAARC Member States, particularly the Least Developed and Landlocked Member States, face structural constraints and challenges that result in their weak productive capacity affecting their competitiveness in external trade due to, among others, high trade and transit cost.5 The general notion has been that the economic integration and cooperation between SAARC countries have been predominantly pessimistic in nature. While the global economy has been benefitting from different types of cooperation, South Asia is lagging behind in this regard due to the existence of numerous challenges within the region, such as creating a politically friendly climate in South Asia: making rapid progress on economic reforms; achieving accelerated export orientation; promoting domestic and foreign investment; and developing regional integration strategies (Khan, 1997). Also, it is often argued that the region is characterised by low trade complementarities. However, much of the RIS studies

have demonstrated evidence otherwise, based on both economic logic and empirical estimates (RIS, 2015). Therefore, the cost of non-cooperation among the regional economies would deprive them of benefits such as reaping economies of scale in production; and lower prices and better quality resulting from greater competition. These aforementioned benefits of regional cooperation foregone are the cost of non-cooperation in South Asia. These benefits of cooperation and the cost associated with it within the region are often not fully appreciated.

With the background presented, this chapter discusses the cost of non-cooperation in the SAARC region, the methodology and framework RIS has developed to calculate the cost of non-cooperation in South Asia, empirical estimates of the cost of non-cooperation of two countries of South Asia- Sri Lanka and Pakistan followed by a way forward for policy steps that might benefit the region, especially from the point of view of greater integration in terms of trade in goods and services.

Review of Literature

Although the SAARC focuses on various areas of cooperation according to the SAARC Secretariat,6 in this chapter, we will be restricted to the economic and Trade aspects of the SAARC region.[7]

In the past few decades, the share of world trade to world GDP ratio has increased from 37 per cent in 1985 to 57 per cent in 2021.8 This growth, to a large extent, has been made possible

by an upsurge in participation by developing countries in global trade, as they underwent a huge shift in their economic policies, embracing the fact "Trade as an engine of Growth". Despite SAFTA spearheading the South Asian initiative for regional economic cooperation, the region still remains one of the least integrated regions in the World. Between 1995 and 2005, intra-regional trade in South Asia hovered around 5 per cent of the total trade of these countries compared to intra-regional trade ranged between 20 and 60 per cent in the case of many other regional economic blocs during the same period (Chatterjee, 2014). Thus, SAARC remains one of the weakest trading blocs in the World. (Eusuf, 2005). It is important to note that the countries that lack cooperation at the regional level tend to lose on the opportunities on account of untapped expanded markets, additional investment and production space and less than optimal use of natural, capital, technological and labour resources. Further, the countries would be deprived of the advantages of economies of scale, scope and specialisation if they fail to cooperate in production and trade (RIS, 1999).

These costs of non-cooperation among the South Asia countries are high costs to consumers. Enhanced regional trade would bring the prices of many key commodities significantly by avoiding the additional costs of importing from outside the region. For example, (Qamar, 2005) estimated that Pakistan would benefit from importing from India in the range of USD 400 to 900 million if it replaces its present imports from other

countries. This study also estimated that if Pakistan-India trade were to open, bilateral trade volume would cross USD 5.2 billion.

It may be stressed that the available differences in unit values of items between the SAARC sources of imports and extra-SAARC sources are not necessarily due to quality differences. (RIS, 2004) Illustrated that India made Hero- Honda motorcycle which could be purchased in Sri Lankan Market at Sri Lankan Rs 78,000 compared to the original Hondo motorcycle from Japan at Rs 1,49,000. Similarly, the price difference between the Indian motorcycle, Kawasaki- Bajaj (Sri Lankan Rs 73,665) and the original Kawasaki motorcycle from Japan (Sri Lankan Rs 1,60,000).

Therefore, in spite of the potential benefits that could accrue from regional cooperation calculated across various literature and reports, the process of achieving regional cooperation has not made much headway. Therefore, RIS had made an attempt to properly analyse the constraints to such cooperation is essential to know what steps the Government needs to take so as to extirpate them.

Development of Novel Methodological Framework by RIS

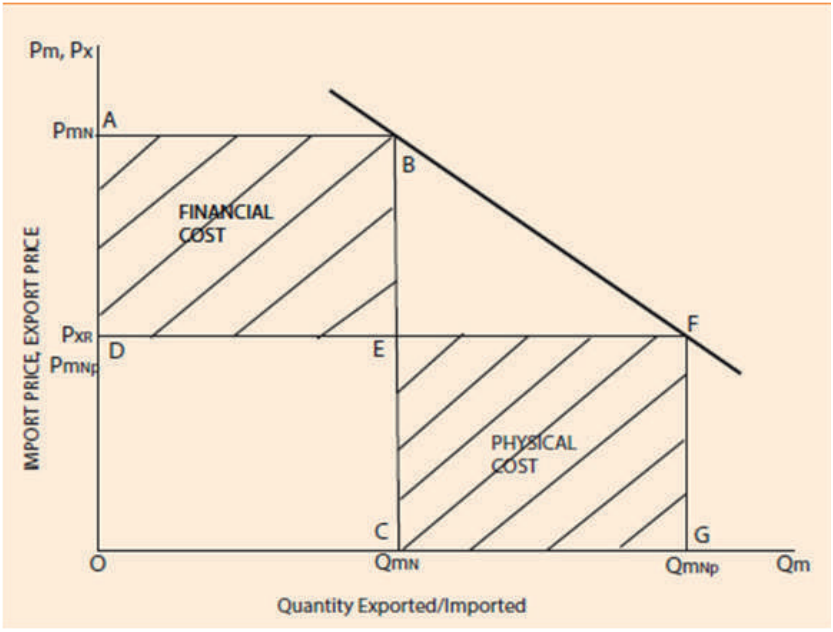
The first contribution in developing the methodological framework by RIS, carrying out a detailed quantitative assessment of the cost of non-cooperation in the SAARC region was put forward in 1999 (RIS, 1999). An empirical exercise was

carried out to compute the costs incurred by SAARC member countries in terms of not importing from within the SAARC region. For this purpose, unit values of items at the Standard International Trade Classification (SITC) 3-digit level were computed in the case of countries for which data on the quantity of exports and imports were available for India, Pakistan and Sri Lanka.9 These estimates are based upon both the items that are presently being imported by Sri Lanka and Pakistan from SAARC region as well as from outside the SAARC region in 1994. They also include those items which were not imported in 1994 by these countries from within the SAARC region. As a direct comparison between unit values of imports from within the SAARC region and outside was not possible, a comparison was made between the unit value of exports of SAARC Member Countries (SMCs), by converting from Free on Board (FOB) to Cost, Insurance and Freight (CIF) value by using a CIF/FOB factor and the unit values of imports of Sri Lanka and Pakistan from outside the SAARC region.

Das (2016) built upon the framework and methodology presented in the above (RIS, 1999). However, he conceptualised the segregation of 'Cost of Non-Cooperation' into two parts: a) Financial Costs of Non-Cooperation and b) Physical Cost of Non-Cooperation. 'Financial Costs of Non-Cooperation' refers to the additional foreign exchange expenditure incurred a country incurs when it imports goods from the global market but not from the regional market, even though the prices in the

global market are higher than those in the regional market. It is important to note that the lower price of regional products may not necessarily be due to lower quality as compared to products that are imported from the global market. Another type of Cost of Non-cooperation is the Physical Cost of Non-Cooperation arising due to the loss in terms of quantity because of higher import price constraints and additional import quality demanded.

Figure 1: Types of Costs of Non-Cooperation



Source: (Das, 2016)

The type of Non-Cooperation Costs can be explained from the above Figure. The X axis is quantity imported/exported and the Y axis represents import/export prices. Considering

the downward sloping import demand curve of a country N in a region say South Asia importing quantity QmN at a price PmN, its total import expenditure would be OA*OC. Similarly, if a region exports products to the rest of the world at price PxR then the same quantity imported by country N that is OC at QmN would entail import expenditure of OD*OC in which case there will be a saving of import expenditure of precious foreign exchange to an extent of AD*DE. Therefore, the financial cost of non-cooperation is given by the area of the rectangle ABED.

For the Physical Costs of Non-Cooperation, let us say country N keeps its expenditure the same. Given the, downward sloping demand curve, it can now import more quantity when the import price is lower. Now if country N imports at a price PmNp from the regional market i.e. a price lower than the global market price, it can import its potential quantity QmNp which is higher than the quantity QmN. This would entail an import expenditure of OD*OG given by the area of rectangle OGFD, equivalent to area OABC, which was the expenditure in the previous case. With the same expenditure, it could import higher quantities to the tune of CG (OG-OC) by cooperating in the regional market. This physical loss of CG in quantity terms gives us the physical cost of non co-operation which is represented by the area of the rectangle CEFG.

RIS's contribution

RIS utilised this inbuilt concepts and methodology to carry out the cost of non-cooperation among the SAARC region for the three time periods 1994, 2009 and 2014. (RIS, 1999) revealed that in 1994 Sri Lanka as well as Pakistan imported many items at higher unit values compared to if sourced within the SAARC region. In 1994, Sri Lanka and Pakistan lost approximately USD 266 million (36 per cent of the actual import bill pertaining to items imported) and USD 511 million (28 per cent of the actual import bill pertaining to items imported) in 1999. For Sri Lanka, the unit values of imports from outside the SAARC region are, on average, twice the unit values associated with regional imports of the same items, in 1994. For Pakistan, the ratio between additional-SAARC unit value and SAARC unit value was approximately in 1.57 in 1994.

(Das, 2016) Further calculated the cost of non-cooperation for the years 2009 and 2014 (Table 1). He found that the cost of non-cooperation for both Pakistan and Sri Lanka has not only increased substantially but increased at an increasing rate, reiterating the fact that greater regional cooperation and integration offer immense opportunities and benefits for SAARC member countries.

Table 1 : Cost of Non-Cooperation for Pakistan and Sri Lanka

Costs of Non-Cooperation					
	Values in USD Million			Growth (%)	
Year	1994	2009	2014	1994-2009	2009-2014
Pakistan	511	1319	6821	158	417
Sri Lanka	266	600	2848	126	375

Source: (Das, 2016)

Table 1 shows an alarming picture. The loss estimated in importing at higher cost due to non-Cooperation for both Sri Lanka and Pakistan with the SAARC region comes to around USD 600 million and USD 1319 million in 2009. For the year 2014, the cost of Non-Cooperation for Pakistan came around USD 6821 million, 2.4 times more than the estimated cost of Non-Cooperation for Sri Lanka. If we draw a comparison for the period 1994-2009 and 2009-2014 we clearly see that rate of increase of these costs has also substantially increased from approximately 160 per cent to 420 per cent and from 126 per cent to 375 per cent for Pakistan and Sri Lanka respectively between these two periods.

Das (2016) also provided the cost of non-cooperation from the perspectives of external Debt for the period of 2010 and 2014. Table 2 shows that the share of non-cooperation in external debt stocks for Pakistan was approximately 42 per cent and for Sri Lanka was approximately 40 per cent. This allows for opportunities and benefits among the SAARC region, i.e., if they cooperate both of these countries can simply reduce their external debt stock by 40 per cent by taking care of the cost of non-cooperation.

Table 2: Share of Cost of Non-Cooperation in External Debt[10]

Country		2010	2011	2012	2013	2014	2010-14*
Pakistan	External Debt stocks, total (in Million USD)	64003	65520	62144	60045	62184	62779
	Cost of Non-Cooperation (in Million USD)	2938	4724	5463	2796	6821	26290
	Share in External Debt stock (%)	4.59%	7.21%	8.79%	4.66%	10.97%	41.88%

Sri Lanka	External Debt stocks, total (in Million USD)	21762	25887	35792	40257	43609	33461
	Cost of Non-Cooperation (in Million USD)	1098	3314	2821	3475	2848	13158
	Share in External Debt stock (%)	5.05%	12.80%	7.88%	8.63%	6.53%	39.32%

Source: (Das, 2016).

From the above analysis carried by RIS, we infer that the methodologies developed can be used to calculate the cost of non-cooperation of various regional cooperation. It can also be used to empirically derive the costs associated with various sectors of non-cooperation and accordingly, the cooperation among various regions can be strengthened in various aspects of cooperation such as economic and trade, etc.

Endnotes

1 United Kingdom, Department for International Development, White Paper on Eliminating World Poverty: Making Globalisation Work for the Poor (London, Her Majesty's Stationery Office, 2000) indicates that the number of people living on less than $1 a day increased significantly in South Asia, Sub-Saharan Africa and Eastern Europe and Central Asia in the 1990s

2 M.E. Kreinin, M.G. Plummer, Economic Integration and Development: Has Regionalism Delivered for Developing Countries? (Massachusetts, Edward Elgar, 2003).

3 https://mofa.gov.np/wp-content/uploads/2016/03/Revised-SAARC-Brief.pdf

4 https://www.un.org/ldcportal/content/south-asian-free-trade-area-safta

5 https://www.saarc-sec.org/index.php/areas-of-cooperation/economic-trade-and-finance

[6] https://www.saarc-sec.org/index.php/resources/publications/66-saarc-at-a-glance/file

[7] Various areas of cooperation as follows: 1) Human Resource Development and Tourism, 2) Agriculture and Rural Development, 3) Environment Natural Disaster and Biotechnology, 4) Economic Trade and Finance, 5) Social Affairs, 6) Information and Poverty Alleviation, 7) Energy Transport Science and Technology, 8) Education Security and Culture

[8] https://databank.worldbank.org/reports.aspx?dsid=2&series=NE.TRD.GNFS.ZS

[9] 44 items as per 3 digit SITC codes.

[10] Note: This is based on Average Unit Price Calculation i.e Total Trade Value over 2010-14/ Total Quantity over same period

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7

EFFECTIVE RATE OF PROTECTION

Background of the issue

International trade is considered an important driver of economic growth. There exist two schools of thought on framing the international trade policy-free trade versus protectionism. Economists are divided on the question of whether a country should follow the policy of free trade or provide protection (in the form of tariffs, subsidies or quotas) to its domestic industries. Adam Smith favoured the policy of free trade, which is based on the idea that market forces will ensure that production happens efficiently. On the other hand, the advocates of protectionism believe that regulation is necessary for the smooth functioning of the market forces.

India faced the same issue while framing its trade policy after independence. It followed a very restrictive trade policy till the 1980s which was characterized by high tariffs and non-tariff barriers in addition to a complex system of import licensing. The objectives of this policy includes protection to domestic industries, conserve foreign exchange resources and to ensure adequate supplies of inputs to industry.

The trade policy system in India can be divided into two phases: 1) The period 1950–62 focused on heavy inward orientation, where the policy of import-substitution was considered very important, especially after the foreign exchange crisis of 1956-57, and 2) The period 1966–74 was marked by outward orientation and the policies focused on export subsidies, devaluation in 1966, which rationalised the over-valued exchange rate, but these policies could not mark the shift towards the outward orientation as there were restrictions on foreign capital inflows, indigenous contents conditions, import licensing etc. that continued (Panchamukhi, 1978).

Traditionally, nominal rate of protection and implicit tariffs have been used to measure or quantify the trade policies. Implicit tariff is defined as the percentage excess of domestic price over international price. There are two components of implicit tariff – nominal tariff and the other is due to non-tariff trade policies. Thus, the nominal tariff is only a part of the implicit tariff.

It was earlier believed that the higher the nominal tariff rate on imports of a final good, higher would be the output level of the protected good. Nominal tariff rates are not a good indicator of how much protection the domestic producers receive as, for them rise in value added is more important than rise in prices which is derived after the cost of intermediate inputs is deducted. The tariffs on intermediate commodities were ignored till a new measure of protection called effective rate of protection became known to the trade theorists.

Effective rates are used to measure the impact of protection policy on the rewards to the factors of production. It considers the entire tariff structure rather than tariffs only on the final imported commodity (Batra, 1973) as there are two opposite effects on the output level of the protected good. First, the tariff imposed on the imported commodity acts as an implicit element of subsidy which raises the output of the protected good but on the other hand tariff imposed on the imported input raises the production cost as raw material becomes more expensive and hence lowers the output.

Various studies have shown that there is a lot of difference between the effective rate of protection and the desired levels of protection. Therefore, the Committee on Import-Export Policies and Procedures advised that nominal tariff rates should be set to safeguard industries effectively. The committee also felt the need of moving from a licensing system to a tariff mechanism in a gradual manner which should be reviewed commodity-wise. As the tariff system is simpler administratively and economically, more explicit means of protection. In the process, equivalent tariff rates have to be identified first. The next step is to consider other important things like a new industrial strategy of realising a competitive environment. Lastly, implications of the new tariff structure should be identified and adjustments should be based on the tariff rates to eliminate any kind of undesired bias discovered in the structure of effective protection

Literature Review

The concept of the ERP was first given by Travis in 1962. Other authors like Corden, Johnson and Balassa later rediscovered the concept independently. A number of studies have compared the nominal and effective rate of protection and found that there is a lot of inconsistency between the two. In many studies, it was noted that effective protection was much higher than the nominal protection. Balassa (1965) calculated the nominal and effective rate of tariffs for thirty-six industries in five countries in 1962 and found that ERPs were higher than nominal rates. Donges (1976) considered a sample of fifteen countries and showed that ERP was higher than the nominal tariff and the ERP was highest for consumer goods, lower for intermediate products and lowest for capital goods. Ray & Marvel (1984) found that nominal tariffs understated the effective protection in the US, Japan, the European Community and Canada in the post Kennedy round period. Fane & Phillips (1991) based on the input-output table of Indonesia, estimated nominal and effective tariff rates for 134 tradable industries for the year 1985. They found that the protection policy has subsidized manufacturing (average ERP was 44 per cent) at the expense of mining and quarrying, where the average ERP was -1 per cent.

In Indian context, Mehta (1997) estimated the ERP and found that the liberalisation process has led to significant decline in the protection of Indian industry as the average value of Effective Rate of Protection has declined to 30 per cent in 1995-96 from 90 per

cent in the pre-reform period. Goldar & Saleeem (1993) estimated ERP and studied the relationship between ERP and industrial performance. They found that industries which have higher ERP (level of protection) do not exhibit significantly higher growth. (Gang & Pandey, 1998) studied the inter-industry structure of protection in India and how it has changed over time. They found that the level of protection varies depending on the notion of tariff rate used. When ex-ante tariffs are used then the level of protection was high but this changes when ex-post tariff rates are used. Das (2003) estimated three measures- an effective rate of protection, import coverage ratio and import penetration rates for around 72 three-digit industries, which were divided into three-use based sectors for the four phases of trade reform. The results showed that the effective protection levels (using Corden's measure) were the highest in the second phase of trade reforms. There was a rapid decline in the levels of protection based on effective rates of protection in the 1990s.

Development of Methodological Frameworks by RIS

The effective rate of protection depends not just on the tariff on the commodity produced but also on the tariff on the inputs and the input coefficients. According to Corden (1966), ERP is the percentage increase in value added per unit in an economic activity which is made possible by the tariff structure relative to the situation in the absence of tariffs but with the same exchange rate.

The formula for calculating ERP for an importable product j is given below:

$$v_j = p_j\left(1 - a_{ij}\right)$$

$$v_j^{'} = p_j\left[\left(1 + t_j\right) - a_{ij}\left(1 + t_i\right)\right]$$

$$g_j = \frac{v_j^{'} - v_j}{v_j}$$

From the above equations we can derive

$$g_j = \frac{t_j - \sum a_{ij} t_i}{1 - a_{ij}}$$

where v_j is the value added per unit of j in activity j in absence of tariffs;

$v_j^{'}$ is the value added per unit of i in activity j made possible by the tariff structure;

g_j is the effective protective rate for activity j;

a_{ij} is the share of i in cost of j in absence of tariffs;

p_j is the price of unit of j in the absence of tariffs;

t_i is the tariff rate on i;

t_j is the tariff rate on j.

