

India-EU Connectivity Partnership for Development, Demand and Democracy



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विकासशील देशों की अनुसंधान एवं सूचना प्रणाली

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Foreword



Ambassador Dr Mohan Kumar

Chairman, RIS

In May 2021 at the summit-level meeting, both India and EU launched a sustainable and comprehensive Connectivity Partnership that upholds international law, conforms with international norms and affirms the shared values of democracy, freedom, rule of law and respect for international commitments. The India-EU Partnership expects to promote a transparent, viable, inclusive, sustainable, comprehensive, and rules-based connectivity. It is based on principles of social, economic, fiscal, climate and environmental sustainability and a level playing field for economic operators.

In the light of above background, I am pleased to compliment RIS and appreciate the efforts in bringing about the Report on India-EU Connectivity. The Report highlights the importance of connectivity between India and the EU and does so by analysing the bilateral trade and investment flows between the two powers. The Report is extremely topical since it looks at connectivity for sustainable development and green transition, in the run-up to the COP 26 meeting at Glasgow. There is no gainsaying the fact that India and EU can be a force for good in overall battle to achieve the SDGs by 2030. In a very useful chapter, the Report also does a comparative analysis of funding for infrastructure by different agencies such as EIB, AIIB and NDB.

I have no doubt that this Report will prove to be invaluable for scholars and policy makers alike.

A handwritten signature in black ink that reads "Mohan Kumar". The signature is written in a cursive style and is followed by a horizontal line.

Mohan Kumar

Preface



Professor Sachin Chaturvedi

Director General, RIS

The meeting between Indian Prime Minister Shri Narendra Modi and President of the European Council, Mr Charles Michel on 8 May 2021 in connection with the India-EU Connectivity Partnership has wider significance. It has imperatives for larger linkages between Europe and India bringing in Asia, particularly Central Asia, South Asia and South-east Asia together. In this context, physical connectivity and other forms of connectivity such as digital, cyber, energy, air connectivity, banking and finance, and cooperation in science and technology, environment, infrastructure, SDGs, oceans, people to people partnership, among others, need to be adequately analysed for evolving a strategic roadmap by the think-tanks through several consultations and reports of this nature.

The present Report is an endeavour in that direction. It covers the broad contours of connectivity linkages and its various forms along with trade and investment linkages and also tries to explore a roadmap for effective implementation of Agenda 2030. The report also makes an effort to study areas associated with alternative energy resources such as green hydrogen, solar and other kinds of non-conventional energy. Financial connectivity is also discussed from the institutional perspective where linkages between financial institutions, banks and providers of fintech are analysed.

In the coming days, RIS would organise a number of discussion meetings before the India-EU Summit to chalk out a robust roadmap leading to enhanced India-EU cooperation across different sectors. We hope the Report would serve as a reference point for all stakeholders. We also take this opportunity to thank the RIS team for preparing the report in a short time for generating innovative ideas and suggestions for strengthening EU-India partnership.

A handwritten signature in black ink, appearing to read 'Sachin Chaturvedi', with a stylized flourish underneath.

Sachin Chaturvedi

1

Importance of Connectivity for India-EU Economic Relations



Introduction

Promotion of a comprehensive, rules-based, sustainable, inclusive, equitable and transparent approach to connectivity is at the core of the India-European Union (EU) Connectivity Partnership. The agreement aims to boost the bilateral strategic partnership, thereby ensuring that the world is 'multipolar, greener, safer, cleaner, more digital and resilient'. The landmark Partnership, signed by the 'economic power-couple' with a combined market size of 1.8 billion people and GDP of 16.5 trillion Euros, also seeks to provide appropriate incentives to promote greater private sector investment and participation in all connectivity aspects (Government of India, 2021a and b; EU, 2021).

Better connectivity helps in boosting trade, attracting greater investments, as well as in bringing down business transaction costs and time. It also leads to structural reforms, increased movement of skilled professionals, development of Global Value Chains (GVCs), enhancement of the role of Micro, Small and Medium Enterprises (MSMEs) and reduction of various disparities (Brooks, 2016; Fau, 2016). Countries including India, that are part of Asia Pacific have been experiencing economic growth and prosperity due to factors including an increase in international trade and

investment as well as the GVCs. It has, however, been seen that the ensuing benefits from such globalization efforts have not been shared in an equitable manner. This has resulted in a situation where many people have been facing hardships due to inadequate access to the various elements of connectivity including those related to energy, digital technology and transport (UNESCAP, 2014).