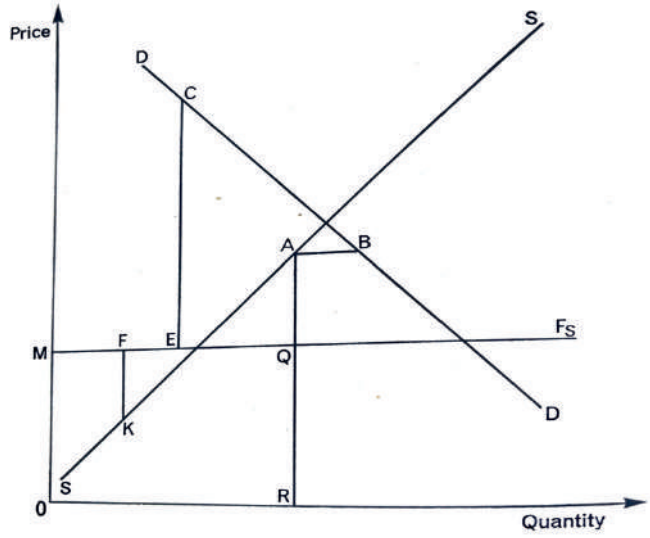
It was further assumed for simplicity that no non-traded inputs are required in the production of traded goods. But it would be unrealistic to assume that. So, to include the non-traded inputs in the analysis, two different measures given by Corden and Balassa are used: Non traded input costs are included in the value-added at domestic and world prices (Corden's methodology). Balassa treated non traded inputs as traded inputs with zero tariffs or export-tax subsidy.

Dr. Panchamukhi has contributed immensely to the theory of tariffs. In his paper on the optimal tariff rate (Panchanukhi, 1961), he used an innovative game theory model and demonstrated that in situations of uncertainty, maxmin principle defines the optimality of tariff, which is in contrast to the approach of Johnson's concept of optimal tariff(Johnson, 1953). He has also developed the approach of decomposing the ERP into the contribution of tariff policies and non-tariff barriers. His work on evaluating trade policies includes another interesting concept of Domestic Resource Cost (DRC). He has estimated ERP and DRC for a large number of ESCAP (the ECAFE) countries, including India.

Though the concept of ERP was developed, very few studies have estimated it for India in the 1970s. Bhagwati, Desai, along with Panchamukhi in 1970, had contributed a chapter on ERP (chapter 17) which is one of the earliest studies to present extensive calculations of the standard ERP. They also discussed the limitations of the ERP approach and were cautious against using ERP estimates for identifying the direction of resource-allocation pulls. The study estimated the ERP for India's industrial sector for eighteen industries which covers consumer goods, raw materials and intermediates, and capital goods for the years 1961 and 1962 and also analysed the various conceptual as well as statistical difficulties in using the ERP estimates for identifying the direction of resource allocation pull.

It also stated that we cannot consider the observed implicit tariff as equivalent to an identical explicit tariff which is the standard practice while estimating ERP. This equivalence can be obtained only in the situation of universal competitiveness. Bhagwati (1968) has considered the case when foreign supply is monopolistic and showed that the two will not yield the same results.

The study in its calculation of ERP, considers three factors important for estimating ERP in the context of India. Firstly, it described the difficulty in regarding the ERP, which is calculated from implicit, nominal tariffs in a Q.R. regime, as an indicator of the direction of the resource pull, which is due to the policy of Industrial Investment licensing, which restricts the entry of domestic producers. This is illustrated in the figure given below:



Source: Bhagwati, J., & Desai, P. (1970).

In the figure, DD is the demand curve and SS is the supply curve; F_S is the foreign supply curve. If AB represents the import quota, the equilibrium domestic price would be AR and AQ/QR would be the implicit, nominal tariff rate. When along with import quota, investment/output licensing is allowed which restricts the domestic output to MF, the equilibrium price would rise to (QR+CE) and the premium on imports would rise from AQ to CE and thus the implicit, nominal tariff would increase to CE/QR. The apparent increase in the implicit tariff would imply that domestic output has increased but in fact it was due to the restriction of output that the premium has increased which has, in turn, led to the rise in the implicit tariff.

Second factor deals with the adjustment for export subsidies. India, especially since 1964, had situations where an industry was first being protected from imports and then being subsidized for exports. To avoid bias, the authors have deliberately selected the years 1961 and 1962, during which the export incentives were relatively low. The third factor is related to A.U. licensing, under which producers obtain licenses to import intermediates directly. The analysis has treated A.U. imports and other tradeable inputs separately.

ERP was calculated for four different cases: In the first case, the standard nominal tariff rates are used for all the items. In the second case, the preferential tariff rates (for the UK) are used where applicable. For each case, the non-traded inputs are treated as a) other inputs with zero tariffs and b) primary factors

and hence are part of value added. The following methodology has been used in calculating the ERP due to Q.R. on imports and tariffs.

When there are no import quotas, the domestic prices would be the tariff-inclusive c.i.f. prices. Considering non-traded inputs as inputs with zero tariffs, the value added in the jth industry would be:

$$V_J^{'} = \frac{X_j\left(1+r_j\right)}{\left(1+T_j\right)\left(1+m_j\right)} - \sum_{i=1}^{n} \frac{D_{ij}\left(1+r_j\right)}{(1+T_i)(1+m_i)} - \sum_{i=1}^{n} M_{ij}(1+r_i) - S_i$$

The difference V_j-$V_j^{'}$ indicates the effects of Q.R.s on imports. Where X_j is the total input-value of the ith item for the jth industry, in domestic market prices.

M_{ij} is the imported inputs of ith type through actual-user-import licenses, in the jth industry.

D_{ij} is the rest of the inputs of the ith type, in the jth industry.

r_i is the ad valorem tariff on the ith import.

m_i is the rate of premium (difference between market price in the ports and the c.i.f. price) as a proportion of the c.i.f price.

T_i is the transport margin as an ad valorem rate per unit value of the ith item.

V_j is the net value added in the jth sector, at domestic prices.

S_j is the total non-traded inputs in sector j.

X_j is the output-value in domestic market prices for sector j.

When there are no tariffs and no Q.R.s on imports, then the value added in the jth sector would be:

$$V_j'' = \frac{X_j}{(1+T_j)(1+m_j)} - \sum_{i=1}^{n} \frac{D_{ij}}{(1+T_i)(1+m_i)} - \sum_{i=1}^{n} M_{ij} - S_j$$

The difference V_J' - V_j'' indicates the effect of the imposition of tariffs only and the difference V_j - V_j'' is the change in value- added in the jth sector on accounts of tariffs and Q.R.s on imports.

$$(V_j - V_j'') = (V_j - V_j') + (V_j' - V_j'')$$

Dividing both sides by the value added in world prices

$$\frac{V_j - V_j''}{V_j''} = \frac{V_j - V_j'}{V_j''} + \frac{V_j' - V_j''}{V_j''}$$

$$\frac{V_j - V_j''}{V_j''} = \frac{V_j - V_j'}{V_j''} + \frac{V_j' - V_j''}{V_j''}$$

$$\tau = \tau^{(1)} + \tau^{(2)}$$

τ is the total effective rate of protection

Where $\tau^{(1)} = \frac{V_j - V_j'}{V_j''}$

$$\tau^{(2)} = \frac{V_j' - V_j''}{V_j''}$$

$\tau^{(1)}$ is the ERP due to the Q.R.s and $\tau^{(2)}$ is the ERP due to the tariffs (explicit).

The results showed negative value added at international prices during 1961 for some products which include leather and leather manufacturers, bicycles, and non-ferrous metals and during 1962 it was negative for matches, bicycles, non-ferrous metals and iron and steel. The negative value added could be due to economic reasons or statistical difficulties but in the case of leather and leather manufacturers and sewing machines

where India is internationally competitive it could be attributed to the statistical difficulties.

In another study, Dr. Panchamukhi (1978)estimated the ERP for the 69 sectors of the Input-Output table of 1965 (converted into 1968-69 prices). He did this for two cases by including the non-traded inputs as:

- Non-traded inputs are treated like other inputs but with zero tariffs.
- Non-traded inputs are included in the value added which implies that the protection of these inputs also receive protection along with other primary factors.

He found that ERPs are higher than the nominal implicit tariff rates in most of the sectors for both the cases. Though it was found to be negative for some sectors which included bidi, plantations, foodgrains, sugarcane, etc. which implies that protection has not served its objective in these sectors. But for other sectors, protection has benefitted the primary factors of production though in varying degrees. ERPs also varied with the degree of processing i.e.; the production activity of intermediate goods received less protection than that of finished goods. It was also found that the ERPs for capital goods are less than consumer goods or intermediate goods, which suggests that the bias is in favor of consumer goods as they receive more protection.

ERP in case of import substituting sectors was found to be much higher as compared with potential export or export sectors which implies that the import-substituting sectors were more attractive. This bias worked against the export-promoting

activity and needs to be corrected. He suggested that instead of focusing on providing larger subsidies to exports so as to raise the ERP, the focus should be on reducing the ERP given to the import-substituting sectors by changing the import control system.

Panchamukhi (1978) estimated ERPs for the Indian aluminium industry for the period 1958 – 1970 and also explored the relationship between ERPs and the characteristics of the industry. ERP estimates were examined at the stages of bauxite conversion and alumina reduction. Using input coefficients and domestic and international prices, implicit tariffs were calculated. Results showed high ERPs from 1958 to 1963, decreasing afterward and turning negative in 1970. ERP variations between units suggested resource allocation biases within the industry. Notable findings include a negative, albeit small, relationship between ERP and capital intensity, a negative and substantial correlation with technical labor share, and a contradictory positive and significant link with import market share.

RIS' Contribution

RIS has contributed in the process of quantifying trade policies by estimating the ERP for the sectors of the input-output table which reflected the level of protection given to different industries. The study showed that ERPs ranged from 27 per cent to 8294 per cent when non traded inputs are treated like other inputs and from 26 per cent to 2456 per cent when non-traded

inputs are included in the value added. It also identified that in most of the sectors, ERPs were higher than the nominal tariffs. Dr. Panchamukhi's work on quantifying the trade policies discussed the various conceptual and statistical difficulties related to it. With the global scenario changing as the trade moves from trade in final goods to trade in value-added, it's worthwhile to revisit the concept of ERP.

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8

NEW DEVELOPMENT COMPACT

Background

The history of development assistance, since the very beginning, has been in contestation and divided between the industrialised and the developing donors. On one hand, the industrialised countries through 'Development Project' provided resource transfer to the poor countries with the motive of improving the standard of living; countries like India, Russia and China, on the other hand, provided assistance to fellow developing nations after the end of World War II (Clarke, 2022). With the reduction in the growth prospects of the developed nations in the 1970s, more and more developing nations have emerged as donor countries on the ground of development assistance. The issues in the development aid range from the amount of assistance to motivation behind it, through the changes in scope and actors of development assistance. The motive behind the development assistance has been criticised in the literature at various events. Earlier, development assistance

from industrialised countries was condemned because of the presence of conditionalities for economic reform. Recently, some developing countries have been criticised over the lack of control of the recipient country on various infrastructure projects, promoted under its development assistance programme. Nevertheless, different countries have different principles and approaches to development assistance and hence provide different methods of measuring it.

The discussions over the measurement issues of development assistance can be collected from 1969 when the OECD adopted *Official Development Assistance* (ODA) as an indicator to quantify the international aid flows from developed nations to poor countries for welfare and economic development. The OECD-DAC has been often criticised over the lack of theoretical basis, lax implementation policies and ono-transparency (Smith, Fordelone and Zimmermann, 2010 and EIAS, 2013). This was followed by a novel suggestion by Norway in the form of *Development Contracts* which was based on the Structural Adjustment Programme (SAP) with complementary change in the broad development priorities, including better access to trade and finance with readjustment of ODA policies (Chaturvedi, 2016a). A similar approach was introduced against the context of the 'right to development' as the Development Compact (Sengupta, 1993), which needed the developing countries to go through economic reforms under SAP in lieu of sufficient resources for development from developed countries based on

mutual obligation and reciprocity. This agreement was further explained as a contract among the countries based on shared responsibility (UNDP, 2003).

The conditionalities attached to the development assistance or the development agreement between industrialised countries and developing countries have raised criticism over the complex nature and multifaceted risks involved in it (Oxfam, 2006). Given the slow response of developed nations and the challenges with the conditionalities attached to the North-South development assistance, RIS has evolved a New Development Compact among the countries of the Global South on the principles of South-South Cooperation with no imposition of conditionalities, mutual gains, collective growth opportunities, non-interference of the actors and greater emphasis on self-reliance (Chaturvedi, 2016b). The modalities under this development compact should be in coherence with the development policies of the developing countries having no adverse effect on the macroeconomic variables of the country.

Review of Literature

Though international assistance in the world started making its mark after the end of World War II, the international architecture of development assistance was found to be in its nascent stage in the early 1960s with the ratification of a framework by several European countries, the United States and Japan in the form of Development Assistance Committee (DAC). The

DAC was established to advise and promote the best practices for development aid. The promotion of assistance by the DAC countries through summit-level meetings, reports, etc. reflected the development aid programme through the lens of developed nations, and the projects were being used as a tool of international policy. These Western countries tried to achieve the twin goal of providing assistance to humanitarian needs while progressing the national interests of the donor country. This also led to the recognition of Western countries as traditional and largest donors of development aid in the global forum. However, many developing countries had emerged as assistance providers building upon the flow of aid with the South and having a multifaceted approach to development cooperation.

With the growing engagement of non-traditional or alternative donors, as recognised in the Western literature, and the increase in the size of their development assistance, DAC-OECD nations found it challenging to maintain their hegemony in the development aid programmes. Two groups of developing countries emerged as donors in the development assistance literature, one comprising of BRICS nations and the other including Turkey and gild countries like Saudi Arabia, the United Arab Emirates and Kuwait. The assistance among developing countries has been criticised by the OECD-DAC based on their lack of theoretical bases, robust implementation policies, partisan approach, and non-transparency (Smith, Fordelone and Zimmermann, 2010 and EIAS, 2013). The

fundamental difference between the development assistance provided by developed and developing countries has been centered around the theoretical bases for their participation. On one hand, the monetarist approach has supported the concept of developed countries in providing development aid, on the other hand, the emerging economies have relied upon the structuralist approach. The disagreement between the two approaches has focused on macroeconomic stability.

The monetarist approach dwells upon the importance of the macroeconomic stability of a country to attain growth, whereas the structuralist approach argues that the country's growth is feasible with a certain level of macroeconomic instability (Yanagihara, 1998; Lim, 2011; Mohanty, 2015a). The ODA through the OECD-DAC programme is based on budgetary support, macro-targeting, policy conditionality and other monetarist principles. However, this approach has been condemned for having complex financial procedures and risks involved in obligatory conditions (Oxfam, 2006). There have been instances from the literature where several developing countries, like Bangladesh, have failed to comply with these strict conditionalities (Matin, 1986 and Rahman, 1992). Moreover, the motive behind ODA is to promote economic development and well-being both of which are said to be different priorities. On the other hand, development assistance from emerging countries is characterised as sector-specific having no complex procedures of macro-targeting with minimal or no presence of the donor.

The idea is to focus on sustained growth through small-scale development cooperation in needy sectors while targeting trickle-down growth instead of a specific development model. This has made aid flows from developing countries more attractive and contributed significantly to the growth efforts of developing countries (Chaturvedi, *et al.,* 2012). The efficiency in the delivery system of development aid from the developing countries can also be verified with increasing demand from the developing countries (Chaturvedi, Kumar and Mendiratta, 2013). However, development cooperation by emerging countries cannot be seen as a homogeneous group like in the case of OECD-DAC nations.

Many other developing countries have also adopted sector-specific practices in their development assistance policy, for example, Brazil's assistance is very much dominated in the health and energy sector, whereas in the case of China, their development assistance is skewed towards the infrastructure and manufacturing sector. The development assistance experience from China denotes that it funds the infrastructure projects, however, uses goods trade in setting loans from the recipient countries (AFRODAD, 2010). Moreover, its development assistance through the Belt and Road Initiative (BRI) has been taken in the development aid debate with a pinch of salt. Characterised as opportunistic with a lack of transparency and unavailability of data, Chinese development assistance is seen as outside traditional norms and to meet ODA criteria. The infrastructure projects under its BRI have been criticised

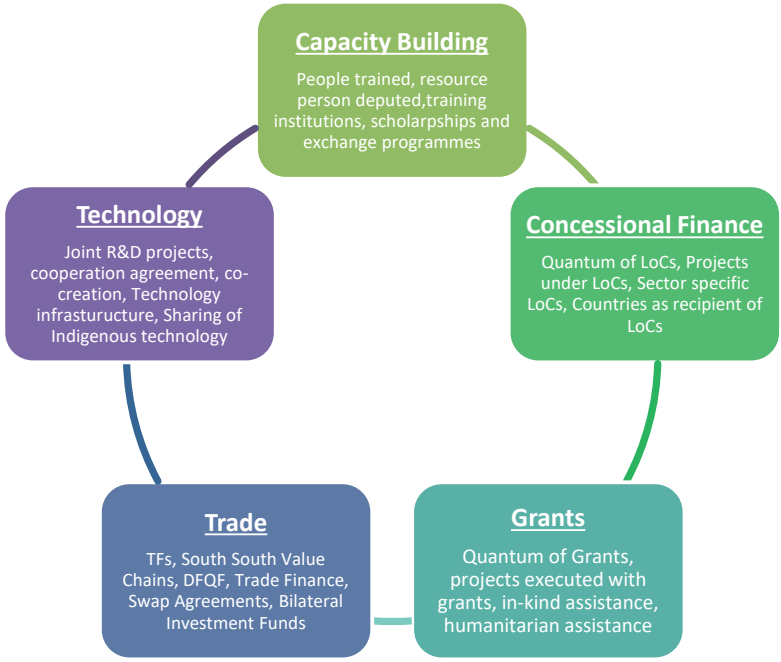
for creating a debt trap for the recipient countries, which has also led to the withdrawal of some countries from BRI. Hence, the trust factor has become important in the development assistance debate, especially after the sudden increase in Chinese development assistance in developing countries.

India, on the other hand, has followed a robust approach with its development assistance programme with other developing countries with its strategy of solidarity and mutual respect while treating the recipients as development partners. Its objective of development cooperation has to mitigate poverty and stimulate economic growth in the recipient country with a broader goal of sustainability of Southern growth. The country has been engaging in development cooperation since its independence era where the development assistance has been purely demand-driven, sector-specific aiming at mutual gain through trade and investment as well as cooperation policies. India's development partnership has gone through a radical transformation in its nature and content. It can be observed that sectors like agriculture, manufacturing and services, especially telecommunication services, have been the major areas where the development assistance of India was focused, which has now been diversified to multiple sectors. This strategy with theoretical underpinning, i.e. Mission Approach discussed in the next section, provides effectiveness, efficiency and predictability in India's role as a trusted development partner.

How RIS has developed the Index

The development cooperation of India can be articulated with the mission approach, which aims at identifying a set of growth drivers which would help the partners in development efforts. This helps in focusing on the long-term development of the country instead of the micro-focus on debt. The Mission approach has elements of the ingredient approach, in which tangible organisations are being used for South-South Cooperation, as opposed to the framework approach defining the rules of North-South Cooperation. India's development cooperation has been demand-driven where financial and other types of assistance are provided based on the requests and needs of the partner countries. Its assistance has been sector-specific support rather than budgetary allocations. Based on the mission approach, India has developed broad strategies for its development partnership and such strategies are known as be New Development Compact (Chaturvedi, 2012). This development compact has five action pillars or modalities (as shown in Figure 1), namely, capacity-building, concessional finance, grants, trade and technology, under the principle of equitable access and mutual gain in South-South Cooperation (Chaturvedi, 2016b).

Figure 1: Five Modalities of Development Compact



Source: RIS, 2019

The five modalities of the development compact framework are again classified under sub-modalities. For example, grants in cash, grants in kind and humanitarian assistance are classified as sub-modalities under the grant component of the development compact. Another example is the capacity-building modality, where dedicated training programmes, delegating experts or volunteers to projects in partner countries, technical assistance, etc. have helped the partner country in attaining development assistance with improvement in the human and technical capital. Other sub-modalities in this component also include

concessional finance to professional educational institutions which may be partially or completely self-financed. India, even before its independence in 1946 launched its training programmes for China. Currently, its ITEC and other dedicated training programmes are involved in capacity building in the partner country. Complementing human capacity building, India has also been sharing technology and knowledge base with developing countries and pushing its partners to achieve self-reliance in the long run. The similarity in the development stages of its partner countries helps in an easy adaptation and use of the technology before the technology obsoletes and helps in overcoming the high cost of technology development. Some sub-modalities under this segment, which India uses, are technology transfer, cooperation for joint research and development projects, training to acquire technological skills, etc. With the world becoming fragmented in production and trade sectors through global value chains, technological cooperation among developing countries is opening new avenues for economic development.

India has also focused on trade and investment as a strategy to foster development partnerships with its partner countries. It has provided Duty-Free Tariff Preference (DFTP) or Duty-Free Quota Free (DFQF) to least-developed countries providing them market access in India with zero or lower tariffs than the MFN rates. This provides the development partner in exploring inter- and intra-industry economies of scale with more intra-South

trade, given the similarity in demand patterns among the developing economies. This has gained prominence with the emergence of regional value chains. Some other sub-modalities in this segment are swap agreements, bilateral investment funds, trade finance, etc. Development finance through Lines of Credit (LoCs) has been an important aspect of India's development cooperation policy. The journey of LoCs witnessed an increasing trend in India's development partnership, and it has accounted for more than 90 per cent of the total concessional finance from India (RIS, 2022). The other modalities under the concessional finance segment are buyer's credit, interest equalization and other instruments. Apart from its contribution to international and multilateral organisations, India has also provided grants to its development partners in the form of cash, kind, debt forgiveness, grants for building physical assets and humanitarian assistance. This modality, in the case of India's development cooperation history, has been dominated by cash grants. This classification of the development partnership of India, with the support of a theoretical base, has provided a basis to develop a database and further, the much-needed visibility in the global context.

The Contribution of New Development Compact

India's development partnership, which has evolved over its experiences and resources, has been underpinned by the philosophy of '*Vasudhaiva Kutumbakam*'. The development

cooperation, in the Indian context, can be traced back to its pre-independence era, which has grown not only in quantum but has also opened up various avenues and identified different modalities to engage with the Global South as a development partner. India's own experience of struggling to achieve economic growth and development after the colonial rule provides first-hand experience and in-depth knowledge of the challenges faced and the reconstruction required for mutually coping with the developmental challenges with fellow developing partners. Based on the Mission approach embedding the South-South Cooperation principles, RIS developed the 'Theory of Development Compact' capturing India's development partnership in five different modalities and quantifying the development cooperation provided to the countries over a period of time.

The theoretical base of India's Development Cooperation, through the Development Compact Framework (DCF), has provided India's viewpoint in the vast literature on development aid where many countries and international organisations are coming up with their respective framework/concept of development aid. For example, Official Development Assistance (ODA) from the Development Assistance Committee of the OECD in 1969 and China, in 2011, 2014 and 2019, with its White papers on Chinese Development Assistance have provided their framework towards their approach to development assistance. RIS development framework also helped in creating the

development cooperation database (DevCoopIndia) for India providing details of development partnerships at a country level over the years in different modalities and sub-modalities. The database captures all the financial and non-financial assistance provided by India to its development partners. RIS has also tried, in the database, to quantify the qualitative development cooperation classified under various modalities of the DCF.

For specific sub-modalities, like grant-in-kind, humanitarian assistance in Concessional Finance and Duty-Free Tariff Preference in Trade modality, estimated values have been used to calculate their share in the development cooperation of the country. For the sub-modalities related to capacity building, like training programmes, deputation of specialists, scholarships and exposure visits, the database records the number of experts, people trained and the budgetary allotment given by the government of India. It is estimated that more than 3 lakh people have been trained or scholarship-issued or experts deputed under the capacity-building modality of DCF. Based on the DevCoopIndia, RIS (2022) estimated the total development assistance since India's independence to be nearly around US$107 billion.

The development cooperation has been spread across all developing countries of the world with special emphasis on its neighbouring countries under the 'Neighbourhood First' policy. The spread is not only seen in the value of development assistance but also the number of DCF modalities used across

the development partners. This theory of development compact and the database built upon it would help policymakers, practitioners, researchers and other stakeholders analyse India's development cooperation through its past trends and composition and provide various insights for future decisions and policymaking.

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9

‘GROWTH POLE’- A SPATIAL APPROACH TO DEVELOPMENT: ROLE OF CONNECTIVITY AND INFRASTRUCTURE

Background

Development economics literature has confronted different vintages of theories, models and approaches for attaining higher economic growth and development in countries across the world. Outcomes of the standard applications of those have been mixed and governed by local conditions. In the past, several paradigms have dominated development thinking in the postwar period, including Harrod, Domar, Hirschman, Nurkse and Schumpeter, which provided alternative theories on development in the 1950s through the 1970s, and thereafter. Several institutional innovations also happened at the same time to help the theoretical predictions of development models realized in developing and less developed countries. Accordingly, the thrust of development theories kept

on evolving with technological innovations, cross-border trade and investment flows, and market integration at different periods of time. While some theories predicted superior development outcomes in terms of increased productivity, efficiency and competitiveness in different economic sectors through higher capital-output ratio, investment in heavy industries, rapid technological progress, etc; other schools of thought focused on addressing imbalance in development, inequity and equal opportunities.

Development journey of countries across the world in the Post-Washington Consensus period reveals fascinating trends. The world has registered remarkable growth in GDP and poverty reduction over the past decades. Per capita GDP in PPP terms in constant 2011 prices has multiplied by 1.8 times for the world economy and 3.2 and 1.3 times for South Asia and Sub-Saharan Africa, the two underdeveloped regions of the world, respectively. Many attribute this success to globalization, efficiency of market economy, trade openness, higher capital flows, regional trade integration through FTAs and RTAs, global financial integration, and institutional and regulatory reforms. At the same time, the world witnessed the coexistence of high GDP growth and underdevelopment manifested in perpetuation of poverty, income inequality and social backwardness. For instance, the top one per cent of the richest individuals have gained disproportionately higher growth in income than the bottom 50 per cent since 1980. While unequal ownership of capital

has been identified as the main reason for the concentration of income, the need for higher public investment in education, health and environmental protection for creating opportunities for earning higher income was felt strongly (Alvaredo et al, 2018).

In the 1980s and 1990s, many developing countries faced a recurrence of balance of payments crises impairing their growth process significantly. Structural rigidities, financing constraints, demand for higher social sector allocations, macroeconomic mismanagement, etc continued to plague their development process. Official Development Assistance (ODA) and concessional finance, though critical, remained insufficient to support the desired growth momentum in the recipient countries. Constrained fiscal space and limits to public sector allocations in infrastructure development, connectivity projects, entrepreneurship and skill development and other sectors further accentuated those problems. These problems were not simply historical but rather continued to affect the development prospects of many countries of the world at various points in time. Many countries of the world face similar economic circumstances now as well.

Besides pure economic models, the spatial approach attracted significant attention in development economics practice. The spatial approach was implemented within a geographically defined space in the form of industrial clusters, special economic zones, export processing zones, economic corridors, growth

triangles, growth quadrangles, and so on. Models of regional and urban development were largely inspired by spatial economics.

Concept of Growth Pole

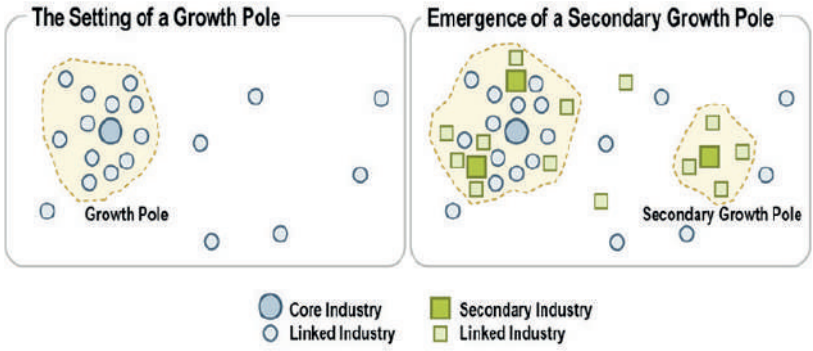
In the spirit of the spatial approach, regional development and planning has been central to national economic development strategies in different countries at different points of time. As a result, planned cities and urban centres, industrial clusters, special economic zones, transport corridors, export processing zones and other similar types of spatial units have come up in many countries at achieve varied macroeconomic objectives e.g. export promotion, job creation, infrastructure development, industrial growth, among others. The rationale behind this exceptional attention given to regional development is the fact that socially and economically backward regions are often left behind in the race toward high economic growth, thereby widening the gap between the rural and urban areas with increased social disparities. Another angle to find merit in the spatial approach is the failures of mainstream multi-year national development programs, which are heavily premised on the idea of 'trickle down effect' with anticipation that growth impulses will be transmitted from the urban centres to the backward regions. However, growth remained largely unidirectional in many parts of the world in which the resources of underprivileged areas (hinterland) were ruthlessly exploited by the urban centres (growth poles). Several regional policies

surfaced to deal with this predicament and one among them was based on growth poles.

"Growth poles" is one such mechanism, originally coined by Francois Perroux in 1949, that propagates a growth trajectory with the prior knowledge of unequal industrialization and development in different regions, even within the geographic boundaries of a country. By "growth pole" Perroux meant a center in abstract economic space from which centrifugal forces emanate and to which centripetal forces are attracted. This connects some urban centers (or dominant firms) where economic activity is concentrated. Thus "growth poles" can act as growth engines for the hinterland (remote or backward areas), which would ultimately lead to higher job creation, raise per capita income and mitigate income inequality. Perroux tried to build on the theory that Schumpeter had proposed on innovation and the role of large firms, which itself was dependent on discontinuous spurts in a dynamic world. Perroux tried to break away from the limiting geographical dimensions adopted in central place theories. Figure 1 illustrates a typical growth pole that connects core industries and linked industries. As nicely captured in Rodrigue (2020), certain large firms or multinational generate agglomeration effects and industrial clusters develops around the growth pole. Core industries attract linked around it and growth percolates down. In subsequent phases one growth pole may lead to the rise of another growth poles, if not strictly in a sequential fashion. In the secondary growth pole, some linked

industries may emerge as core industries, and this process of interaction continues over a medium- and long-term horizon.

Figure 1: Depiction of Growth Poles



Source: Rodrigue (2020).

Speakman and Koivisto (2013) refer to the dynamic industries that trigger additional investment, employment generation, factor payments and strengthen inter-industry linkages. They emphasize that growth poles are simultaneous and coordinated investments, mostly by the private sectors, in many sectors that support a self-sustaining process of industrialization which could become a source of growth and competitiveness for the African countries. Likewise, Avram and Braga (2017) have highlighted how growth poles have contributed to the European economic integration, and how emerging markets are emerging as promising growth poles in the future.

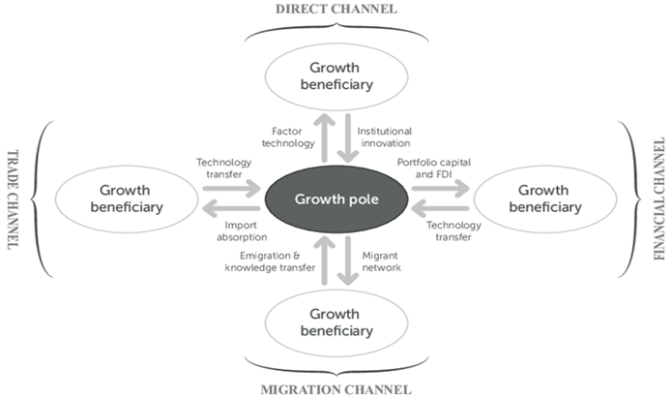
The conception of growth poles has received enormous attention and has been subject to numerous definitions and interpretations. Despite the fact that the term growth pole has several annotations, in simplest terms, it can be defined as a point of economic activity from where economic growth commences and gradually advances or diffuses to the peripheral area. The term point is an expression for a firm, group of firms, an industry or an urban location capable of exerting a propulsive and dominant impact on the economy. Polarization effect conceptualized by Perroux is the foundation of the Growth Pole Theory. Perroux (1949) stated that-"the bitter truth is this-growth does not appear everywhere at the same time: it becomes manifest at points or poles of growth, with variable intensity; it spreads through different channels with variable terminal effects on the whole of the economy".

A similar concept- "economic corridor"- captures the mechanics of achieving the predictions of the growth pole theory. An economic corridor, which borrows the spatial perspectives, envisages a gradual path of evolution of a growth corridor — starting from a transport corridor to a logistics corridor, to an economic corridor, and then to a growth corridor. As per this approach, improved connectivity would facilitate efficient utilization of natural and human resources in the hinterland and enhance urbanization and industrialization in the growth centers. This approach appears to be the most feasible option to meet the development aspirations of the countries in the

Indo-Pacific region (RIS-ERIA-IDE JETRO, 2017). Following this model, high-saving economies can deploy their surplus financial resources in building infrastructure and logistics in low-saving economies in the region, which, in turn, would result in growth pole effects by incentivizing local firms in the invested economies to expand and diversify industrial production and move up in the value chains.

Parallel to investment in connectivity projects, skill gaps in local industrial sectors can be bridged through training, capacity building and customized on-the-job training. The net result would be higher economic activity in the local economy in the form of local industrialization, greater participation in regional value chains, remunerative employment of local labour and, possibly, higher standards of living.

Figure 2: Channel of Transmission in Growth Poles



Source: World Bank (2011).

Besides the Perroux theorization of growth pole and the spatial or urban geography conception of growth pole, growth poles are also used for leading countries those have potential to yield spillover effects in other countries. World Bank (2011) has built on economic concentration as the basis for the growth pole. As per this paradigm, emerging and developing economies would emerge as the growth poles and the activities in those growth poles would propel activities in ancillary sectors of the economy. Figure 2 explains the channels of transmission of growth pole impacts on trade, investment, labour mobility and direct impacts on income, employment and social welfare. It emphasises on focusing on the development of small regions with huge potential for growth instead of the entire economy as a whole and concludes that economic development in the poles will diffuse to the peripheries. The application of this concept failed to produce desired results during the 1960s and 1970s but it is again gaining prominence and catching the eye of many policymakers. Modifications are being made to make it fit in the contemporary world and this has led to the emergence of several sister concepts like economic corridors, transport corridors, special economic zones, transit corridors which facilitate the functioning of growth poles. Numerous researches have been conducted to estimate the impact of contemporary growth poles on the economy and to comment on their effectiveness in bridging the gap between rural and urban areas.

Economic development is not uniform and certain specific regions have greater potential for growth. Consequently, economic advancement materializes around them. In the Perrouxian theory, a firm or an industry was required to act as a propulsive pole and the system proceeded through inter-industry linkage via backward and forward linkages. However, his work largely referred to growth poles in terms of abstract economic space. Hirchman (1958) moved a step forward by emphasizing on the shift from economic to geographic space. He noted that "an economy to lift itself to higher income levels should first develop within itself one or several regional centers of economic strength". He referred to growth poles as centers. Reformulation of the theory of growth poles witnessed the emergence of the term Industrial Complex. Boudeville defined a growth pole as a city with a complex of propulsive industries. Hermensen described an industrial complex as "an assemblage of technologically and economically interconnected industrial units usually located in a territory". An industrial complex reaped the benefits of reduced cost due to productivity gains, innovation and other knowledge and scale economies which opened opportunities to transmit growth impulses to surrounding hinterlands.

The growth pole is an instrument used by policymakers for regional planning and development. Regional policies based on growth poles gained momentum in developing countries in the 1960s. But by the 1970s policy makers lost interest because its

application failed to record the anticipated outcome. However stagnation in the innovation process in industries considered as growth poles might be a possible reason for many unsuccessful experiments in that era. Ever since, extensive work has been done on the subject matter and various attempts have been made to successfully use regional policies based on growth poles and achieve economic growth which is inclusive and sustainable. Continual innovation and diffusion of knowledge are key determinants for the success of growth poles and this fact was recognized even in the original growth pole theory, where Perroux integrated Schumpeter's theories on the role of innovation with theories of industrial interdependence based on inter-industry linkages.

Perroux's work laid more emphasis on "industrializing industries" acting as growth poles and almost neglected the need of channels required for transmitting the growth originating in poles to the hinterland. As per the contemporary understanding, a "growth pole can be any urban center/firm/industry/ sector which is dominating, technologically advanced and is capable of inducing further development of economic activity throughout its zone of influence". The system proceeds further through inter-industry linkages. The expansion of economic activity of the propulsive industry determines the expansion of industries that supply inputs and regulates the growth of demand industries by the quantity and type of intermediate

goods supplied to them. "Economic polarization is followed by geographic polarisation with the flow of resources and concentration of different economic activities in the growth pole region". The concentration of economic activity reduces the cost of production and increases profitability, which will provide an opportunity for the pole to generate spillover growth effects in the neighbouring terrain.

Role of Connectivity and Infrastructure

The benefits of growth poles can be realized through proper channels which help diffuse economic development to the hinterland. For a self-sustaining pole to emerge at a particular location requires several other conditions, such as easy access to raw materials, efficient human capital, knowledge infrastructure, proper connectivity, fast and proficient transportation, good governance and a ready market for finished goods. So here comes the role of economic and transport corridors and special economic zones (SEZs), which facilitate the development of growth poles. Development corridors and SEZs bear resemblance to growth poles but actually, in practice, they act as component parts of growth poles. Transport corridors connect major centres of economic activity and their primary objective is to improve connectivity and reduce the time and cost associated with transportation, thereby promoting trade expansion. Thorn, Bignoli, Mwangi and Marchant (2022) observe that infrastructure

corridors often lead to spatial development between rural peripheries and urban growth poles.

A dominant industry with a strong inter-industry linkage combined with the availability of other development factors fabricates a perfect environment for the development of a strong growth pole. A triumphant regional policy painted on growth poles will not only contribute to the national economy, which is reflected through the increased GDP growth and per capita GDP numbers but will also upgrade the economy of its surrounding territory by optimal and fuller utilisation of the natural resources and human capital of the hinterland and facilitate the development and enhancement of local industries.

A considerable amount of literature is available on growth poles which covers a multiplicity of aspects, such as the effectiveness of growth poles in the regional development, the impact of large scale transport corridors, the outward spread of growth from growth poles etc. Several research papers observe the impact of the use of growth poles as key elements of regional policy of development and the results are conflicting. There are instances where the regional policies did extremely well, while in other cases, they proved to be a complete failure.