The EU, with its Asia connectivity strategy, aims to play a greater role in the connectivity arena in Asia including in India. It would, nonetheless, be vital for the developed-country bloc to recognise the existing disparities between India and the advanced members of the EU for effective implementation of the bilateral Partnership agreement. To ensure win-win outcomes, the EU - which is aspiring to garner a greater share of India's huge and growing market - needs to recognise the need for developing the latest technology including know-how, capacity building and skilling in India itself to help find innovative, cost-efficient, resilient, replicable and scalable connectivity solutions. In this context, this chapter looks at various connectivity initiatives taken by India and the EU, the areas where European and Indian firms have already shown interest, and the potential areas of bilateral cooperation to strengthen these ties based on 'access, equity and inclusion' as well as using the principle of

sustainability and an integrated multimodal approach for their mutual benefit¹.

Principles

The principle of ‘sustainable connectivity’ is a recurring theme in the EU’s connectivity initiatives. This aspect is seen in the EU-Japan Connectivity Partnership Agreement (EU, 2019a) and the EU’s Asia connectivity strategy (EU, 2018) as well. The EU-Japan Connectivity Partnership Agreement seeks to ensure debt sustainability as well as the high standards of economic, fiscal, financial, social and environmental sustainability (EU, 2019a), while decarbonisation and digitalisation are central to the EU’s Asia connectivity strategy (EU, 2018). These elements of ‘sustainable connectivity’ were elaborated by Okano-Heijmans and Sundar, and they include: (i) Commercial sustainability (*Investing in an economically viable manner in projects attuned to real public requirements*); (ii) Environmental sustainability (*Being mindful of connectivity’s present and future environmental impact even when they are catering to developmental needs*); (iii) Financial sustainability (*Avoiding debt traps and building long-term financial planning into infrastructure projects to ensure enough funds for skills development as well as repair and maintenance work*); (iv) Reciprocal connectivity (*Ensuring a level-playing field among countries as well as compliance with global norms on government procurement and state aid*); and (v) Social sustainability (*Focusing on projects contributing to institutional quality and compliance with labour and transparency norms*) (Okano-Heijmans and Sundar, 2018). Convergence of views between India and the EU on these aspects of connectivity was reflected in their 2017 bilateral summit Joint Statement, according to which ‘connectivity initiatives must be based on universally recognised international norms, good governance, rule-of-law, openness, transparency and equality and must follow principles of financial responsibility, accountable-debt financing practices, balanced ecological and environmental protection, preservation standards and social sustainability’ (EU, 2017).

The swift pace of technological changes is constantly challenging most aspects of connectivity as well as their governance, making it imperative for policy makers to step out of a silo approach of connectivity governance. It has now become essential to adopt a *comprehensive model of governance for the entire connectivity ecosystem*. In this regard, the *principle of an integrated multimodal approach* that incorporates ‘holistic mobility planning’ (relating to ‘efficient movement of people and goods’) can ensure better delivery of various public goods services and maximise benefits from the same (Govt. of UK, 2019).

India has adopted such a holistic approach to connectivity through initiatives such as ‘One Nation - One Power Grid, One Gas Grid, One Water Grid, One Mobility Card, One Optical Fibre Network’ in pursuit of double-digit growth in infrastructure and a good return on investment in a human-centric, sustainable and inclusive manner (Govt. of India, 2019a). Similarly, on the part of the EU, the Connecting Europe Facility (CEF) is the integrated flagship financing initiative to help in developing trans-European connectivity networks in energy, transport and telecommunications. Investments in these sectors are made with an aim to boost social and economic integration across the EU. Issues including regional imbalances, accessibility problems and differences in standards and regulations are being addressed to ensure that growth is inclusive and sustainable. Attention is being given to efforts to reduce greenhouse gas emissions and to make the EU a circular economy. The CEF is also used to implement the Trans-European Network for Transport (TEN-T), Trans-European Networks for Energy (TEN-E) and Digital Single Market (DSM) Strategy, with a focus on sustainability, safety and interoperability across borders (EU, 2019b).

As India and the EU get into the implementation phase of the agreement, both the sides will have to, therefore, combine their physical infrastructure development collaboration efforts with social sector priorities. Efforts to achieve social development objectives should essentially dovetail physical multi-

modal infrastructure building. This approach assumes importance especially in the backdrop of the different levels of development seen in India and in Europe on account of factors including some areas being landlocked as well as in dire need of greater connectivity linkages with seaports and airports for attaining higher growth rates.

Initiatives

The flagship infrastructure initiatives in India include 'Sagarmala Programme' (port-led development to bring down logistics cost for local and foreign trade), 'Bharatmala Pariyojana' (road development), 'Ude Desh Ka Aam Nagrik (UDAN)-Regional Connectivity Scheme (RCS)' (affordable air travel through better regional air connectivity), 'Ujjwal Discom Assurance Yojana (UDAY)' (helping in the operational and financial turnaround of Power Distribution Companies) (Govt. of India, 2019b). Other physical connectivity initiatives include various Industrial Corridors and Dedicated Freight Corridors, Pradhan Mantri Gram Sadak Yojana (quality all-weather road connectivity to uncollected habitations to help alleviate poverty) and Jal Marg Vikas Project (inland waterways) (Govt of India, 2019c). The government's Smart City Mission, which aims to develop institutional, physical, social and economic infrastructure, also gives focus to connectivity including 'efficient urban mobility and public transport, robust IT connectivity and digitalisation, sustainable environment and assured electricity supply' (Govt. of India, 2015).

Other connectivity initiatives in the planning or implementation stages include the National Information Infrastructure (NII) (for high-speed connectivity for government departments till the village level through the integration of networks and cloud infrastructure). The Bharat Net programme, part of the NII, aims to 'deliver all government services at the state, district, and village level digitally by 2022-23 and eliminate the digital divide' (Govt. of India, 2018a). On the digital connectivity front, to take forward its *Digital India* initiative,

the government has invited proposals for 5G technology field trials (Govt of India, 2019d). The cumulative economic impact of 5G in India is estimated to touch USD 1 trillion by 2035. The plan now is to go in for an early roll out of 5G, set up world class research and development facilities, ensure globally competitive domestic manufacturing capacity in all the related areas and participate in international standards activities (Govt. of India, 2018b). The Task Force on the National Infrastructure Pipeline (of infrastructure projects that can be taken up from 2020 to 2025), in its report, estimated that India will need to spend USD 4.5 trillion by 2030 on infrastructure for sustaining its growth rate (see Figure 1.1 for sector-wise break-up). The report estimates around USD 1.43 trillion as the overall project capital expenditure in infrastructure sectors in the country during the fiscals 2020 to 2025 (Govt. of India, 2019e).

On its part, the EU's Connecting Europe Facility (CEF) encourages Public Private Partnerships in the TEN-T initiative. Moreover, participation of a third country (*'any neighbouring country or any other country with which the Union may cooperate to achieve the objectives pursued by the EU Regulations'*) in infrastructure and connectivity programmes is envisaged and encouraged by the EU regulations (EU, 2013a and b).

Opportunities for Cooperation

India-EU connectivity-related discussions have looked at opportunities in a wide range of areas. Several connectivity-related sectors are among the focus sectors of the *Make In India* initiative, and quite a few European companies, who are global majors in those sectors, have their presence in India (see Table 1.1).

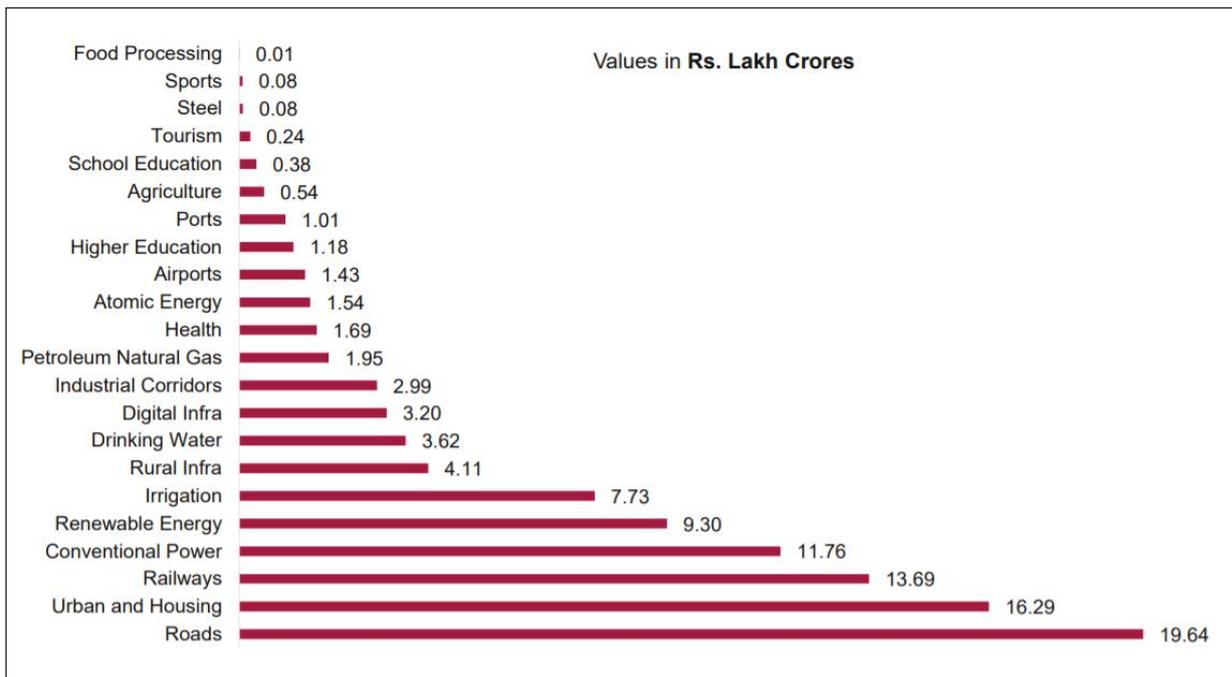
A number of European companies have invested in connectivity-related sectors in India (see Table 1.2). Among the EU member countries, France and Germany have considerable presence in India. Taking note of existing deep cooperation with these two countries, at the government level, there are *dedicated country desks for France and Germany* to facilitate