For instance, the role of urban growth poles in the regional policy of Romania reveals that the urban growth pole program was a complete failure and led to intensification of regional disparities and imbalances despite a significant rise in GDP

and GDP per capita. On the other hand, the after-effects of the Madagascar Integrated Growth Pole Project are quite positive, with a perceptible increase in private investment, number of formal jobs and new registered businesses. Transport infrastructure has a significant beneficial impact on intermediate outcomes like trade, productivity and output per capita but has a detrimental impact on environment quality and social inclusion. Physical infrastructure is a necessary but not sufficient condition for an economy to obtain benefits from trade expansion and that trade facilitation is of greater value than transport infrastructure improvements.

Another disputed point is the consideration of only manufacturing industries to be capable of acting as growth poles and, finally, the theory's complete disregard for environment quality. First of all it must be understood that the growth pole is not merely concerned with industrial development instead "it has to develop conditions under which economic and industrial development occurs". "For this to happen, it must perform three basic functions-service centers, innovating and growth promoting points and social interaction points". Also it is not necessary that only the manufacturing industry can act as a propulsive industry.

The pole can be service sector centric or even agriculture based, provided it performs all the above mentioned functions. Additionally, it must be supported by a fully developed

infrastructure, proper connectivity, a healthy and skilled labour force and market friendly policies. For the growth to transcend to peripheries, "the growth pole must incorporate a hierarchical ordering of growth foci to form the nodes through which development impulses can be diffused to the tiniest villages and the backwash effect (unfavourable effect of core economic growth on periphery economic development) is completely counterbalanced. The growth foci vary in size and function to suit needs of a specific region. The lowest level growth foci will cater to all the basic needs of the local community, such as education, medical, communication, banking etc, at a central place. The intermediate growth foci will have all the amenities of the lowest growth foci in a greater scale and better quality and must possess secondary manufacturing. The highest growth foci will serve the macro region of the country. It will possess tertiary activities and best quality amenities." A Growth Pole model described above will not only be self-sustaining but will also result in an overall development of the economy. Thus the objective of a regional development policy is to achieve sustainable and inclusive growth and growth poles can serve as an instrument to achieve the desired target. Along with infrastructure and dynamic industries, market-friendly policies, proper law and order, and checks on corruption will speed up the process of economic growth through a growth corridor approach.

RIS Contribution to 'Growth Pole' Approach of Development

As discussed above, growth poles supported by enabling conditions attract well-planned investments, help evolve and mature industrial clusters, and promote exports along with facilitating productive utilization of hinterland resources. The predictions of growth poles envisage a very strong impact of connectivity and infrastructure on the development process. There is enough evidence in support of the positive multiplier effects of infrastructure on development. RIS' approach to development through infrastructure development is an augmentation of the growth pole theory. It is based on four enabling pillars for the growth poles to yield the desired socio-economic results. With a broader template, it is applicable to economic development within a country or involving a few countries through 'growth triangles' and 'growth quadrangles'. A country can fund and collaborate in developing growth poles in another country through development cooperation initiatives. These four pillars are the following:

Quality Infrastructure and Connectivity: Robust and quality institutional, industrial and transport infrastructure in growth poles can result in developing global value chains. Physical connectivity will improve trade facilitation and promote inter-industry linkages, and offer opportunities to countries to choose new product lines and shifts in production lines. Quality infrastructure may include power projects such as smart grids,

renewable energy projects like the International Solar Alliance (ISA), telecom infrastructure, and so on.

Focus Sector Development Cooperation: Agriculture, health and pharmaceuticals and disaster management could be the focus sectors of development cooperation among the countries. Agriculture and agro-processing is an important field of cooperation among countries. The specific development cooperation projects may include establishment of a supply chain for crop seeds and agricultural machinery, joint establishment of regional manufacturing for machinery and farm implements to boost mechanization, marketing networks for agricultural machinery, arranging finance and credit systems, and measures to reduce post-harvest losses of farm commodities such as pulses, cereals, oilseeds, eggs, meat, milk, and dairy products. The two important pillars of cooperation in health are advancing health research collaboration and medical education as well as industrial cooperation in the pharmaceuticals and healthcare sector. Some prospective areas include health systems research, strengthening the creation of a surveillance network including for precise real-time epidemic tracking, pandemic preparedness for emerging and re-emerging infections, drug resistance surveillance for diseases like TB, HIV, development of point of care diagnostics, anti-microbial resistance, etc. In the field of disaster management, India's experience with management of natural calamities such as floods, tropical storms, drought conditions, etc. can be shared with other countries in the region.

Skill Development and Capacity Building: Education and skill development are important areas of capacity building. Developing and poor countries in various regions of the world can share their experiences with other countries to meet skill gaps. For instance, India has advantage in the healthcare sector, medical training and other capacities. Similarly, India and Japan can collaborate in Africa in mining and mineral exploration. It would also be essential to synchronize capacity building and skill development to industrial demand at the ground level. Entrepreneurship Development Institutes can be established for creating cadres of future entrepreneurs in the region.

People-to-People Partnership: People-to-people exchange is important for sharing of experiences at the grassroots level as well as for improving human potential through capacity building and training. Public understanding enhances the durability of any project or institution, but most people engage only when their personal interests are addressed. The gains from economic interdependence are more secure when they are widely understood. Tourism and education are the major mechanisms of people-to-people interactions. Universities can play a key role in strengthening greater interaction among the people of various regions. Southeast Asia has extremely rich experience in this regard. The saga of economic growth in the ASEAN region has several fascinating stories of economic corridors and growth poles eventually leading to regional integration. The economies

of ASEAN countries could evolve a balance in hard and soft elements that optimize a corridor's competitiveness.

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10

GAP INDEX TO MEASURE PROGRESS ON SDGS

Background

The world leaders embraced the action plan for sustainable development through the 2030 Agenda in 2015. The responsibility for follow-up and review of the progress was kept with the respective governments, and the central role of overseeing by high-level political forum (HLPF) (UN, 2015). Voluntary National Reviews (VNRs) are one such review mechanism. In the realm of measurement of progress to attain the levels set, the methodology of using standardised Z-scores has been used by the RIS. The essence of this methodology is that various countries/ sub-national entities like states are at different levels of comparable achievements and happen to be and continue broadly on a standard normal curve. The words Goals, Targets and Indicators are used in the SDG parlance for the 17 Sustainable Development Goals, under it the 169 targets, and the related global (241) or local indicators (as determined

by the concerned member countries exercising flexibility to set indicators like India has 284 national indicators). Alternatively, for the sake of simplicity, in gap measurement methodology, the word 'target' is used for the aimed indicator level set to be achieved by a specified year. Resultantly, the word 'target' is used in this chapter in both contexts. Technically, the targets may be positive or negative in the arithmetic sense, when a higher or lower value of an indicator is desirable, for instance, agricultural productivity per hectare (SDG target 2.3) or percentages of children facing stunting (SDG target 2.2) respectively.

Review of Literature

In the literature, the gap analysis methodology has been adapted of late to measure progress on SDGs. OECD (2017) conducted a study on measuring distance to SDG targets to assess the progress of SDGs for OECD countries. Another OECD (2022) study found significant gaps in the case of many OECD countries, advocating the mobilisation of resources from the international community.

Kumar, Anand and Shaw (2022) carried out a study to measure distance to 2030 SDG targets for India and to capture South Asia imperatives. Four SDG goals, i.e., 2 (Zero hunger), 3 (Good Health and Well-being), 6 (Clean Water and Sanitation) and 7 (Affordable and Clean Energy), were the focus of the analysis using the methodology of measuring the distance to SDG targets. Standardised distances to SDG Goals 2, 3, 6 and 7, at India level, were measured as 2.21, 0.94, 0.84 and 1.06 of

the related standard deviations. An integrated approach to food security and nutrition, health, water and sanitation was suggested bringing out their interlinkages. Kumar and Anand (2023) further undertook a measurement of SDG progress in India using a gap analysis approach analysing indicator-wise, target-wise and goal-wise gaps for India, including each state/ UT. Further, highlighting the challenges at the goal level, accomplishing objectives of SDG 2 and SDG 5 within the remaining time-frame was assessed to be difficult tasks. Suggestions made included harnessing the interconnectedness among the goals to enhance allocative efficiency. It was suggested to complement traditional data sources with the data from non-traditional sources towards better research. It also added Principal Component Analaysis (PCA) as well as coefficients of correlation among the state/ UT-wise standardised gaps, bringing out synergy among these approaches.

Standardised z-scores for Measuring Gap to Indicator Level Targets

The issue of the availability of data regarding development indicators on the progress of most countries/ states is a pertinent starting point. Notably, under the UN SDG classification criteria/ definitions of various indicators, tier-1 covers indicators that are conceptually clear, have an internationally established methodology and the related standards are available; and the data towards these should be regularly produced by at least

half the number of countries and half the population in each region, for which the indicator is relevant. Against it, though conceptually clear, having an internationally established methodology and relevant standards, if the related data is not regularly produced, it is classified as a tier-2 indicator. Further, if an indicator even does not have an internationally established methodology or standards, it falls in the category of tier-3. Tier 1 of the indicators is considered the most coveted. Notably, at the 51st session of the United Nations Statistical Commission, held in 2020, the tier-3 indicators were done away with.

In the gap analysis, if missing values occur so for some years, the data for the remaining years can be analysed, without much sacrifice of assessment, to have a feel of the progress.

The steps envisaged for measuring the gap to the SDG indicator level targets are

I. In case the values of different indicators are not measurable in comparable units e.g., aggregated on, say, population, like GDP; the per capita value may be first computed.
II. Targets are first analysed and set for the terminal year, say, 2030. These may be as already specified, like the maternal mortality ratio to be brought down to less than 70 per 1,00,000 live births (SDG target 3.1); or as a specified reduction ratio (SDG target 1.2) on multidimensional poverty to reduce by at least half; or a specified enhancement ratio (SDG 2.3) encompassing to double the agricultural productivity by 2030. Some targets may be as accepted in international

agreements. In case, no such targets are available, the 90th percentile on the best performer side is used as such indicator level.

III. Distance to the target set is first measured as (T-x) or (x-T) for a positive or a negative indicator, respectively.

IV. The distance computed is next divided by the standard deviation of the indicator values of countries or states/ UTs, denoted as σi, for an indicator 'i' giving the desired standardised z-score, indicating the standardised distance to the target that remains to be achieved.

Accordingly, the standardised gap is $\{(T_i - x_i) / \sigma_i\}$ for a positive indicator}, whereas $\{(x_i - T_i) / \sigma i$ for a negative indicator.

Where x_i = Current value of the indicator 'i', T_i = Target value of the indicator for say, 2030

σ_i = standard deviation of the indicator 'i' as per available data values for the countries/ states being compared.

V. A higher value of 'standardised distance' for a country/ state implies a rather bigger challenge. Some countries/ states may be performing faster on an indicator and thus, the current indicator value may already be more desirable than its target value, indicating that the target has already been achieved, and thus 'standardised distance' for it is treated as 'zero'.

VI. Within each given SDG target, the 'standardised distance' of each indicator is next aggregated by assigning, say, equal weights to each indicator in it.

VII. Finally, the average distance to the target at the aggregate level of the country/ state is computed by assigning say, again equal weights across these, to have a feel of the aggregate progress, and the remaining task to accomplish.

Standard deviation (σ), as witnessed, highly influences the measured standardised gaps. *Ceteris paribus*, the larger the value of a σi, the smaller the gap from the target for this indicator. The equal weightage assigned to various indicators within an SDG target, to the various SDG targets within an SDG, and to the various SDGs for a country/ state; are under the strong assumption of equal importance at each such level. Accordingly, Kumar and Anand (2023) also undertook principal component analysis (PCA) and assessment of coefficients of correlation on the standardised gaps of the social sector SDGs.

RIS's contribution

The focus of the RIS papers includes to how SDGs can be imparted traction to fast-track achievements under various indicators. SDG 17, on 'Partnerships for the Goals - Strengthen the means of implementation and revitalise Global Partnership for Sustainable Development', incessantly remains *sine qua non* of Indian policies. Accordingly, the focus is kept on deepening the south-south cooperation to collaborate better not only in

the methodological space but also to impart traction towards achieving SDGs.

Notably, deceleration by the pandemic should be kept in mind. Besides, one may have a look at the Lucas critique, which encompasses that, '...any change in policy will systematically alter the structure of econometric models' and accordingly, favourable policy disruptions may break the past trend and fast-track progress on any indicator.

RIS contributed to the methodology by adding a Principal Component Analysis (PCA). In order to keep this exercise more meaningful, the first six SDGs, covering the social sector and thus being relatively proximate, were analysed (Kumar and Anand, 2023). The PCA brought out the extent to which the variance in various Indian state/ UT level Social Sector SDG standardised gaps gets picked up by the Principal Components.

RIS also added the Pearson coefficients of correlations among the state / UT level standardised gaps compared for the SDGs 1 to 6 that fall under the Social Sector It was revealed that gaps between SDG-4 on quality education and SDG-2 on agriculture and nutrition have a robust 0.53 coefficient of correlation, implying close relations. It was thus found that policy may focus on programmes covering, say, early child nutrition care and education, harnessing allocative efficiency through programmes like ICDS to reduce the gaps to targets. In descending order, the next coefficients of correlations were found to have values 0.46 (Goals 5 and 6); 0.45 (Goals 4 and 5); 0.41 (Goals 4 and 6), as

well as 0.41 for another pair (Goals 1 and 5); 0.37 (Goals 2 and 5); and 0.33 (Goals 1 and 2). This revealed that in totality among the 6C2, i.e., fifteen pairs, for one the correlations were robust whereas moderate for six, indicative of the need for synergic allocative policy initiatives. Moreover, out of the above seven pairs (fourteen entries) Goal 5 appeared four times, whereas Goals 2 and 4 three times each, indicating relatively better interconnects.

India's overall progress was encouraging on many SDGs, in spite of the major COVID-19 roadblock. Achievements of some SDGs like 2 and 5 need more dedicated efforts. Notably, India's progress on the early indicators set for 2020 was behind many of the related targets set for 2020. At the current pandemic-impaired pace, India may miss certain SDG targets for 2025, which necessitates timely, effective actions.A key finding splicing the PCA and Coefficient of correlation results is that the PCA-1 comprised standardised gaps in descending order for SDG 4 (0.499) and SDG 5 (0.492). Strikingly, similar results on the coefficients of correlation, again revealed on state/UT level gaps that SDGs 4 on quality education and 2 on agriculture and nutrition had a robust value of 0.53 implying close relations.

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11

ACCESS, EQUITY AND INCLUSION (AEI) IN SCIENCE, TECHNOLOGY AND INNOVATION: CONTRIBUTION OF RIS TO THEORY AND PRACTICE

Background of the Issue

Advancements in Science, Technology and Innovation (STI) have transformed our lives in many ways and as such advancements continue to progress rapidly with cascading effects, there can be no doubt that we are living in an era where STI is a major driving force of economies and societies. But have the fruits of such advancements been shared equitably with all sections of the global population is an inevitable question as we laud the progress made. Similarly, there are questions about access to innovations, participation and contribution of women to STI and on role of STI in addressing inequities. The traditional view that Science and Technology (S&T) are scale neutral has been questioned by academics working in STI studies, S&T Studies (STS) and politics of S&T. With technoscience emerging

as the key factor in STI, issues relating to Access, Equity and Inclusion in STI as well as in the distribution of fruits of STI are inevitable. Even in countries like the USA where the private sector plays a significant role in STI in terms of investment and Research and Development, the government is a major funder and facilitator of S&T and hence has a role in determining whether fruits of STI are shared equitably or not. AEI in STI has emerged as a major topic of research and policy-making on societal implications of STI and the promotion of STI. RIS is contributing to this through research and publications and in particular, by proposing that AEI should be a norm/value to assess outcomes of STI policies and programs and by suggesting a methodology and indicators to measure AEI. This has linkages with RIS work on Intellectual Property Rights and Access to Medicines, Climate Change Related Technologies and Access and Benefit Sharing (ABS) of genetic resources on one hand, and, with RIS work on Technology Transfer, Technology Facilitating Mechanisms and STI for Sustainable Development Goals (SDGs) on the other hand.

In this chapter, the origins of RIS work on AEI are traced and its subsequent work is described and contextualized. Further, this work is more a work-in-progress than a study that has come up with some final findings and conclusions.

RIS was a partner institution in the Global Ethics in Science and Technology Project (GEST) funded by the European Commission(https://cordis.europa.eu/project/id/266592).

The GEST project (2011-2014), coordinated by Dr Miltos Ladikas, then with the University of Central Lancashire (UCLAN), focused on Governance and Ethics in Science, Technology and Innovation (STI) and had partner institutions in Europe, China and India. How do we conceptualize Ethics in STI in concrete terms instead of discussing merely in terms of ethics in doing science, research ethics and how to link that with Governance emerged as major questions in the Project. The Project recognised the multiple approaches to these questions and also the need to go beyond European conceptualisations in ethics in STI and not just focus on values like autonomy, freedom of choice, informed consent and traditional indicators in STI. RIS wanted to address the issues differently and thereby come up with a new approach that can supplement and complement the ones put forth by other partner institutions. Access, Equity and Inclusion (AEI) was put forth as a framework for Ethics in STI. AEI refers to Access, Equity and Inclusion. In the literature Access, Inclusion and Equity has also been used. For the sake of convenience and uniformity, we use AEI and this can be used interchangeably with AIE(Access, Inclusion and Equity).

In 2002, the World Bank's World Development Report Globalisation, Growth and Poverty – Building Inclusive World highlighted the cause for inclusive growth (World Bank, 2002). Since the early 2000s, many academics have written extensively on the need for inclusive growth. The key argument was globalisation has not lifted 'all the boats' and across the world,

income inequalities were increasing. So according to them, there was an urgent need to think beyond growth and give emphasis to inclusive growth and inclusive development. (e.g. Stiglitz, 2002; Kaplinsky, 2005) The global economic and financial crisis of 2008 also reinforced the view that markets alone could not be relied on to solve problems in economic growth and uncontrolled globalisation and liberalisation have to be reined in partially and tempered with policies that promote inclusive growth and inclusive human development. Much has happened since then and today, deglobalisation has gained prominence and concerns over increased inequalities and further marginalization of the poor in the Post COVID era continue to be expressed.

In India, the 11th, 12th Five-Year Plans focused on inclusive growth stressing on growth with equity and ensuring that benefits of growth reach all sections, particularly the sections that have been left out of economic growth and that have been further marginalised. Concerns over inclusion and inclusive growth were expressed in literature and were promoted as an antidote to market-oriented neo-liberalist policies. Inclusive growth was envisaged through various policies and initiatives that would make growth more inclusive and through policies that would address the causes of exclusion, lack of access and inequity on account of growth. The UPA government (2004-2014) launched many programmes and enacted laws to promote inclusive growth. Right to Education (RTE) Act, extension

of reservations to Other Backward Classes (OBC) in higher education, National Food Security Act, Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), - Bharat Nirman (six schemes for improving quality of life, transportation and bridging the gap between rural and urban), Indira Awaas Yojana (Housing Scheme for Poor) and National Rural Health Mission were some of them.