investments and help in solving problems. The areas of Indo-French cooperation include ‘climate change and environment’, railways, smart cities, renewable energy, R&D, and tourism. Germany has numerous collaborations and joint ventures with India as well as investments in areas including automobiles, transportation and construction activity. There are also India-Germany Joint Working Groups in automobiles, skill development as well as water and waste management, in addition to the *Make In India Mittelstand* programme to boost the presence of German MSMEs in India’s manufacturing sector³. Indo-German cooperation has expanded to new areas such as Artificial Intelligence (AI) and Internet of Things (IoT). Both sides are also planning closer cooperation in digitalisation, start-ups, cyber-security, space, Green Energy Corridors, education and skill development as well as high-speed and semi high-speed rail projects. Green Urban Mobility (including greater use of electric vehicles) is another priority area in India for Germany (Govt. of India, 2019f). To strengthen ties with India, the French

government too has prioritised cooperation in areas such as AI, space, cyber-security and education (Govt. of India, 2019g).

In *digital connectivity*, similarities in the regulatory approaches in 5G can help India and the EU in making collaborative efforts. Some suggestions for such efforts include: (i) 5G projects in India’s rural areas on the lines of the EU-Brazil 5G Range project for accessing 5G network in Brazil’s remote areas; (ii) collaboration between the 5G trial initiatives of India and the EU; (iii) tie-ups for harmonisation of 5G standards in India and the EU; and (iv) using India’s End-to-End 5G Test Beds initiative (to promote research and innovation on 5G) to organise events on interoperability and hackathons (TSDSI, 2019). What can help in this regard is the EU-funded ‘India-EU Cooperation on ICT-Related Standardisation, Policy and Legislation’ (2015-2020). It aims to bring about greater interoperability and ease of doing business for firms (by avoiding delays due to various factors including differences in certification, testing and labelling requirements), thereby boosting India-EU trade as well as

Figure 1.1: India’s National Infrastructure Pipeline 2020-2025: Sector-wise break-up



Source: Govt. of India, 2019e.

Table 1.1: European presence in ‘Make in India’ focus sectors related to connectivity²

‘Make in India’ Sector Related to Connectivity	European presence
Automobile	BMW, Mercedes, Volkswagen, Daimler and Borgward Automotive (all five from Germany), Volvo (Sweden), Piaggio (Italy) and Renault (France).
Automobile components	ZF, FAG and WABCO (all three from Germany), Magneti Marelli (Italy) and Valeo (France)
Aviation	Airbus (France), Rolls Royce (UK), Frankfurt Airport Services Worldwide (Germany) and Fairfax (London)
Construction	Aqualyng (Norway), Alstom (France), and GIZ (Germany)
Electronic systems	Bosch, Continental, ‘Giesecke and Deverient’ (all three from Germany), Magneti Marelli (Italy) and Philips (Netherlands)
IT and BPM	Accenture (Ireland), Capgemini, Atos and Steria (all three from France), SAP (Germany) and Philips (Netherlands)
Oil and gas	British Petroleum, Cairn Energy and Shell (all from UK)
Ports and shipping	AP Moller Maersk (Denmark)
Railways	Alstom Transport Holdings B.V. (Netherlands) and Inversiones EN Concesiones (Spain)
Renewable energy	Enercon (Germany) Vestas and Nordex (Denmark), Enel (Italy) and Gamesa (Spain)
Roads and highways	Hindustan Construction Company Ltd-Laing Sadbhav Consortium (UK)
Space	Official cooperative arrangements with space agencies of European countries / bodies including Bulgaria, France, Germany, Hungary, Italy, Norway, Spain, Sweden and the UK as well as with European Centre for Medium-Range Weather Forecasts (ECMWF), European Organisation for Exploitation of Meteorological Satellites (EUMETSAT) and European Space Agency (ESA)
Thermal power	GDF SUEZ (France)
Tourism and hospitality	Accor (France), Thomas Cook, Premier Travel Inn and Cox & Kings (all three from UK)

Source: Govt. of India website on the ‘Make in India’ initiative.

the Make In India initiative to strengthen manufacturing of telecommunication and electronics items in India (website of the India-EU ICT Standardisation Collaboration initiative).

India and the EU - which have existing official mechanisms such as the *EU-India Joint Working Group on ICTs* and the *EU-India Co-operation Dialogue on Digital Communications* - are also looking at cooperating in areas such as Internet of Things/Machine-to-Machine

technology, network security as well as testing and certification (EU web link on ‘international cooperation on 5G’). Expeditionary 5G deployment in India can help develop innovations in various fields including rural development, agriculture, education, health and manufacturing (Govt. of India, 2018b). The EU has pitched for closer cooperation with India in AI, 5G, IoT and Big Data on the basis of “fair competition based on global standards”, and with an emphasis on free data flow and ‘protection of fundamental freedoms in cyberspace’ (Fontelles, 2020). The Joint Statement during the 2017 India-EU Summit had called for stronger links between the *Digital India* and *Digital Single Market for Europe* initiatives as well as measures to boost the Indian and European start-up ecosystems through a Start-up Europe India Network (EU, 2017).

The *airport* development sector in India has attracted European interest with Switzerland’s Flughafen Zürich AG winning the concession to build and manage a new airport in Jewar, Uttar Pradesh (Zurich Airport, 2019). Another area with potential is the aviation Maintenance, Repair and Overhaul (MRO) segment. There is European interest in the sector in India with companies such as Thales International, Sabena technics of TAT Group and Airbus (all from France) making inroads (GIDB web link on aviation MRO).

India’s ports sector is getting the attention of European players. These include the Denmark-headquartered Maersk that has helped in the development of JNPT (Mumbai) and Pipavav port (IBEF, 2019). What could help bring more investments from European players into India’s ports sector is a plan to focus on a wide range of value-added services for clients at ports, following the example of the Port of Rotterdam that implemented such a strategy and successfully attracted many European Logistics Centres. There is also a need to improve efficiency and bring down logistics costs in India by focusing on methods such as increasing capacity of railways (KPMG, 2008).

Cruise tourism is a segment with ample potential for tie-ups with Europe. India had eased cabotage curbs for ten years to facilitate cruise ships from overseas, including from Europe, to run domestic cruises. An added incentive is the decision to make tariffs of Indian ports comparable to that of ports in Europe (Govt. of India, 2018c). In the area of *container trade*, Shipping Corporation of India has an Indian Sub-continent Europe Service covering Felixtowe, Hamburg and Antwerp ports in Europe (Govt. of India, 2011). The ports sector has witnessed partnerships between Indian and European ports (Port of Antwerp, 2017; Port of Antwerp website; JOC, 2015; Adani Ports, 2017). Indian port sector can consider tie-ups with European ports stakeholders on use of the latest technologies in the ports and logistics. For instance, the Hamburg Port Authority that has taken major initiatives on IoT through collaborations with companies and has developed a *smartPort Logistics* technology platform to improve maintenance (Deloitte and ASSOCHAM, 2018).

There is European interest in India’s roads sector as well as seen by the presence of ROADIS, the largest European highway concession manager in India (website of ROADIS). India’s National Investment and Infrastructure Fund and ROADIS have set up a platform to invest in road projects in India (NIIF, 2019). Such partnerships and investor interest from Europe could be encouraged to give a boost to the Indian roads sector, which is the second largest in the world (Invest India web link on roads and highways).

In railways, the EU has been looking for a long-term engagement with India with a focus on “digitization, green transport, EU-Asia rail links and shared innovations.” India too has expressed interest in partnering with Europe for investments that can take forward the *Make In India* initiative for manufacturing as well as in developing new technologies “without tied conditions.” India also wants European investments in railways that can lead to employment opportunities for Indians.

Table 1.2: Some major investments by European Firms in India's Connectivity Sectors

Indian Company	Country	Foreign Collaborator	Item of Manufacture	FDI (\$million) 2000-2019
Siemens	Germany	Siemens Aktiengesellschaft	Electrical and electronic engineering	1,146.04
Optum Global Solutions (India) Private L	Netherlands	Optum Global Solutions International BV	Other data processing, hosting and related activities	430.24
Cisco Systems India	Netherlands	Cisco Systems Management BV	Other information technology and computer service activities	425.59
Daimler India Commercial Vehicles	Germany	Daimler AG	Manufacture of motor vehicles for transport of goods, manufacture of special purpose heavy motors	377.38 152.24
Serco BPO	Luxembourg	Serco International S.A.R.L	Data processing, software development and computer consultancy services	309.01
Serco BPO	Luxembourg	Serco International S.A.R.L	Activities of call centres	294.85
Daimler India Commercial Vehicles	Germany	Daimler AG	Manufacture of commercial vehicles such as vans, lorries, over-the-road tractors for semitrailers	272.14 236.80 174.56 118.26
Meenakshi Energy	Netherlands	Engie Global Developments B.V	Electric power generation by coal based thermal power plants	269.83
Nissan Motor India	Netherlands	Nissan International Holding BV	Manufacture of motor cars and other motor vehicles	230.98
Digital Global Soft	Netherlands	Hewlett Packard Leiden B.V	Computer software	206.64
Renew Power Ventures	Netherlands	Jera Power RN B.V	Electric power generation using other non-conventional sources	200.39
Man Force Trucks	Germany	Man Truck and Bus AG	Manufacturing of heavy commercial vehicles	186.84
Vai Metals Technologies	Germany	Siemens Vai Metals Technologies GmbH	Other specialized construction activities	165.77
Mahindra & Mahindra	Cyprus	Golboot	Motor cars and other motor vehicles	153.86 142.86
Karanja Terminal and Logistics	Cyprus	Karanja Terminal and Logistics Cyprus Ltd.	Cargo handling incidental to land transport	102.46

Source: Compilation from Govt. of India, 2019h - only investments of over USD 100 million.