When RIS undertook research on Ethics in STI, there was substantial literature on the need for inclusive growth and many programmes focusing on the promotion of inclusion and socio-economic development were being implemented. There was also a growing literature on inclusion, access and equity in STI. So concerns over the inclusive sharing of fruits and equitable distribution of gains from advancements in S&T and access to such fruits were expressed in the literature. According to Henk ten Have: "The need to establish common values and benchmarks, as well as to promote ethical principles and standards to guide scientific progress and technological development, is becoming increasingly acute, especially in developing countries that do not equally enjoy the benefits of scientific and technological advances" (ten Have 2006). On the other hand, the traditional discourse on ethics in STI was heavily influenced by theories from ethics, political philosophy, sociology of science and philosophy of science. (Olive, 2010). Mitcham and Briggle have pointed out that the popular images

and analytic reflection on ethics and technology have changed over the years as technology advances, so are the socio-critical and hitorico-cultural reflections and issues of privacy and access, are common to Telegraph, Radio, Telephone, Computers and Internet (Mitcham & Briggle, 2009)

In the 1990s Ethical, Legal and Social Implications (ELSI) of S&T became a major topic in understanding how S&T impacts society. ELSI implications of biotechnology, particularly implications of genetics became a hot issue. The Human Genome Project underscored the need for such an analysis by funding research on ELSI implications of human genome mapping. Since then, it has become part of studies on understanding the impacts of S&T. In the earlier decades, Technology Assessment (TA) was much favoured and the Office of Technology Assessment (OTA), established by the USA Congress in 1972, played a key role in developing TA as a major tool in the analysis of the impacts of S&T on society. ELSI and TA needed interdisciplinary teams and expertise in many domains. Ethics became important on account of concerns expressed by the public, positions taken by various bodies advising governments on ethics and regulation and rapid developments in S&T. In parallel, there concepts and practices like citizen science, and public engagement (in S&T) gained prominence. In Europe, Responsible Research and Innovation (RRI) gained importance as it was supported by the European

Commission, which also funded many research projects on the theoretical and practical aspects of RRI.

Scholars like Judith Sutz, Barry Bozeman, Susan Cozzens and Govindan Parayil wrote on inequality and science, equity in science and exclusion and science. In Latin America, the scholarship drew attention to the fact that sections of the population gained no benefits from innovation, while some sections benefited significantly. According to Mariela Bianco, "In Latin America, economic growth and enhanced competitiveness fueled by science, technology and innovation (STI) in several economic sectors coexist side by side with poverty, malnutrition, inadequate health and housing conditions in both urban and rural areas. In fact, innovation itself is sometimes a cause of greater inequalities in Latin America, increasing existing gaps within particular economic and social sectors or between formal and informal economies. By this situation, substantial portions of the Latin American population are excluded from the benefits of innovation while, at the same time, a minor portion lives by the same technological standards than populations in developed countries" (Bianco, 2002, P. 2).

Concerns were expressed as to whether new technologies like nanotechnology will benefit all sections of society or whether they will further contribute to inequities in access to innovation. (Cozzens & Wetmore 2011) . The other question was

how to ensure that technologies were developed and adopted with equity in mind. Researching Inequality through Science and Technology (ResIST), a project funded by the European Commission, examined S&T and inequality and published reports that explored multiple facets of inequality (https://cordis.europa.eu/project/id/29052/reporting/fr). Thus there were many interlinked issues/questions on STI, inclusion, inequalities and how STI can be harnessed for the benefit of all sections (OECD 2015). Having said this, this chapter should point out that since the later 1970s, much scholarship and policy interventions have emerged on women's participation in S&T and how to enhance their participation in S&T and how to make S&T policies and institutions gender inclusive. (e.g. Gupta, 2020; Swarup and Dey, 2020; Srinivas & Pandey, 2022).

When RIS started working on AEI, the intellectual milieu was ripe for developing AEI as a framework and norm. In the last decade and a half, much has happened in terms of theorizing and categorizing innovation and on inclusion in STI, instead of discussing in terms of formal and informal innovations, now the discussion is more nuanced and practically relevant as there have been examples of inclusive innovation, frugal innovation, and, user-led innovation. The literature on them is also growing. (e.g. Parthasarathy, 2022; Raina, R.S., Das, K. (2020). Economists have written extensively on innovation and inequality and whether technical change results in reduced inequality. (e.g. Acemoglu and Johnson 2023), and, Aghion, and Griffith, (2022).

UNCTAD's Technology and Innovation Report 2021 explored technological advancements and inequality (UNCTAD 2001)

Review of Literature and Concepts

As Access, Equity and Inclusion are linked to inequalities, inequities, and exclusion, literature deals with multifaceted aspects of these in STI. This ranges from making inclusion more inclusive to enhancing access, and to make S&T more equitable. A major issue is the lack of universally accepted definitions for Access, Equity and Inclusion in S&T. Another issue is whether it should be presumed that, per se, S&T is unequal in access, inequitable and exclusionary. And if so, is it more on account of institutional practices, structures and policies than on account of the pursuit of S&T?

According to Kalliomäki, et.al (2022), "In the language of practitioners, policymakers and the research community, inclusion refers to various different contexts such as possibilities of various groups to participate in research processes and co-creation of products and services, as well as possibilities of different marginalized groups to benefit from STI policy measures. Therefore, conceptual clarity is needed to promote inclusive STI policies". Conceptual clarity is needed but that need not deter us from exploring this idea of inclusion or linking it with policy (Srinivas, 2020). Irrespective of the slack of clarity and indicators, many studies have been done on inclusion/ exclusion, divides (particularly digital divides) and access.

Although all of them do not use the AEI framework nor is there a consistent framework or approach among them, there is an increase in literature on AEI. Some of them are related to STI policies(https://www.unescap.org/kp/2021/frontiers-inclusive-innovation-formulating-technology-and-innovation-policies-leave-no-one) and inclusion while some of them are on innovation/science policy and inclusive development (e.g. Bortagaray, I., Gras, N. (2014), Prakash, et.al (2023), Gillwald & Patridge 2022, Petersen & Kruss 2019, Oxfam India 2022, Arocena, R., Sutz, J. (2018). and George, et.al. (2019).

The absence of indicators and parameters for AEI and for concepts like inclusive innovation, juggad innovation and frugal innovation is a key constraint. Moreover, as AEI is closely related to justice, fairness and equality, there should have been debates and discussions among scholars in STI/STS and scholars in fields like ethics, political philosophy and law. But that has not happened and hence a good amount of literature is from scholars working in STS/STI and Science/Innovation policy. This has strengthened the ideas but the weakness is that there is not much quantitative literature, nor is there much interdisciplinary work in these.

Although AEI is closely related to gender and STI, not much has happened in terms of cross-fertilization of ideas, interdisciplinary research and dialogue among scholars. While

terms like 'inclusive innovation' are used frequently, there are different models of inclusive innovations with different assumptions. (Levidow & Papaioannou, 2018). On account of rapid digitization, financial inclusion through technology and concerns over the digital divide there is an increase in literature on policy, inclusion and technology (e.g. Prakash, et.al 2023). All these indicate there is scope for further work on AEI in terms of theory, practice and indicators.

Having said these, we have to point out that newer issues like the Digital Divide, inclusion and exclusion in Artificial Intelligence, and, equity and access in energy transitions have expanded the scope for research and policy analysis. Thus, whether the term AEI is used or one or more of its components are used, Access, Equity and Inclusion will continue to be an important theme for research in societal impacts of STI and STI policy.

Development of Novel Methodological Frameworks by RIS

RIS work on AEI has two components, one theoretical, historical and policy-oriented and the other quantitative, covering data and indicators. The first was developed as part of the research and output for the GEST Project and expanded further. The second was to complement the first so as to build a framework

with indicators for AEI. Discussing of AEI without any context would not make sense when the project was on Global Ethics in S&T with a comparative analysis of Europe, China and India. So, RIS adopted a two-pronged strategy one proposes AEI in the context of S&T as a normative principle elucidating how AEI can be used as an ethical norm in S&T, not as a contrast to partner institutions in Europe and China posited as Ethics in S&T but to complement that and to bring a unique perspective.

In the Chapter 'Science and Technology for Socio-economic Development and Quest for Inclusive Growth: Emerging Evidence from India', it was stated "Indian science and technology policies have been shaped by the concern that the application of science and technology should enable faster socio–economic development and that all sections should benefit from scientific and technological advances. The unstated assumption in these policies is that value-neutrality and scale-neutrality are to be addressed by appropriate interventions in favour of marginalized sections of the population" (Chaturvedi & Srinivas, 2015, P.92). The Chapter concluded by observing, "Indian science and technology policy has come a long way since the early 1950s. Today, as India aspires to be a global leader in science and technology, it is important for Indian policy to give attention to ethics in science and technology policy. However, this does not mean that science and technology policy has to import values from Europe or the USA. Rather, in our view,

access, inclusion and equity can be considered ethical values and can be used to assess policy outcomes. This makes better sense in the Indian context, as it links societal development with science and technology policy. It also reflects the current thinking on sustainable and inclusive growth." (P95). This Chapter thus pioneered the idea of 'AEI' and contextualized it by discussing developments in policy and discourse in science, technology, society and development in India. While acknowledging that science policy in India has been oriented towards the application of S&T for the overall development of the society, it proposed that AEI can be considered as (relevant) ethical values that can be used for policy assessment. Read in the context of the GEST Project and the major output from the Project, the edited volume 'Global Ethics in S&T' this chapter is a key contribution that asserted a unique perspective from India.

In the Discussion Paper "Science, Technology, Innovation in India and Access, Inclusion and Equity: Discourses, Measurement and Emerging Challenges" the ideas in the Chapter were developed further with more discussion on the theoretical aspects (Chaturvedi, Srinivas and Rastogi, 2015). This paper added a methodology and indicators on AEI based on the available data for 14 states of India. Based on Principal Component Analysis, three indices were constructed along with 12 indicators (please see Table below).

Table: AEI Indices and Indicators

Science and Technology Index	Socio-Economic Index	Index for Basic Needs
• Number of recognized general and professional educational institutions • Number of enrolment/scholars in general educational institutions. • Number of enrolments/scholars in professional educational institutes, Patent application by states. • Number of Patent Applications • Telephone exchange lines.	• Death Rate • Birth Rate • Infant Mortality Rate • Number of population below poverty line	• Health- number of hospitals and dispensaries, number of beds. • Access to Drinking water- percentage of households with safe drinking water. • Education- Schools for general education (primary, secondary, and high secondary), literacy rate.

The details are available in the Discussion Paper. This methodology was proposed by Prof. Manmohan Agarwal and the analysis was done by Dr. Rashmi Rastogi.

While the Chapter and DP developed the concept of AEI and gave a methodology further work on AEI was done through a Policy Brief, text of which was provided to Department of S&T as an input to the then STI Policy Process (of 2020). The Policy Brief 'Access, Equity and Inclusion and Science, Technology and Innovation Policy' expanded the ideas further and made a strong case for using AEI in STI Policy. It also elaborated how

AEI can be used for developing a STI policy for India. (Srinivas, 2020)i. It was stated "Our analysis shows AEI has significant implications for STIP. AEI can be used as a norm/value and will have multiple uses in science policy and practice. It can be used at different stages of R&D and in large research projects, besides evaluating innovation"(Srinivas, 2020, P. 10) Building upon the earlier work, this Policy Brief discussed inter alia, Emerging Technologies and AEI, and, Research Funding and AEI. The Policy Brief gave specific reasons for the STI Policy that was under development.

Besides these, RIS organized an online consultation on Consultation on Access, Equity and Inclusion (AEI) and Science, Technology and Innovation (STI) on 3rd September 2020 and experts on STI spoke in this. This event had a session on Gender and AEI in STI Policy.

RIS was part of a few projects on Responsible Research and Innovation (RRI)(PROGRESS https://cordis.europa.eu/project/id/321400/reporting); RRI Practice https://cordis.europa.eu/project/id/709637

and NewHoRRIzon https://newhorrizon.eu/) and has contributed substantially to the discourse on RRI and in contextualizing it for India and in suggesting how it can be applied to agricultural biotechnologies. In the article 'Responsible Research and Innovation and India: A Case for Contextualization and Mutual Learning', a linkage between

AEI and RRI keys was explored, and it was suggested that the AEI framework will be relevant for contextualizing RRI in India and elsewhere (Srinivas, 2022) This is a novel and important contribution to RRI discourse.

RIS's contribution

RIS pioneered the idea of AEI and developed it further, but it did not apply it in terms of any concrete application to real-world problems. This is because AEI is a framework and a norm that has to be applied through tools like indicators on the one hand and through policies and programs on the other hand. RIS being a policy research think tank has a focus more on doing theoretical work that has policy relevance and on developing new ideas and methodologies than on testing them in real-world context or in project implementation. AEI was developed as a contribution to the discourse on Ethics in S&T and RIS provided a unique perspective grounded in policies and discourse in India and putting that in the broader context of discourse on equity, and, inclusion in STI and the use of STI to further them.

RIS over a period of time has taken this forward by developing a methodology, linking it with policy process to give recommendations and in proposing linkages with RRI. While this is important, there are many issues that need attention.

The conceptual framework for AEI has to be developed and strengthened further. There is a big need for developing indicators, methodology and principles to measure AEI. While

these two are necessary, AEI has to be made more robust by examining it in specific contexts, by indicating what 'ought to be' and how that could be achieved. The praxis aspect of AEI has to be made more explicit and robust. Moreover, AEI's linkages with other relevant principles have to be studied and it should be developed further to address specific exclusions and inequities and also in addressing AEI issues in emerging technologies. How AEI can contribute to ELSI and TA is another theme that is worth exploring. Obviously these are big challenges and need time, resources and an enabling milieu to address them. So the full potential of AEI is yet to be unveiled and utilized. This provides a unique opportunity for RIS to take forward and expand the scope and diversify the work it initiated about a decade ago. The milieu today is again ripe and more conducive than it was a decade ago for working further on AEI.

Thus AEI is a unique contribution from RIS in policy research, particularly in STI and society research. It has a long way to go and has to be developed further, made robust and acceptable and if that is done it can be considered as a major contribution from RIS in theory, discourse and practice.

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12

SOCIO-ECONOMIC ASSESSMENT (SEA)

Background of the Issue

In 2009, Bt Brinjal was put under indefinite moratorium despite approval by the MoEF&CC's Genetic Engineering Appraisal Committee (GEAC), which is responsible for the appraisal of proposals relating to the release of genetically engineered (GE) organisms and products into the environment including experimental field trials. Following this occurrence in 2012, the Supreme Court constituted a Technical Expert Committee (TEC) on Genetically Modified Organisms (GMOs) to submit a detailed report on the pros and consequences of the introduction of GM crops in India. After an extensive deliberation with all the stakeholders, the TEC submitted its final report in 2013. The report recommended an indefinite moratorium on the field trials of GM Crops till the government comes out with a proper regulatory and safety mechanism. The report categorically stated that the regulatory process must include considerations based on the prevailing socioeconomic and need-based factors,

taking into account the available alternatives, and assessing the impact the product/technology is likely to have in the Indian context and across the cross-section of Indian farmers. This is very much in consonance with the provisions of Article 26 of the Cartagena Protocol on Biosafety (CPB), wherein India is a signatory.

The report further observed that it was ironic that whereas the importance of socioeconomic considerations, sustainability, and development goals had been well recognised in the international agreements that India has signed/accepted (e.g. CBD and CPB,) these criteria do not specifically figure in its own national regulation particularly keeping in mind that meeting the development and sustainability goals is highly relevant in the Indian context. Thus, the TEC noted the importance of the need and socioeconomic impact assessment of GM products as one of the criteria that should be applied in the evaluation at an early stage and suggested broadening of expertise in this context. Most probably, following such observations and recommendations, the Ministry of Environment, Forests and Climate Change (MoEF&CC) entrusted RIS to develop guidelines for the Socio-Economic Assessment (SEA) of GM crops in India.

The MoEFCC, awarded this two-year-long research project to RIS, under the Biosafety Capacity Building Project Phase II, which was funded by UNEP/GEF. RIS, in collaboration with six prominent academic/research institutions, carried out an extensive study and submitted its report to the Ministry in 2017.

The report provided a detailed "Guidelines Framework for Socio-Economic Assessment". The Framework is constituted of five key dimensions, viz. economic, health, environmental, social, and cultural. It also included model questionnaire templates for assessment surveys. Such a Framework is intended to provide a comprehensive ex-ante analysis and socio-economic impact assessment of GM crops before they are considered for commercial approval. This, in addition to the risk assessments pertaining to the environment, human and animal health, would provide a holistic overview and will greatly pave the way for informed decisions and evidence-based policy making. This will eventually ease the policy conundrum, lead to the restoration of public faith in the regulatory architecture, and eventually avoiding the dilemma regarding the approval for commercialisation.

RIS has been conducting research on CBD (Convention on Biological Diversity), CPB, and, biotechnology regulation for more than two decades and has worked with the Secretariat of CBD/CPB, MoEFCC and Department of Biotechnology (DBT), Government of India on Socio-Economic Assessment of LMOs and has participated in Conference of Parties/Meeting of Parties of CBD/CPB, contributed to workshops organized by CBD and MoEFCC, besides taking part in on-line discussions organized by CBD Secretariat. The research from RIS on this issue has resulted in journal articles, inputs to the CBD Secretariat, Policy Briefs, Discussion Papers and Special Issues of Asian Biotechnology and

Development Review (ABDR), an open-access, peer-reviewed international journal.

Review of literature

Ever since the commercialisation of Bt Cotton began in 2002 in India, there have been many studies conducted to assess its socio-economic implications. Most of these studies have been of ex-post type. These studies have been carried out both by Indian researchers as well as foreign researchers across many states and regions in India. However, there have been very limited ex-ante socio-economic assessment studies on the crops that are yet to be approved. Furthermore, the literature survey indicates that most of the studies on GM crops have been on the assessment of economic gains/benefits and related themes. Other themes, such as environmental impacts, health impacts and impact on gender and employment, have not received the same attention. While taking Socio-Economic Considerations (SECs) in decision-making, findings from studies that address different themes/ issues are important so that the decision-makers can get a holistic understanding of the impacts and will not be misled by positive claims of economic gain. In 2007 itself, RIS, in collaboration with ICGEB, came out with a Report as part of MoEF/ GEF/World Bank-aided Capacity Building Project on Biosafety, wherein, it reviewed Socio-Economic Considerations in Indian biosafety decision-making, under the ambit of Article 26 of the CPB (RIS and ICGEB, 2007). Various reports and scholars such as UNEP

(2010), Falck-Zepeda and Zambrano (2011), Racovita (2011, 2017), Chaturvedi et al (2012), COGEM (2014), Binimelis and Myhr (2016), Beumer (2019) etc, have dwelled upon the issue of socio-economic considerations and have enumerated some socio-economic issues that can be taken into account in reference countries' decision-making process. RIS, while developing its own "Guidelines Framework for Socio-Economic Assessment", had benefitted from the relevant available literature and it could put forward a more holistic framework for a comprehensive Socio-Economic Assessment.

Development of Novel Methodological Framework by RIS

Socio-economic assessment is very much required as many studies have revealed that technologies are not scale-neutral, or gender-neutral and they impact different stakeholders differently. There are also issues like, unanticipated and unintended consequences arising (such as negative environmental impact, increase in pest resistance) and as the economic gains tend to vary significantly, across regions and over the years, economic impact assessment alone cannot be used to justify permission to use or to promote adoption. Non-economic variables such as access to proper information and knowledge, risk perception and availability of support from technology providers/government, influence the adoption of technology, across various groups and for decision-making, risk perception, expected gains and anticipated impacts

on health and environment are important. Therefore, for a holistic socio-economic assessment related to emerging biotechnologies such as GMO/LMOs, economic assessment studies are not sufficient.