Indian Railways, facing capacity constraints, has held talks with the EU divisions on mobility and transport as well as standardization. The issues of bilateral discussions included “railway reforms and regulations, railway safety and technology (signalling), procurement and standardization as well as digitization and innovation” (Govt. of India, 2019i).

India was one of the target countries for the EU’s *Promoting European Rail Excellence outside EU* or *PERES Partnership* to develop rail value chains, promote small and medium enterprises as well as for a joint internationalisation strategy and implementation roadmap (Eurail Clusters website). There are several European companies participating in or eyeing the Indian railways sector (Bombardier Transportation website; Alstom website, IBEF web link on Siemens; RailNews, 2019; Swissinfo, 2019; Nandan Sharma, 2019; Govt. of India, 2019j; Roche, 2013; Govt. of India, 2019k).

The *Smart City Mission* has attracted interest from several European nations. The EU, through the Agence Française de Développement (AfD), is supporting the *Mobilise Your City (MYC)* programme in India to bring down their urban transport-related Green House Gas emissions and contribute to a sustainable transport policy (Govt. of India, 2018d).

Another crucial factor that encourages EU players to participate in the Indian connectivity space is that in almost all connectivity-related sectors, 100 per cent Foreign Direct Investment (FDI) through the automatic route (without the need for government approval) is permitted in India (Govt. of India, 2017; Invest India website).

Indian companies are also interested in accessing connectivity-related sectors in EU. For instance, many Indian airlines are keen to expand their operations including to Europe, and would therefore be eyeing more landing slots and code-sharing arrangements (PTI, 2019; Bailey, 2019; Mufti, 2019). The recent acquisition of the Norway-headquartered REC Solar by the India-based Reliance New Energy Solar indicated India’s interest in the

renewable energy segment in Europe (Mint, 2021). The number of EU companies controlled by investors from India had risen significantly from 2,000 in 2007 to 12,000 in 2017. The sectors where Indian investors had the highest concentration of greenfield investments by number during the 2013-2017 period in the EU included *computer programming, scientific research and development, financial services, wholesale trade, motor vehicles manufacturing and manufacturing of basic pharmaceuticals*. In terms of value of greenfield investments, the sectors of interest in the EU to Indian investors during 2013-2017 were motor vehicles manufacturing, rubber and plastic manufacturing *scientific research and development, financial services, basic pharmaceuticals manufacturing and computer programming* (EU, 2019c). This, however, shows India is yet to make a mark in the EU’s connectivity segments.

Way Forward

India and the EU—being democracies with time-honoured ties, and having agreed on the basic connectivity principles—can take forward their shared approach to connectivity by effectively implementing the Connectivity Partnership for their mutual benefit as well as to assist developmental efforts across the world in a sustainable manner. What can help in this regard is the foundation laid by their existing connectivity-related initiatives. Nevertheless, given India’s *infrastructure deficit* (Dangra, 2016) and poor connectivity with its South Asian neighbouring countries (Kathuria, Ed., 2018), the current priority for India should be to improve connectivity facilities within the country and in the neighbouring region. The EU could help in this regard with its technological might and financial resources including that of its pension funds, without tied conditions.

Steps could be taken to ensure greater investments from the EU into the *Make In India* initiative through more partnerships on the lines of the *Make In India Mittelstand* programme. Twinning programmes for sea ports and airports could be initiated through sister port/airport agreements with the best

ports in Europe. In the aviation sector, the existing India-EU horizontal agreement could be upgraded to a comprehensive agreement in a win-win manner to cover aspects related to regulatory cooperation, aviation security and safety, air traffic management modernisation and environment.

Existing mechanisms such as the India-EU Clean Energy and Climate Partnership and the EU's partnership with the India-led International Solar Alliance could be strengthened to ensure greater European investments and technology into India to boost renewable energy sector and energy efficient construction. In urban development, more smart cities could be included under the EU-AFD Smart City project with a focus on areas including urban e-governance and sustainable mobility. What could also help would be expansion of initiatives to boost sustainable urban development through city-to-city pairing and cooperation between Indian and European cities, as well as initiatives such as Green Energy Corridors, Green Urban Mobility and Mobilise Your City.

There is also a need to look into measures that encourage greater participation of Indian companies in EU's connectivity sectors. Besides, various agreements that India has with individual European nations on connectivity-related issues should be analysed to find out synergies that can be incorporated into a comprehensive India-EU connectivity partnership action plan. As a first step, a dedicated connectivity desk could be set up at the India-EU level and at the bilateral level with each EU member country to resolve issues. Lastly, it is important to carry out an impact evaluation of existing India-EU connectivity-related initiatives in order to determine whether to strengthen or reframe them to ensure optimal outcomes.

Endnotes

1. This is an abridged (and updated) version of the discussion paper RIS-DP # 250 published by the RIS in July, 2020.
2. The UK has left the EU.
3. Invest India website

2

India-EU Partnership in Trade and Investment



Macroeconomic Dynamics in the Partner Economies

India and the EU are natural partners, having a long historical legacy along with strong economic linkages (Sachdeva 2019). During the last two decades, the world economy passed through multiple phases of boom and bust because of the global business cycles. Despite the considerable level of economic fluctuations, both economies stand out to be resilient in withstanding the fury of the prolonged global recession. However, both the regions were perturbed to some extent with the advent of the second episode of recession. Both the partners posted robust macroeconomic performances during the past two decades, but India's performances were undeniably noticeable as a fast-growing emerging economy.

Indian economy was close to \$3 trillion in 2019 but declined swiftly to \$2.7 trillion in real terms due to an unprecedented pandemic in 2020. The phase of the pandemic was construed as a temporary state and the global economy could overcome the difficult period soon. It is reckoned that the GDP of India is to reach \$5 trillion in dollar terms in 2024/25 (PIB 2020). Though the second episode of the global recession was shocking to the world economy, where most of the countries were confronted with irreversible economic disaster owing to a

sharp decline in real GDP growth rate, it was, indeed, a boon for India to maintain higher CAGR of 7.4 per cent during the second phase of recession (2013-18) over the first phase of the recession of 6.8 per cent during 2008-12. High growth performance was propelled by the domestic resource management policies, having high savings and investment ratios over a long period. In the second phase of the recession, especially during 2013-18, real GDP per capita grew in the range of 5.1-7.1 per cent per annum which was unprecedented in the recession-ridden world economy.

The labour force of India reached 494.7 million and the demographic dividend in the form of personal receipt of remittances reached \$83.3 billion as in 2019. The inflow of remittances was 2.9 per cent of GDP in 2019 which increased further to 3.2 per cent of GDP in 2020. Along with remittances, trend of FDI inflow was sturdy in India, contributing to output in the range of 1.5-2 per cent of GDP during the second episode of recession. Both factors were responsible for maintaining a high investment ratio, close to one-third of GDP in recent years.

Trade has been the growth driver of the country since reforms in India (Ahluwalia 2002). This was amply reflected by its openness when it reached 55.8 per cent in 2012 but

declined gradually to 36.5 per cent in 2020 with the continuation of recession for the 14th year in succession. India has a comfortable balance of payment situation despite the intermittent appearance of exogenous shocks from time to time. It was having a positive current account surplus in 2020. FOREX reserve situation of the country was exceptionally sound when it touched the level of \$600 billion mark and was placed within a comfortable limit to manage its external payments for over a period of more than a year. This situation insulates the domestic economy from any possible payment crisis in the near future and is well placed for undertaking deeper bilateral cooperation. Some of the sectors for cooperation are trade, industry, energy, services, telecommunication, science & technology, agricultural development, human resource development, among others (Jain 2020).

The EU is the largest regional economy in the world. Its GDP reached the level of \$16.6 trillion in 2019 but eroded by over a trillion-dollar in constant prices due to COVID-19 in 2020 (OECD 2021). With the onset of the global recession in 2008, the growth rate of the region declined into the red zone in 2009 but revived quickly in 2010. The 'Euro Zone' crisis in 2012 compelled the region to undergo a phase of recession in the year but recovered smartly in 2014 and the process of recovery continued until 2017. With the continuation of the recession, there was a contraction of the global economy and the growth rate of real GDP of the EU slowed down and was below 2 per cent till 2019 (IMF 2021). The resurgence of COVID-19 brought down GDP growth rate unexpectedly again to -6.3 per cent in 2020 which was unprecedented in the annals of the economic history of the EU. At present, sharp recovery is underway in several of the EU member countries. As compared to the size of the economy, the size of the population is low with a very high dependency ratio of over 55 per cent.