In order to develop a comprehensive framework for Socio-Economic Assessment (SEA), RIS, based on extensive analysis of literature, CDB discussions, experts' consultations and field surveys, proposed the Guidelines Framework for the Socio-Economic Assessment (SEA). It had identified 11 key objectives to be part of this guidelines framework. This guidelines framework is only indicative and is an example. Although farmers may be considered as a single category of stakeholders as the impact on small and medium farmers varies from that of large farmers, we have listed them as separate categories. It is important to assess the net gain vis-a-vis the net gain from the cultivation of conventional i.e. non-LMO crop or variety, for such farmers. Whether the net gain is commensurate with the increase in the cost of inputs and whether that is good enough for them to switch over to or opt for LMOs has to be assessed.

Studies on the impact on labour, have shown that in the case of Bt cotton, the demand for labour, including women labour increased in order to carry out operations such as picking and the demand for labour for spraying got reduced as the number of sprays and quantity sprayed were lesser than that of the conventional crops. Thus it is important to assess the overall impact on labour, in terms of earnings, cost, and health impacts.

Literature shows that herbicide tolerant (Ht) LMOs are likely to reduce the demand for labour, as the labour needed for weeding might get reduced. In that case, the income lost on account of reduced demand for women labour on account of weeding vis-a-vis the positive impacts on them in terms of health has to be estimated so that the assessment is comprehensive. However, it is not as simple as it looks, as demand for labour and supply depend on many factors, including wages and alternative options for both farmers and labourers.

Drawing from our extensive primary and secondary research, broadly speaking, there are five key dimensions that are important in any Socio-Economic Assessment. Hence data on them is essential for conducting any meaningful SEA. Those five key dimensions are as follows:

I. Economic
II. Health
III. Environmental
IV. Social
V. Cultural

Economic Dimension:

I. Economic potential of LMO is tested in experiments and field trials. Based on the yield, its performance vis-a-vis potential is assessed. To assess it in real-world conditions for evaluation and to check whether the potential is realized and,

if so to what extent is obviously important. The parameter here is yield gain. This can be due to the trait conferred to the LMO, which enhances productivity or due to better seed or reduced damage from pests.

II. The yield gain should result in income gain for the farmer. The gain from the LMO can be compared with income from non- LMO. Income = Price x Quantity. The same formula should be applicable for non-LMO. If the yield gain is not translated into commensurate income gain, farmers may not gain much from adoption.

III. We need to assess the cost incurred on account of the adoption of LMO, for the farmer or for the region and evaluate whether the economic and social gains are adequate enough to justify costs incurred. The costs incurred are seed, agro-chemicals (fertilizer, pesticides, growth hormones, vaccines, etc., as the case may be), feed/fodder in case of animals, water, energy, labour, implements, machinery, depreciation of equipment, interest on loans, insurance, if any. These costs are commonly incurred costs. If the adoption of LMO demands extra costs or other costs not listed here, they should be taken into account. For arriving at the costs, there are standard methods and these have been codified by ICAR for economic assessment of costs of cultivation. We suggest that these methods be used to estimate the costs.

IV. Net benefit to the farmer needs to be estimated. This is the difference between income and costs i.e. income – costs.

Further, the costs can be bifurcated into fixed and variable costs. Here also standard methods are used to identify and arrive at fixed and variable costs. There are no suggested methodologies here as this is a simple formula and can be used to arrive at the net benefit to the farmer.

The net benefit from adoption should obviously be more than the net benefit from non-LMO. A comparative analysis of the net benefit from LMO vs. non-LMO can indicate whether it is economically beneficial to society or whether farmers will adopt it.

The above set of parameters thus measures the impact on farmers in terms of gains in yield, income and whether adoption results in economic gains to producers. The preferred or optimal gain for deciding the suitability of LMO for approval is set by the regulator.

V. Assessing economic gains for small and medium farmers: To estimate the impact on small and medium farmers, net gain on account of savings in costs and increase in yield vs. increase in seed cost and additional cost of increased use of major inputs (fertilisers, irrigation and other costs) has to be calculated. Comparing non-LMO varieties with LMO varieties with respect to these costs and the associated gain can be used. Cost-benefit analysis can also be used.

VI. Assessing long-term gains for farmers is important as the gains from LMO should be consistent and sustainable. As adoption may entail more investments and an increase

in costs, unless the LMO provides sustainable additions to incomes, it may not be preferred by farmers. Given the investment required from farmers for adoption, the long-term gains should be commensurate with that, and farmers should get gain over a long period without wide variations in yield, income and net gain. For decision-making, assessing the increase in returns over a period, and the sustainability of the increase and gains and the impact on factor productivity in the relevant cropping system. This can be assessed if relevant methodologies are available and reliable baseline data is also available.

VII. Consumer Benefit: An increase in availability at a lower cost is the parameter to assess consumer benefit. For consumers, unless the economic or other gains are not translated in terms of cost or availability, no direct benefit is derived from LMO. As demand is sensitive to price, lower prices can stimulate higher demand from consumers. But when the supply increases without any change in price, it may indicate that there are no direct economic gains for the consumer while the producer has gained on account of a reduction in cost and increase in yield.

So the regulator needs to assess the impact on consumers who, as a category, are different from producers. In this the regulator can assess how different types of consumers are impacted by LMO and whether some consumers benefit more

than others. So even when there are net gains for consumers, the regulator may want to know which type of consumer benefits the most and who benefits the least. Hence for this, additional data or information may be sought.

Health Dimension:

1. The health impacts have to be assessed as part of SEA. While at the macro levels, health impacts are measured in terms of QALYs (quality-adjusted life years) and DALYs (disability-adjusted life years), in our analysis, we are more concerned with assessing benefits in terms of reduction in illness that results in reduced medical costs and other gains such as money saved on treatment, medicine and increase in employment opportunity as work days lost on account of illness are reduced. But estimating them is not easy if base line data is not available.

Please note that these gains arise on account of the reduction in the use of harmful inputs in terms of quantity and the use of lesser toxic inputs. The economic gains on account of this are captured in data on costs and benefits. Here we are computing only the money saved that otherwise would have been spent on the cost of medicine, fees to doctors and related costs. The long-term health benefits could be more than this and money saved might not be the appropriate indicator for that. Having said that we want to indicate the measurement here pertains to illness and treatment arising out of handling harmful chemicals during cultivation and not for other causes or consequences. Hence caution needs to be exercised in assessing the health impacts.

So data collection and/or modelling for health impacts has to be sensitive to this. What has to be measured is the Gain in health benefits of farming families and farm labour and other involved groups in terms of health gain/health support, correction of health disorders, and reduction of episodes of illness.

2. For fortified foods, if that is the trait, the benefits in terms of nutrition, impacts on health and economic benefits have to be assessed. Enhancement of the non-LMO through trait can result in enhanced availability of carbohydrates, vitamins or more calories. The health benefits and economic benefits have to be assessed, including reduction in/avoidance of disease/deficiency. The regulator will be interested in knowing how the conferred trait is translated into such gains in real-world applications. Hence data in terms of components of food/output and the baseline data of the non-LMO crop will have to be compared.

Environmental Dimension:

The environmental impacts are more difficult to quantify in terms of monetary units. Nevertheless, there are methods to assess them. Risk assessment studies indicate the potential environmental risks and benefits and the focus here is to assess the environmental benefits at the farm level. Hence the environmental gain at the farm level has to be evaluated on the basis of data or from risk assessment modeling. Reduced toxicity in the environment, less harm to birds and beneficial

organisms, reduction in toxicity of the soil, reduction in damage to other flora on account of reduction in use of lesser quantity of chemicals and reduction in or avoidance of hazards from non-LMO cultivation are some of the relevant measurements. Modelling studies can predict these or indicate the potential positive changes and to validate this, the regulator may ask for data or data from the farms. The regulator knows that environmental benefits may not be the same or uniform in all farming environments and hence site or field-specific data may be required. Here the baseline is that of non-LMO cultivation and only the benefits that can be attributed to change in cultivation have to be considered. Other factors such as climate, changes in ecosystems, human intervention and changes in land use patterns can impact but the regulator is more concerned with beneficial changes from LMO cultivation than with changes in environmental quality per se. Based on the model and data on the farm or region, the regulator will use the relevant indicator to measure environmental benefits. Further, to differentiate the environmental benefits from other positive changes on account of non-LMO interventions, comparative studies may be made.

Primarily, the benefits can be classified into three categories:

1. Effect on soil quality and water quantity and quality: This can be indirectly measured in terms of cost saving on account of avoidance of remediation or restoring the original

quality. Environmental indicators will be used to assess the quality of water and soil. Here the baseline will be non-LMO cultivation. Besides quality, the quantity of water is also a factor in assessment. The effects will be in terms of a better environment, including soil quality and cost that was saved. For regulatory purposes, the environmental effects based on modeling or comparative studies, baseline data and data on soil, water and environment will be required.

2. The reduction in the use of pesticides and harmful chemicals leads to lesser residues and a decline in pesticide use results in less harmful effects on the environment, animals and humans. Tested data for residues and reduction in pesticide use can be provided as data. For this soil samples will have to be tested and the benefits of reduction in the use of pesticides can be assessed in terms of traces of chemicals in the bodies of humans and animals. Environmental models can predict these and the data can be compared with this, controlling for other variables.
3. Impact on agro-ecology: This is measured in terms of impacts on the distribution of species/population in a specific farming system. In this, the baseline will tell the position prior to LMO cultivation and post-cultivation distribution can be measured. Here flora and fauna are taken into account. The regulator may demand additional evidence or data relating to the impact of specific species which may

be endangered or aesthetically significant or have cultural/ spiritual significance.

The environmental impact will be a combination of the above three. Given the multiple impacts of LMO cultivation in farming ecosystems the regulator will take a holistic perspective than going by simply positive or negative aspects or impacts. The risk assessment, environmental modeling exercises and environmental quality indicators will be used. If the regulator perceives that some negative aspects are significant despite the overall positive impact, special measures or efforts may be suggested to overcome them. Regulators will be interested in both short-term and long-term environmental assessment and hence may call for efforts in long-term assessment to be taken up.

Social Dimension:

The social benefits to be assessed are primarily distributional effects on different groups. This is in addition to economic gains/benefits, which may not be uniform across all types of producers. Gender is an important dimension to be considered. The list below gives an indication of the impacts to be assessed and how to assess them. The regulator may seek more impacts to be assessed.

1. Assessing the rate of return by farm size: This assessment is similar to the ones mentioned earlier under the economic

impact assessment. Here the same methodologies can be used. The purpose is to know whether smaller farms are able to get an adequate rate of return from the LMO or are the returns are skewed in favor of large farms and if so, on account of what factors. In other words, regulator wants to assess whether the technology is neutral vis a vis the farm size.

2. Assessing impact on labour labour (from the perspective of labour): In this, the wage and the availability of employment for labour labour are to be considered. The regulator may want to know whether the technology adversely affects demand for labour and, if so, at what stage of cultivation. Further, the effect of technology in terms of economic loss on account of reduction in labour employed and workdays lost on account of the adoption of technology are important. Technology may reduce the need for labour in some operations or in some operations, owing to a reduction in the use of input such as chemicals/pesticides, labour may not be needed as in the case of non-LMO crops. But more labour may be needed to pluck or to harvest on account of an increase in yield. So the overall impact is important for understanding. The non-farm employment opportunities should also be factored in and whether the technology displaces labour to non-farm work should be assessed. The methodology could be a survey and the data should capture, inter alia, employment pattern and income; labour usage

time and income; changes in employment and costs/benefits for labour.

3. Distribution of benefits by caste, both, as farmers and as workers, can be assessed by survey. Here the regulator may link this with farm size, farm ownership and other factors to assess how benefits are impacted by caste and whether all castes benefit uniformly from technology as farmers and as labourers. As some farmers may also work as farm hands in some seasons when they are not cultivating, the regulator may seek further data to understand this and whether this is due to factors related to technology or factors external to that.
4. Assessing impact on women (women farm labour and women as farmers perspective): This is similar to item 2 as above. The regulator will assess the impact of technology on women as workers and as farmers to find out whether the technology is gender-neutral. The methodology could be a survey and the data should capture, inter alia, employment pattern and income; labour usage time and income; changes in employment and costs/benefits for labour.

Culture Dimension:

Among the dimensions of SEA, impacts on culture are the most difficult to measure as it is difficult to quantify this. Further, the linkage between technology, values/norms and society is straightforward. Nevertheless, the regulator has to ensure that

the technology is not culturally offensive or harmful and it does not result in outcomes that negatively impact societal norms and values. The following are suggested as criteria to assess cultural impacts.

1. Equity and Inclusivity – This covers the degree of equitable access to technology and information and whether the technology promotes inclusive development or deepens socio-economic inequalities.
2. Cultural Compatibility: Whether the technology is aligned with cultural and aesthetic values regarding food.

A template for the Model Questionnaire to be answered by the technology developer/technology provider while applying for approval of their GMO/LMO-based crop was also proposed as part of the Guidance Document, that was submitted to the MoEF&CC.

RIS's Contribution in Furthering the Discourse and Scope

The "Guidelines Framework for Socio-Economic Assessment" proposed by RIS has been an important value addition in the literature on Socio-Economic Considerations (SECs) and framework to undertake a socio-economic assessment with special reference to developing countries (Chaturvedi and Srinivas, (2019). In the literature on CPB and the implementation of Article 26.1, the study draws insights from field surveys and research on CPB. This has also presented a roadmap for the implementation

of Article 26 to develop Guidelines and Methodologies for Socio-Economic Assessment (SEA). In contemporary times, parties to CBD are engaged with developments like synthetic biology, Gene Drives etc. The Guidelines Framework developed by RIS can contribute to the development of regulations for new and emerging modern biotechnologies as well.

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BASIC NEEDS INDEX: RIS STUDY DURING THE EARLY 1990S

Background of the issue

It is observed that the 1980s was marked by a growing disparity between the global North and South, characterized by worsening terms of trade, unstable exchange rates, increasing debt, and an unfair world trading system. These conditions created a challenging environment for development in developing countries, leading to the 1980s being labelled as a 'lost development' decade. This period sparked a significant debate over the role of the state and governance in development, as well as the search for an optimal development paradigm. A key realization of this time was the global community's failure to adequately address the fundamental question of 'whose development?', indicating a need for more inclusive and equitable development strategies.

In the mid-1970s, three main development strategies were discussed: growth-oriented, employment-oriented, and anti-poverty-oriented. There was a growing consensus that a direct link between economic growth and overall well-being was

not guaranteed. Emphasis was placed on the importance of providing basic amenities such as food, housing, education, health care, and clean water to the wider population. This led to the emergence of the 'basic needs strategy', which focused not only on income and its distribution but also on the types of goods and services produced by the system, reflecting a more holistic approach to development.

It is notable that in the early 1990s, against a backdrop of questioning traditional development metrics, RIS conducted a study on 'Basic needs issues in development'. This study aimed to create a 'Basic Need Index' for various country groups. It addressed the growing dissatisfaction with using 'economic growth' and 'per capita income' as the sole indicators of development. The study was focused on defining 'what constitutes basic needs' and proposed an alternative 'basic needs index'. It also explored interconnected topics such as the relationship between per capita income levels and basic needs indicators, the structure of development and its impact on satisfying basic needs, and the roles of education and health in this context.

Review of literature

The Seventies witnessed intensive discussions and research relating to development strategies, especially focusing on basic needs issues. The UN International Development Strategy for the decade of the Seventies adopted a resolution calling for a

'more equitable distribution of income and wealth, substantial increases in employment, better nutrition and housing on an urgent basis' (General Assembly Resolution 2626 (XXV), 1970), which was further supplemented by the conclusions of Seventh Special Session (General Assembly Resolution 3362 (S-VII), 1975). The international organisations like ILO and the World Bank also emphasized the need to have employment and anti-poverty-oriented strategies. The call for NIEO in 1974 stressed the restructuring of the world economy in favour of the developing countries and the Lima Declaration of 1975 came out with a resolution that by the year 2000, the share of LDCs in world manufacturing should rise to at least 25 per cent from 7 per cent in 1973. The Tripartite World Conference on 'Employment, Income Distribution and Social Progress, and the International Division of Labour ' adopted a resolution which called for the inclusion of 'satisfaction of an absolute level of basic needs' as an explicit goal in the national development plans (ILO, 1976). The World Bank also joined the movement when it said that one of the major goals of the international community should be to meet the basic human needs of the absolute poor by the end of the century. The World Health Assembly later in 1979 called for health for all by the year 2000.

The shift in emphasis from growth-oriented strategy to basic needs and equity-oriented approach to development was an indication of the direction in which development thinking had been undergoing transformation during those years. The concepts

like 'human development' and 'sustainable development' were also at the centre of development thinking during the late 1980s and early 1990s.

Two classes of basic needs were generally identified, viz. material basic needs and non-material basic needs (Ghai et al., 1977). Bare physical needs like food, clothing education and health facilities, which make material basic needs were considered to form 'first floor' in the hierarchy of basic needs, to which every person on earth should be entitled by virtue of having been born (McHale, 1978; Streeten and Burki, 1978). The non-material basic needs or social needs, like participation in the political process, decision making, constitute a 'second floor' class of needs specific to each society (Teekens, 1988). There was a growing feeling that popular participation in nation-building is central to the concept of basic needs and should therefore be considered when needs are being chosen, ranked and budgeted.

However, the literature survey revealed that it was difficult to think of a common definition of basic needs. While some commonality in the material basic needs among countries could be discerned, though the issues relating to prioritization and magnitude differed, the non-material basic needs received different interpretations in different countries. The core basic needs like nutrition, education, health, shelter, and water and sanitation may not coincide with the list of basic needs expressed by the people. In addition, the list of basic needs has been expanded over the years - ILO considered employment also as

a basic need and there were also views that leisure be included in basic needs.

Development of Novel Methodological Framework by RIS

The RIS study considered Basic needs in a dimensional framework - at the input level and at the output level. This was done to analyse patterns in the provision of basic needs and achievements in terms of output indicators. The 'input level' included indicators like calorie supply to requirement ratio, primary enrolment ratio, secondary enrolment ratio, and physicians per thousand population were included. The other crucial variables like housing and sanitation, facilities accessibility to safe drinking water, and number of births attended by health staff could not be covered due to a lack of consistent data availability for the sample of countries under study. For similar reasons, the representation of non-material basic needs forming negative rights, and to quality of the environment could not be given in the computation of the basic needs index at the input level. The second set considered the 'output' side of the basic needs - reflecting achievements of the society in the areas of life expectancy at birth, adult literacy rate, and decline in infant mortality. In addition, we also constructed the Aggregate Development Index (ADI), a composite index of development, that included 22 major social and economic indicators).

The statistical analysis in the Basic Needs study dealt with the computation of composite indices of Aggregate Development Index (ADI) and Basic Needs Index (BNI), and the estimation of the nature of interrelationship among socio-economic indicators. The source of information was the UN and WB database that was available for a cross-section of 38 developing and 14 developed countries.

Alternative methods of computing composite index of development have been tried in the past. Morris (1979), for instance, computed the physical quality of life index (PQLI) for a cross-section of countries by taking an average of three indexes, viz. life expectancy at age one, infant mortality, and adult literacy to which equal weights were assigned. Human Development Report (UNDP, 1990) constructed a composite index of human development based on human deprivation in regard to life expectancy, literacy, and income required for a decent living standard. The human development index was derived as a simple average of human progress (one minus the relative human deprivation) in these indicators. We at RIS deliberated a lot and thought that equal weighting of the indicators constituting the Index was an easy solution but may not capture differing perceptions of people with respect to different indicators and their importance. Further, when we have a large number of indicators, there is the possibility that some of them could be closely correlated and hence equal weighting would not capture these statistical aspects. While one could do a random

survey eliciting the preferences of people, it would be costly and time-consuming. Finally, we thought of using the technique of 'principal component analysis', which has an inbuilt mechanism to determine the optimal weights that capture the largest fraction of the variance in the indicators forming the index of wellbeing. There are, however, some limitations of the method. For instance, there is still a certain degree of arbitrariness involved in variable rescaling and the resultant principal components may display some sensitivity to rescaling. It is not necessary that the weights assigned by the technique to different indicators would satisfy normative standards (as may be set or perceived by the people), which might vary across countries.

RIS's contribution

The results were presented on both the dimensions of the basic needs index at the input level and at the output level. It was observed that some of the African and South Asian countries together formed bottom-ten countries in terms of scoring in BNI at the input level. Most of the Latin American and Newly Industrialising Countries like Singapore, Republic of Korea and Hong Kong were at the top of scoring within the group of developing countries. The inter-temporal patterns in the relative position of developing countries during 1965, 1975, and 1985 revealed that some countries like Sudan, Malawi, Indonesia, Philippines, the Republic of Korea, and Mexico had consistent

improvement over the years, which reflected the deliberate government intervention in the provision of basic needs.

The ranking of countries seemed to change considerably when one looked at countries' performance in terms of BNI at the output level. Countries which scored better in BNI at the input level lagged behind in BNI at the output level, which required further in-depth analysis of the effectiveness of basic needs provisions in driving expected outcomes.

The ranking of countries based on BNI, ADI and HDI of UNDP-HDR revealed considerable variations. This means that we need to be careful in defining the purpose and selection of indicators, Also, it is worthwhile to look into the implications of methodological differences in the estimation of development or wellbeing indices.

In retrospect, the Basic Needs study of RIS can be said to be a seminal contribution to the understanding of wellbeing of people when questions were raised about GDP as an indicator of development and attention was drawn to the huge gaps in addressing basic amenities of life. UNDP had begun to develop alternate measures of human development.

Research over the years has revealed that higher income levels do not necessarily mean higher wellbeing, especially in the context of adverse climate change, biodiversity loss, lack of access to basic amenities, social inequality, and increased stress levels.[1] There has been a growing recognition of the need to complement purely GDP-based progress with alternative measures of societal

progress.[2] After the RIS BNI study and UNDP HDI, globally various initiatives have been taken to develop multidimensional wellbeing measures. The Multidimensional Vulnerability Index (MVI) launched by UNDP more recently captures gender disparities, inequalities in access to health, education and shelter, and poverty. The World Happiness Report, developed by the Sustainable Development Solutions Network (SDSN), reports how people evaluate their own lives. The OECD 'Framework for Measuring Well-Being and Progress' launched the Better Life Index to capture well-being. The OECD framework includes dimensions such as income and wealth, work & job quality, housing, health, knowledge and skills, environment quality, subjective well-being, safety, work-life balance, social connections, and civic engagement. There were also attempts by the RIS in the mid-2010s to develop Wellness dashboards within the group of the BRICS (Brazil, Russia, India, China and South Africa), that incorporated traditional knowledge and integrated approaches to development at the level of citizens.

Some of the G20 countries, like Canada, France, Germany, Italy, Japan, Korea, Mexico, UK, have also taken initiatives in designing wellbeing indicators to meet their specific requirements. The UK Office for National Statistics has developed a 'Measures of National Well-being Dashboard' aimed at monitoring 'how we are doing' as individuals, as communities and as a nation, and how sustainable this is for the future. The indicators include life satisfaction, feelings that life is worthwhile, happiness,

anxiety, mental well-being, unhappy relationships, loneliness, life expectancy, disability, health satisfaction, unemployment rate, job satisfaction, crime rate, access to natural environments, low income, household wealth, etc. Other countries outside the G20, like Bhutan, Chile, Ecuador, and New Zealand, have also developed multidimensional development measures.[3]

India's G20 presidency during 2022-23 laid emphasis on sustainable lifestyles (LiFE), values, wellbeing and accelerating SDGs. RIS, as a lead institution in the Think20 engagement group spear headed two task forces viz. Task force on 'LiFE, Resilience & Values for Wellbeing' and Task force on 'Accelerating SDGs: Exploring New Pathways to the 2030 Agenda'. The Task Force on LiFE proposed a new model of development based on LiFE principles, norms, and measurement frameworks, and provided guidance for policies and actions based on widely accepted goals. The G20 Development Ministers adopted High-Level Principles (HLPs) for Sustainable Development, which was endorsed at the India G20 Summit held in Sept 2023. The Task Force on SDGs identified issues and measures required to overcome hurdles in augmenting resources and giving a greater role for local communities and women for accelerating SDGs. RIS has taken further initiatives in promoting the LiFE concept by organising a Global Summit on LiFE Economy recently with the support of the G20 Secretariat and Ministry of External Affairs. It may be noted all these initiatives of the RIS not only directly touch

upon basic needs aspects of development, but also contribute immensely to the mobilisation of global opinion in fostering more inclusive and environmentally sustainable societies. It is proposed to take forward the initiatives of the RIS in LiFE and Wellbeing measurement through collaborative efforts in association with other like-minded institutions across the world.

Endnotes

1 Some research findings show that there is no apparent connection between evolution of GDP and development in average happiness. See for instance Easterlin, 1995; Fischer, 2009.

2 See for instance OECD, 2006; Deaton, 2008; Stiglitz, Sen & Fitoussi, 2009; Giannetti et al, 2015.

3 Wellbeing indexes are used by countries for policy making, see for instance, Stiglitz, Fitoussi & Durand, 2018

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14

MAPPING STI NEEDS FOR SOCIO-ECONOMIC DEVELOPMENT

Background – Connecting innovation system with development gaps

Technology is the most powerful tool for accelerating socio-economic development and systemic transformations to deal with grand challenges. Countries have individual responsibilities to define their own strategies and operational template in this regard. Much of these initiatives in the recent past have been inspired and guided by the Agenda 2030 and the Sustainable Development Goals (SDGs). RIS work on situating Science, Technology, and Innovation within the realm of SDGs relate to socio-economic development primarily in the SDGs parlance to leverage the advancement in global understanding of measurable (as well as aspirational) statistical indicators in

order to deliver Agenda 2030 globally and at the same time the rising awareness on localizing developmental efforts.

There is an imperative to go beyond the contemporary conceptual and analytical framework to comprehend the development of an STI ecosystem suitable for the purpose of achieving SDGs. In this scenario, there is a need to develop and pursue an integrated approach, where all the relevant stakeholders such as government, private sector, academia, research, international agencies and civil society, are taken on board. Several international agencies have prepared their respective roadmap drawn based on disparate methodologies. However, there is lack of understanding on how to match supply and demand when it comes to scientific research and technological solutions that can address specific development goals and targets across countries having different contextual realities and resource endowments. When it comes to STI capacities and localization the distribution is further skewed. While countries differ in their capacities to generate and process data, connecting it with genuine technological needs away from price signals remains a difficult domain.

Review of literature

In the literature, innovation systems and quantifiable development gaps, and strategies to address those have not been dealt with in any significant manner. It has to be borne in mind that, connecting the national innovation system with

other forms of innovation system such as regional and sectoral, becomes more organic and spontaneous Iizuka M. and Hane, G. (2020) Haddad, C. R., Nakić, V., Bergek, A., & Hellsmark, H. (2022). Freeman, C. (1995). However, little effort has been made to assess how innovation systems contribute to short, medium and long term development needs and what kind of technological solutions need to be deployed Doloreux, D., & Parto, S. (2005) Edquist C (2005). By and large implementing agencies lack such knowledge. During the pandemic, the integration of the national innovation system with the bio-medical sector in India, could lead to the development and delivery of healthcare products and services in a short span of time. Such a new approach needs to be pursued in multiple sectors towards achieving the SDGs Iizuka M. and Hane, G. (2020) IATT (2021).. The UN Guidebook on STI for SDGs Roadmap has elaborated the rationale for STI for SDGs Roadmap and the need for strengthened international partnerships on STI for SDGs.

On the question of STI for SDGs, it can safely be said that key technologies are needed in the short to medium term as part of any template for development interventions in any region, irrespective of local capacities or resources[Chaturvedi Sachin and Saha Sabyasachi (2021), Chaturvedi, S., & Ravi, S. (2019), UN DESA (2020), Implementing Science, Technology, and Innovation (STI) for SDG Roadmaps at the Country Level] . In fact, all development policy designs are increasingly being shaped by their technology content Freeman, C. (2004). From the

perspective of the process involved, scientific discoveries and technological advancements need intermediaries to complete the feedback loop on assessing the nature of demand. Government agencies, national and sub-national, may play that role.

How delivery of development can be integral to innovation systems – RIS conceptual framework

Line ministries are pivotal in the identification, procurement and deployment of technologies in the flagship schemes. Significant learning and experience are being generated on ways and means to leverage technology under flagship schemes. Therefore, line ministries need to augment internal capacities to come up with coherent strategies for appropriate technology choices towards speedy and optimal outcomes in the delivery of development schemes. The push towards monitoring and evaluation of flagship schemes at micro level and household level through use of GIS, IoT, ICT, Geo-Tagging and other modern technologies needs to be strengthened and extended to monitor the quality rather than quantity of the outcomes through flagship schemes. Regional asymmetries in adoption and deployment of technologies in Flagship schemes need to be examined to avoid exclusions among the targeted population. State governments as the implementing authority must be supported to overcome the S&T capacity gaps in respective states. Therefore a mapping methodology for technology needs is important.

Focus may be on those SDG indicators that are directly aligned with known significant scientific challenges connected to existing complex development gaps often beyond accessible technological solutions in developing countries. In such cases, access, equity, affordability alongside sustainability would be important considerations for any scientific enterprise. One way to encourage national planners and policymakers to pay attention to STIs for SDGs is by demonstrating that the use/ availability of existing or potential STI solutions would help accelerate the achievements under respective indicators. From the perspective of developing countries, diffusion of available technologies in all regions is equally important. With respect to grand challenges, developing countries are at a continued disadvantage and may not be in a position to develop, acquire or access STI solutions unless appropriate policy interventions are made.

Indicative mapping framework – developed by RIS

The Concept

An attempt has been made towards building a comprehensive "Indicative Technology Mapping (ITM)" for four SDGs (2, 3, 6 and 7), their underlying targets and interlinked indicators from a cross-domain perspective.

- **SDG-2:** End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- **SDG-3:** Ensure healthy lives and promote well-being for all at all ages
- **SDG-6:** Ensure availability and sustainable management of water and sanitation for all
- **SDG-7:** Ensure access to affordable, reliable, sustainable and modern energy for all

The ITM is mainly focused on a set of existing as well as emerging technologies, whose adoption and diffusion are critical to achieving progress on all the selected SDGs. It also aims to indicate areas of technological capability dominance that are vital for achieving progress on select SDGs.

The ITM may depict the scale and diversity of technologies which are deployed or have the potential for deployment at scale for achieving the relevant targets under the SDGs. The indicator wise categorization and the cross sectoral linkages of the technologies with SDGs and their interlinkages with other SDG targets and indicators will provide a comprehensive view of how the deployment of such technologies can complement the achievement of not only the focused SDGs but other SDGs as well.

The mapping of technologies with their respective indicators and SDG targets open different areas of innovation, as laid out in the UN Guidebook for preparation of STI for SDGs Roadmap.

Given that there exists an array of technological options that could cater to these challenges, it is imperative to first assess these alternatives. One way of doing this is by first classifying all these technologies into existing, emerging or new. Since newer technologies will take some time to fully penetrate their desired markets, the prioritization of alternative technologies will have to be such that utmost importance is given to existing technologies, then emerging and later to new technologies. This also allows us to identify gaps in the existing technology landscape. The information could be very useful in channeling research investments into new technologies that address these gaps.

Targets defined under each SDG are development objectives that need to be achieved universally, in totality and in spirit to fulfill the aspirations of a sustainable and equitable world. Targets are also instruments to connect more than one SDG so that achievement of a particular target would support fulfilling objectives under other SDGs as well. While countries are free to define their indicator framework, a reference indicator framework has been identified by the UN after a rigorous negotiation process among statistical agencies of various countries. While the range of indicators that have been identified captures the spirit of the related target, the aspiration of the target as well as that of the concerned SDG goal, can only be achieved by addressing the slated issues going beyond the scope of specific indicators in some cases. This is partly due to the fact that indicators are

developed keeping in mind data availability as well as the status of the methodology that goes into the computation of indicators. However, the abilities of statistical agencies to report relevant data are widely disparate.

While many countries depending on the development context as well as the maturity of the statistical systems, have expanded the list of indicators beyond the scope of the UN indicators, several countries, especially those with weaker statistical systems, are likely to depend on the UN indicators as well as on reporting done by third parties primarily specialised UN agencies like FAO, WHO, ILO, UNESCO etc. The national level monitoring of the SDGs in India is developed by the Ministry of Statistics and Programme Implementation (MoSPI). MoSPI has created 306 national indicators (now revised to 295 indicators) in line with the 169 SDG targets and the Global Indicators Framework to monitor progress and the extent of achievement of the targets and Goals. In addition to the 295 indicators, 62 priority indicators have been identified for measuring India's most essential developmental goals.

The Indicative Technology Mapping (ITM) should be useful to assess the current situation of SDG-related technologies and to strengthen the overall STI capability through synergistic and cross-sectoral collaborations. Furthermore, it can be used as input for national STI for SDGs roadmaps and should be helpful to reach out to line ministries, departments, and relevant agencies. The ITM takes into account the changing priorities for STI for

SDGs and allows imagining an SDG-led innovation future and to guide STI policy interventions. The ITM open-up the need to monitor technology readiness levels across technologies and to critically examine the impact of specific policy instruments to monitor progress as part of the overall STI-led development strategy. Likewise, in various existing and emerging technologies, the perceived technological "deficit" underlines the need to foster technological catch-up by enhancing R&D intensity and policy coordination. The technology identification exercise thus opens up several pathways to initiate indigenisation.

Methodological Approach

After distilling the scope of the indicators and careful interpretation of the targets, further value addition needs to be undertaken in terms of selecting key indicators that can be directly linked with STI interventions. It has to be understood that achievement of a specific SDG and fulfillment of a related target may be dependent on several factors including conducive legislative, legal and policy action; good governance; deployment of institutional resources; better planning and administrative management; the inculcation of a scientific bent of mind, enhanced use of scientific monitoring methods focused on outcome and impact; ushering social behavioural change; and mainstreaming outreach and participatory approaches. While ICT tools are increasingly ubiquitous that may help all of the above, the same may not be accessible to all implementing

agencies across countries. This is certainly an area that needs to be considered for robust STI for SDGs roadmaps.

Indicators are linked with both quantitative and qualitative measures covering a substantial part of what each target seeks to achieve. Initially those indicators are selected that highlight development/ sustainability parameters, which throw up significant scientific challenges emerging out of the nature of the development gap and the complexity of the problem based on considerations of access, equity and inclusion as well as sustainability dimensions. In other words, there should be reasons to argue that with use/availability of existing or potential STI solutions the indicator should achieve desired values at a much accelerated pace. It could also be the case that diffusion of already available STI solutions should be a big factor in the achievement of the indicator as well as the target. In certain cases, it is obvious that given the enormity or the complexity of the challenge, existing STI solutions may be grossly inadequate and all countries may not be in a position to develop, acquire or access STI solutions.

Illustration based on SDG 2

SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Target 2.1 suggests that by 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.

The UN Indicators identified in this regard include:

2.1.1 Prevalence of undernourishment
2.1.2 Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)

The corresponding National Indicator Framework identifies the following indicators:

2.1.1 Percentage of children aged less than 5 years who are underweight
2.1.2 Proportion of beneficiaries covered under National Food Security Act 2013, (in percentage)

Clearly, the challenge of food security and end hunger that we derive from this target-indicator combination to inform STI intervention is directly linked with availability, access and affordability to food as well as nutritional security. While access may be a distributional issue, availability coupled with considerations for nutritional security are dependent on a variety of factors, including agricultural productivity and nutritional content, whereas affordability encompasses incomes and transfer payments, including safety nets, especially for the most vulnerable, a robust PDS system etc. This rationale also forms the basis of considering Target 2.1 together with Target 2.2, which states that by 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children less than 5 years of age, and address the nutritional needs of adolescent girls, pregnant

and lactating women and older persons. While the indicators identified both at the global and the national level seek to measure outcome/progress for specific groups, the core components of developmental intervention include availability and access to nutritional food.

The identification of the developmental challenge and decomposition into specific product and process components is crucial for initiating a STI for SDGs roadmap. The same can be undertaken for each target and the underlying indicators.

Identifying the Nature of Technology Needs

Drawing upon Targets 2.1 and 2.2, we suggest that the key areas of intervention with regard to STI inputs are 1) Productivity (linked with quantitative outcomes); 2) Quality (linked with nutritional content). However, the question of productivity is not only linked with farm mechanization, which in itself falls in the category of technological intervention, a substantial consideration would be about improving input use efficiency as well as the quality of inputs in the first place. Taking into account sustainability issues, higher productivity in agriculture has to be achieved by promoting sustainable practices in terms of energy use and water use not only during tilling but also at all levels of industrial level production of inputs. Directly linked with the question of nutrition security are considerations towards improving the nutritional quality of farm produce as well as

preserving nutritional values through later stages of processing and storage.

Upcoming food processing technologies would better reduce wastage and spoilage, cut down on nutritional losses and maintain food texture and taste. In turn these would check against distress sales, stabilize prices, and thus enhance GVA in agriculture. Some of emerging technologies include pulsed electric field (PEF) treatment. Further, the next level Ultra High Temperature (UHT) processing technologies would require shorter processing bursts and provide hygienic and high shelf-life products in the value chains.

Another strand of food processing technologies involves harnessing air in place of argon etc., and use solar energy to run extruders, extractors, driers, desalination units etc. Modern cold chain technologies, including solar-powered micro units; for horticulture, agro-marine and other products can preserve nutritive products and ensure their year-round supply. Nanotechnology can help protect sensitive bio-actives like vitamins, minerals, omega-3 fatty acids.

Target 2.3 states doubling agriculture productivity and enhancing farmers' income. Information and Communication technology is important to connect rural farmers to market information, products, and related services to improve incomes as well as agriculture productivity. Some other enabling

technologies that will support the achievement of the target are bioinformatics, GIS, and data analytics.

Target 2.4 brings forth the sustainability dimension. It states that By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

The associated UN identified indicators is: "2.4.1 Proportion of agricultural area under productive and sustainable agriculture". However, this indicator has been listed under Tier II.

The national indicators are as follows: 2.4.1 Proportion of Net Sown Area to Cultivable land, (in percentage); 2.4.2 Percentage of farmers issued Soil Health Card; 2.4.3 Percentage of net area under organic farming.

It is nearly apparent that the indicators are focused on the outcome and considering the processes leading to those outcomes would be equally as important if not more. At all levels of sustainable and resilient agriculture, there is significant dependence on know-how, improved methods and greater use of scientific knowledge, including in niche areas like carbon capture utilization and storage (CCUS), CRISPR-cas9 etc. This may also entail the availability of a range of technologies that include use of space technology for weather forecasting,

Remote Sensing, Artificial Intelligence for predictive modeling to determine appropriate crops to be grown as per climatic conditions.

In the context of Target 2.5, which aspires that by 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed. The immediate STI input that may be relevant in this case is the promotion of 'gene bank'.

The indicative technology mapping that has been highlighted here is yet to be used fully. In the case of new technologies, there will be a gap in terms of time between their potential demonstrated in the lab and gains realised in the field or in use. In the case of many technologies, regulations are in the offing or not there currently. Their TRL status is not fully known, nor do we know everything about their viability. Hence, Technology Assessment must be appropriately incorporated to maintain due caution in the promotion of any class of technologies.

It is essential to establish a STI ecosystem, composed of all relevant stakeholders. Such an ecosystem would facilitate close coordination among the relevant stakeholders and would help the line ministries in formulating their respective plans to integrate

the application of STI for achieving the related SDG goals and targets. All important scientific ministries and departments are vital participants in the process and must play a significant role in directing STI activities towards the achievement of the SDGs. As development partners in this effort, organisations from the public and private sectors, businesses, start-ups, and social enterprises are integral to the process. All key scientific ministries and line departments through the Flagship schemes have to play a major role in providing direction to STI efforts and are, therefore, preeminent stakeholders in the process. Sub-national governments, particularly, the state governments, also form vital pillars for supporting the formulation of national STI for SDGs Roadmaps.

A sharp sectoral focus in India's progress towards achieving the SDGs in terms of regional asymmetries and gaps at the National and State level is important. The indicator gap mapping and ranking framework put forward by the NITI Aayog based on selected targets and indicators has highlighted India's progress towards the SDGs. At the next level, sector specific ITM can evolve into a comprehensive data driven platform where all resource flows from the public and private sectors can be mapped and matched with STI for SDGs outcomes (and impacts) which would streamline decision making.

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15

TOWARDS A SOFT POWER MATRIX FOR GLOBAL SOUTH: AN EXPLORATION OF VARIOUS DIMENSIONS

Background

The growing prominence of Soft Power diplomacy on the international stage and its consequential impact on a nation's foreign policy has sparked discussions regarding the quantification of a country's soft power. Presently, there exist several indices designed to capture specific facets of a nation's characteristics, including the Soft Power 30 Report by Portland, Monocle's Soft Power Survey, and Elcano's Global Presence Report. However, concerns have arisen regarding the potential Global North bias in the identification of components and methodologies employed in the construction of these indices.

In response to these concerns, the Research and Information System for Developing Countries (RIS), in partnership with the Indian Council for Cultural Relations (ICCR), initiated a comprehensive process aimed at formulating methodologies and components for a Soft Power Matrix from the perspective of

India and the Global South. This initiative serves a dual purpose. First, it seeks to underscore the distinctiveness of soft power strategies employed in the Global South. Second, it aims to shed light on any inherent biases in existing soft power indices, which predominantly reflect the Northern perspectives.

While preparing the Soft power matrix, there were numerous concerns regarding what actually constitutes "soft power",-its characteristics and, thereafter, the quantification of it in the form of an index. The qualitative qualification of soft power bears strong subjectivity in terms of approaches various countries have taken, ranging from cultural connect, humanitarian assistance to peace and security. Thereafter, the quantification part comes in, where the challenges double down to quantify certain aspects of culture, knowledge, or peace and security. However, some components like development cooperation or humanitarian assistance have largely been quantified and can grasp the intuition behind incorporating them in the Soft Power matrix.

This exercise of analysing the present indexes of soft power delves into the rationale behind these initiatives, emphasising the need for a more inclusive and equitable assessment of soft power that accommodates the diverse approaches and strategies employed by nations from the global South. It also underscores the importance of critically evaluating the existing indices to

rectify any imbalances and biases that may have inadvertently emerged in the assessment of a country's soft power.

Review of literature

Professor Joseph Nye's concept of "Soft Power", developed in response to 1980s challenges, diverged from neo-realism, emphasising transnational relations. Coined in 1990, the term 'Soft Power' has undergone evolving interpretations since its inception. At its core, Soft Power revolves around the capacity to attract and co-opt, in contrast to the coercive nature of hard power, which relies on force or financial incentives. Essentially, it is the ability to mould the preferences of others through appeal and attraction. Professor Nye identified three primary sources of soft power: culture, political values, and foreign policy. While initially applied to analyze the United States' foreign policy, the concept has been adapted over the years to assess countries not just in terms of foreign policy but also in areas like openness, tolerance, acceptance, and overall attractiveness to others.

Soft power's relevance has expanded significantly, gaining traction not only in academic circles but also among policymakers. Its conceptual evolution now involves ranking countries based on their foreign policy and broader qualities. In the contemporary context, particularly in the age of the internet and social media, soft power's popularity has surged. The appeal lies in the belief that influencing foreign states through attraction

and persuasion is more just and ethical compared to the coercive application of military power.

However, Rothman (2011) refrains from specifying when certain forms of power are more effective but suggests that both hard and soft powers have limitations in achieving desired outcomes. He redefines power along a continuum from soft attraction to hard control, correlating different forms with resources in international politics. It highlights the influence of attraction through rhetoric, agenda-setting, economic, and military resources, emphasizing a nuanced, non-binary approach.

Nye (2021) concludes that soft power, distinct from hard power, emerged in the context of addressing American power decline, focusing on attraction and persuasion alongside traditional factors. Challenges, including accusations of bias, were addressed by underscoring the subjective and context-dependent nature of attraction.

Over the period, there have been several studies on country-specific soft power strategies beyond US or Eurocentric foreign policy approaches. Sergunin and Karabeshkin (2015) analyse how Russia's interpretation of soft power deviates from conventional models, characterised by pragmatism and an instrumentalist approach. The analysis acknowledges Russia's possession of substantial soft power resources but highlights challenges in their coherent utilization. Similarly, Wuthnow (2008) highlights three mechanisms for leveraging soft power in

support of China's long-term growth promoting international respect for Confucian heritage, emphasizing leadership in the developing world through economic diplomacy, and cultivating an image of being a responsible power in Asia.

India, recognizing the synergy of hard and soft power, has integrated soft power into its diplomacy, bolstering its global standing. As the largest democracy with a robust political system, India's political and economic rise complements existing orders. India strategically utilizes its anti-colonial history of the last century and strong principled stand against apartheid. This approach aims to portray India as a cooperative and stabilising rising power, distinct from China's more assertive model Blarel, Nicolas (2012).

Extending the conceptual understanding of Soft Power by RIS

RIS highlighted the historical connection between Indian civilization and others which is deeply rooted in the sharing of knowledge and both material and spiritual values. Indian traders actively engaged with communities across Asia and beyond, while spiritual envoys spread messages of love and peace globally. Despite Indian empires' historical dominance, the Indian perspective on power, whether soft or hard, prioritises winning over minds rather than territorial conquest. The historical backdrop underscores India's unique approach of using love and peace to foster enduring bonds of care and

sharing. India's ethos of acceptance, rather than mere tolerance, establishes a horizontal relationship, reflecting a deep-seated belief in benevolent coexistence. This historical context contributes significantly to understanding India's soft power dynamics in the contemporary world.

Development of Novel Methodological Frameworks by RIS

Initially, RIS analysed "The Soft Power 30" Report by Portland, which employs a dual-pronged framework, incorporating both quantitative and qualitative aspects to assess soft power dynamics. The quantitative dimension utilises objective data streams, covering Government, Digital, Culture, Enterprise, Global Engagement, and Education. Metrics and data sources include UN Statistics, reports from multilateral institutions, and international organisations. On the other hand, the qualitative dimension focuses on subjective data gathered through international polling, encompassing aspects such as Cuisine, Technology Products, Friendliness, Culture, Luxury Goods, Foreign Policy, and Liveability. This comprehensive approach ensures a holistic evaluation of soft power, combining concrete metrics with the perception-based insights derived from global polling.

The brief classification of objective data is as follows:

Government: The Government sub-index assesses a state's political values, institutions, and policy outcomes, considering

factors like individual freedom, human development, violence, and government effectiveness. It gauges the attractiveness of a country's governance model and its ability to deliver positive outcomes for citizens, making states with well-functioning systems more appealing to potential international collaborators.

Digital: The Digital sub-index introduces a crucial element to the soft power measurement, acknowledging the transformative impact of technology on various aspects of life. It assesses a country's embrace of technology, digital connectivity, and utilisation of digital diplomacy through social media platforms.

Culture: The Culture sub-index evaluates a country's soft power based on the promotion of universal values through its culture. It considers the quality and international reach of cultural production, measuring factors like annual international tourist visits, global success in the music industry, and international sporting achievements.

Enterprise: The Enterprise sub-index gauges the relative attractiveness of a country's economic model in terms of competitiveness, innovation capacity, and fostering enterprise and commerce. It is not a measure of economic output but focuses on economic factors that contribute to soft power.

Global Engagement: This sub-index measures a country's diplomatic resources, global footprint, and contribution to the international community. It assesses a state's ability to engage with international audiences, drive collaboration, and influence global outcomes through metrics such as the number

of embassies/high commissions abroad, membership in multilateral organisations, and overseas development aid.

Education: The Education indicator assesses a country's soft power based on its ability to attract foreign students and facilitate educational exchanges. Foreign student exchanges are recognised as powerful tools of public diplomacy, contributing to reputational gains and positive ripple effects when returning students advocate for their host country.

The Subjective (Qualitative) Data are captured under these dimensions:

Cuisine: Reflects the global perception of a country's culinary offerings, showcasing the influence and appeal of its food culture on the world stage.

Technology Products: Measures the international reputation and impact of a country's technological innovations and products on the global market.

Friendliness (Welcoming to Tourists): Assesses the perceived warmth and hospitality of a nation towards tourists, influencing its attractiveness as a travel destination.

Culture (Contribution to global culture): Gauges a country's influence on global culture through its contributions to art, literature, music, and other cultural expressions.

Luxury Goods: Examines the international perception and desirability of a country's high-end products and brands, contributing to its image in the luxury market.

Foreign Policy (Trust to do the right things in global affairs): Measures the level of trust in a country's foreign policy decisions, reflecting its credibility and reliability on the global stage.

Liveability (Appeal as a place to visit, work, or study): Evaluates the overall desirability of a country as a destination for living, working, or studying, considering factors that contribute to a high quality of life.

Based on the above indicators, the Index aims to encapsulate distinct dimensions of a nation's attributes. However, emerging concerns centres around the potential bias towards the Global North in both the identification of components and methodologies employed in crafting these indices. The risk of a Northern bias suggests a tendency to prioritise and favourable attributes and perspectives that align with or are more prevalent in developed Northern countries, potentially overlooking the nuanced soft power dynamics and contributions of nations in the Global South. This raises questions about the comprehensive inclusivity and representativeness of these indices in capturing the diverse and global nature of soft power influence.

The exercise undertaken by RIS in collaboration with ICCR was underpinned by four key rationales. The primary objective is to develop an indigenous term and definition for soft power, moving beyond the connotations associated with traditional power dynamics. Secondly, the initiative aimed to create a 'soft power matrix' through collaborative brainstorming and methodological exercises, with a focus on quantifying the

impact and robustness of India's soft power initiatives. Thirdly, acknowledging the dynamic nature of the exercise, there was a commitment to ongoing adjustments and reassessments of the matrix components. Lastly, the approach emphasised a broad spectrum of data sources, spanning public and private domains, ensuring a comprehensive assessment beyond specific government entities.

RIS laid out a few dimensions which can be incorporated into estimating the Soft Power:

1. **Diaspora Connect:** highlighting the significant presence of the Indian diaspora with over 32 million individuals, including NRIs, OCIs, and PIOs. Notably, 8.5 million are in the Gulf, 4.4 million in the US, 1.7 million in the UK, and 1.6 million in Canada. The World Bank reports India's diaspora remittances as the world's highest at $87 billion in 2021. The engagement of the diaspora extends beyond economic gains, emphasising involvement in cultural, social, and traditional aspects.
2. **Development Cooperation:** India has undertaken significant initiatives for human resource development and inclusive growth across the Southern world, engaging in bilateral and multilateral efforts. These include promoting development, sustainable infrastructure, and social empowerment. The country collaborates through trade, investment, grants, and technology transfers, offering increased scholarships to students globally. The positive perception of India's

education system and culture is notable among students from developing nations.1 While documented to some extent, efforts are needed to raise awareness. The development cooperation budget, as estimated by RIS, stands at USD 4.5 billion, potentially higher with complete data, showcasing India's commitment to South-South Cooperation principles.

3. **Cultural Ethos:** India has maintained enduring cultural bonds with humanity over an extended period, demonstrating remarkable resilience despite occasional isolated incidents. The positive influence of the Indian diaspora in fortifying these cultural connections is a recurring observation. To assess the contemporary state of cultural linkage, key indicators include the influx of foreign pilgrims to India, global interest in learning and showcasing traditional Indian dance and music forms, the frequency and attendance metrics of cultural programs organised abroad, and the sales figures of books on Indian culture in international markets.
4. **Indian Cinema:** Indian cinema is a significant driver of India's soft power, offering substantial potential for global revenue and goodwill.2 Leveraging social media can expand its reach, fostering cultural awareness and economic opportunities. This influence extends to Indian classical arts, while Hindi cinema plays a pivotal role in promoting tourism, local industries, and global cultural interactions, as evidenced by various indicators of its widespread popularity.

5. **People-to-People Connect:** Education, trade, and health services are key for people-to-people contact. Indicators include CBSE schools, Indian faculty abroad, foreign students in India for education, and medical tourists for health services. India's affordable healthcare and active trade engagement contribute to global goodwill and prestige.3
6. **Democracy:** India's success as the world's largest democracy inspires global democratic processes. Through initiatives like aiding Nigeria, Jordan, and Fiji in their elections, India actively promotes democratic values worldwide. The integration of Panchayats and municipalities, the 74th and 75th Amendment Act, showcases inclusive governance, and the Election Commission plays a pivotal role by offering technical support to countries like Jordan, Maldives, Namibia, Egypt, Bhutan, and Nepal. The India International Institute of Democracy and Election Management further solidifies India's commitment to global participatory democracy.4
7. **Women Empowerment:** India promotes women's empowerment through various programs, including an ITEC-backed training initiative with Barefoot College, specifically targeting illiterate grandmothers in villages without electricity. The program draws participants from numerous countries. India has also provided high-energy biscuits to students in Afghanistan, gaining popularity.5
8. **Environment:** India actively combats global warming and climate change through both domestic efforts and

international partnerships. Key indicators include engagement in the International Solar Alliance, contributions to global ecological protocols, and the recognition of Indians through international environmental awards. India's inclusive approach to sustainable development promotes environmental and social justice from a global to grassroots level.

9. **Peace and Security:** India actively contributes to global peace as the third-largest contributor to UN peacekeeping missions, deploying 7,000 personnel across various operations. It has participated in about 50 out of 71 UN peacekeeping operations, including 13 of the current 16 missions undertaken in countries like Korea, Cambodia, Laos, Vietnam, Congo, Cyprus, Liberia, Lebanon and Sudan.
10. **Role at UN:** India plays a vital role at the UN, advocating for developing nations in forums like WTO, World Bank, and IMF. The country prioritises a constructive approach to global challenges, emphasising peace, stability, and the concerns of the global South. The increasing presence of multilateral institutions/initiatives in India reflects its growing soft power. The increasing presence of multilateral institutions/ initiatives in India, such as South Asia University, Nalanda University, International Solar Alliance, Coalition for Disaster Resilient Infrastructure, are indicators of growing soft power.

11. **Knowledge (New and Traditional):** This index explores the contemporary relevance of traditional knowledge and wellness practices, proposing a new framework for wellness measurement. Indian traditional medicine systems, practiced globally, foster mutual welfare.
12. **Yoga:** The adoption of the UN Resolution declaring June 21 as the International Day of Yoga by 177 countries showcases India's global influence. The popularity of yoga, measured by the proliferation of schools and followers worldwide, underscores its significant global impact.
13. **Global Public Goods:** India has adopted a balanced Intellectual Property Rights regime, harmonising private incentives for creativity with societal benefits. Efforts include reforms in copyright laws, participation in global projects like the IRGSP, providing affordable HIV/AIDS drugs to Africa, establishing a WHO Trust Fund for neglected diseases, and offering low-cost telecom solutions to other nations.
14. **Humanitarian Assistance:** India actively responds to natural disasters globally, with a notable focus on South Asia. India's aid includes bilateral government funding, contributions to multilateral organisations, and assistance to conflict-affected nations like Sri Lanka. The humanitarian ecosystem involves government agencies, state governments, the private sector, NGOs, and significant reliance on the Indian army for implementation abroad. Beyond medical aid, food, and cash, India helps establish disaster management systems in South

Asian countries and shares expertise with affected nations, such as Guyana in 2006. India's growing role in multilateral organisations like UNRWA, ICRC, UNHCR, and WFP reflects a proactive stance.

15. **National Education Policy and Internationalisation of Higher Education:** The National Education Policy 2020 aims to position India as a global education hub by encouraging affordable higher education and internationalisation. Initiatives include inviting top global universities to establish campuses in India, fostering knowledge exchange, and addressing challenges such as low international student enrolment through measures like the Graduate Immigration Route in the UK.
16. **Cultural Heritage Conservation:** India actively promotes its culture and heritage through the restoration of ancient sites, especially in Southeast and South Asia. The Archaeological Survey of India (ASI) oversees these projects, fostering goodwill and cultural ties with host nations.
17. **Food and Culinary Diplomacy:** Indian cuisine is disseminated globally. The increasing number of Indian restaurants worldwide reflects a growing global appreciation for Indian food culture. India can offer culinary expertise and explore commercial opportunities in heritage preservation.
18. **Geographical Indication (GI) Protection:** The protection of Geographical Indications (GIs) enhances regional economic development and creates positive product images. GIs

contribute to global product reputation, stimulate tourism, and support regional growth. India has registered 341 GI products, necessitating support for implementation and sustainability.

19. **Digital Diplomacy and Social Media:** In the 21st century's networked and digitalised society, digital tools, especially social media platforms like Twitter and Facebook, play a crucial role in diplomacy. Effective digital diplomacy enhances India's soft power by influencing global perceptions and fostering direct communication for desired outcomes. Social media serves as a direct engagement forum between Indian policymakers and both foreign and national audiences.

Way Forward

The comprehensive Soft Power Matrix initiative by RIS addresses the initial concerns of potential Global North bias in existing indices. By emphasising the distinctiveness of soft power strategies in the Global South, RIS has introduced a more inclusive and equitable assessment framework. Furthermore, the dimensions incorporated in the index require a quantifying metric and indicators profile to properly assess the impact of Soft Power. Such an indicator profiling can contribute not only to enhance the credibility of the Soft Power Index but also help to capture the impact of soft power in the country's foreign policy approaches. Moving forward, researchers can build upon

this initiative by continually refining and expanding the matrix components, incorporating additional perspectives from various regions, and fostering ongoing dialogue to enhance the global understanding of soft power beyond traditional paradigms.

Endnotes

1 The policy framework enables and encourages institutions to admit international students up to 15 per cent of the sanctioned intake. Going by this figure, India could have recorded 4.85 million international students. Instead, in the academic year 2013-14, there were only 31,126 international students—at a meagre 0.61 per cent, the share of international students is discouraging indeed. However, it must be noted that these figures mark a significant increase from 7,791 in 2000 (AIU, 2016).

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Core IV-B, Fourth Floor, India Habitat Centre
Lodhi Road, New Delhi-110 003 India., Ph. 91-11-24682177-80
Fax: 91-11-24682173-74, Email: dgoffice@ris.org.in
Website: http://www.ris.org.in

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