As an attractive FDI destination, the FDI ratio to GDP was as high as 5.3 per cent in 2016

but started declining in the subsequent years in the EU. The saving ratio of the region stood at a quarter of the region's GDP and the investment ratio was persistently laying below the savings ratio. The region continued to receive and to pay large remittances and therefore, the net inflow of remittances was at the margin. Trade continued to be the driver of growth for the regional economies and trade openness of the region was above 90 per cent before the onslaught of the COVID-19 in 2020. Despite the trade surplus generated by several member countries, overall Forex reserve situation of the region was low which could sustain for over 3 to 4 months. Moreover, both India and the EU are strongly engaged in trade in services. The macroeconomic dynamics of both the partners suggest that further economic engagement between them could be beneficial for their mutual gains.

Dynamics of the Trade Sector

The trade sector became the lifeline for both India and member countries of the EU. India pursued the Export-led Growth (ELG) strategy since its country-wide reforms in 1991, enabled the country to integrate with the world economy (Mohanty 2016). Perhaps the global recession in 2008 was a major watershed in holding back the rapid growth process of India and the world economy. India adopted a trade-switching strategy from ELG to Domestic Demand-Led Growth (DDLG) in the post-recession period (Mohanty 2012). The new experiment with the trade-switching policy enabled India to remain on a high growth trajectory which was less sensitive to changes in the global trade regime. The EU persistently maintained an export-led strategy with trivial changes in the trade policy from time to time during the period of recession. At the beginning of the global buoyancy in 2002, the total trade of the region was \$4.5 trillion and more than doubled in 2007. The rising spree of the region continued to push the regional trade to over \$10 trillion in 2008 even though the commencement of the global recession was already beginning in the

same year. The regional trade passed through a phase of a considerable level of fluctuations during 2009-17, and the total trade continued to remain at \$10 trillion in 2017. However, the region's all-time high trade was reported at \$11.0 trillion in 2018. However, its overall trade started sliding in the succeeding years to settle below \$10 trillion in 2020.

Like other parts of the world, it was a great setback for India in the trade sector and both exports and imports went down to their minimum levels in recent years, while India's exports recorded at \$276 billion, imports touched the level of \$368 billion in 2020. Despite retrogression of trade in the pandemic year, only six EU countries registered higher trade than that of India such as Germany, France, Italy, Netherlands, Belgium, and Spain. It may be noted that trade of the EU bloomed by leaps and bounds during the period of global buoyancy. The EU trade registered a growth rate of 4.9 per cent with the world economy where exports and imports expanded at the rate of 14.3 per cent and 15.4 per cent, respectively, during 2003-07. An unforeseeable climate started hovering around the global economy in 2008 and the shadow of the global recession was reeling over both economies for nearly 1½ decades until 2021. During the period 2008-20, overall trade of the EU decelerated at the rate of -0.8 per cent and exports as well as imports growth declined by -0.5 per cent and -1.0 per cent, respectively. The decline started in the European region due to loss of competitiveness in 2019 (IMF 2019).

India's trade with the world expanded rapidly since the unfolding of the new trade regime of the global buoyancy. The external sector registered a six-fold rise during 2002-20, though the incremental increase in trade was marginal during the entire period of recession. In the second phase of recession, the fury of expanding phase of overall trade deficit with the world started decelerating significantly in volume terms compared to the first phase of recession. India's experience in global trade was somewhat different from that of the EU during the last two decades. During the period of

buoyancy (2003-07), India's overall trade with the world grew at the CAGR of 30.2 per cent where the export sector expanded at the rate of 25.2 per cent and the import sector by 33.5 per cent. The pace of the growth in trade sector declined by almost one-third, but both exports and imports grew at double-digit rates and the overall trade sector rose at the rate of 11.1 per cent, demonstrating the resilience of the Indian trade sector during the first episode of recession (2008-13). Unlike the EU, CAGR of both exports and imports of India moved southward where exports declined by -1.9 per cent and imports by 3.4 per cent with the world during 2013-20. However, overall growth performance of trade sector during the entire period of recession was buoyant where exports and imports grew by 2.9 per cent and 1.1 per cent, respectively, during 2008-20.

Bilateral trade between India-EU posted a four-fold rise during the period of buoyancy (2002-07), and a five-fold rise during 2002-08 as shown in Figure 2.1. Unfortunately, the bilateral trade did not make any headway during the entire period of recession and reached somewhere close to the 2011 level of \$94.37 billion. Bilateral trade continued to be adverse during the period 2012-15 and was turning out to be favourable since 2016. In the second phase of recession, bilateral trade was volatile and total bilateral trade was almost similar to the level of trade as in 2008. The trajectory of bilateral trade is reflected in their growth performances.

Bilateral exports and imports swelled by 24.2 per cent and 28.9 per cent respectively and allowed overall trade to multiply at the rate of 26.6 per cent during the buoyancy period. In the initial phase of the recession, the rapidity of trade growth rates declined significantly but the growth rates were positive and remained in the single digit. The situation declined significantly in the latter phase of the recession where growth performances of bilateral exports and imports were turning into the red zone, and imports declined much sharper than exports. However, India's overall bilateral trade and exports with the EU were positive during 2008-20.

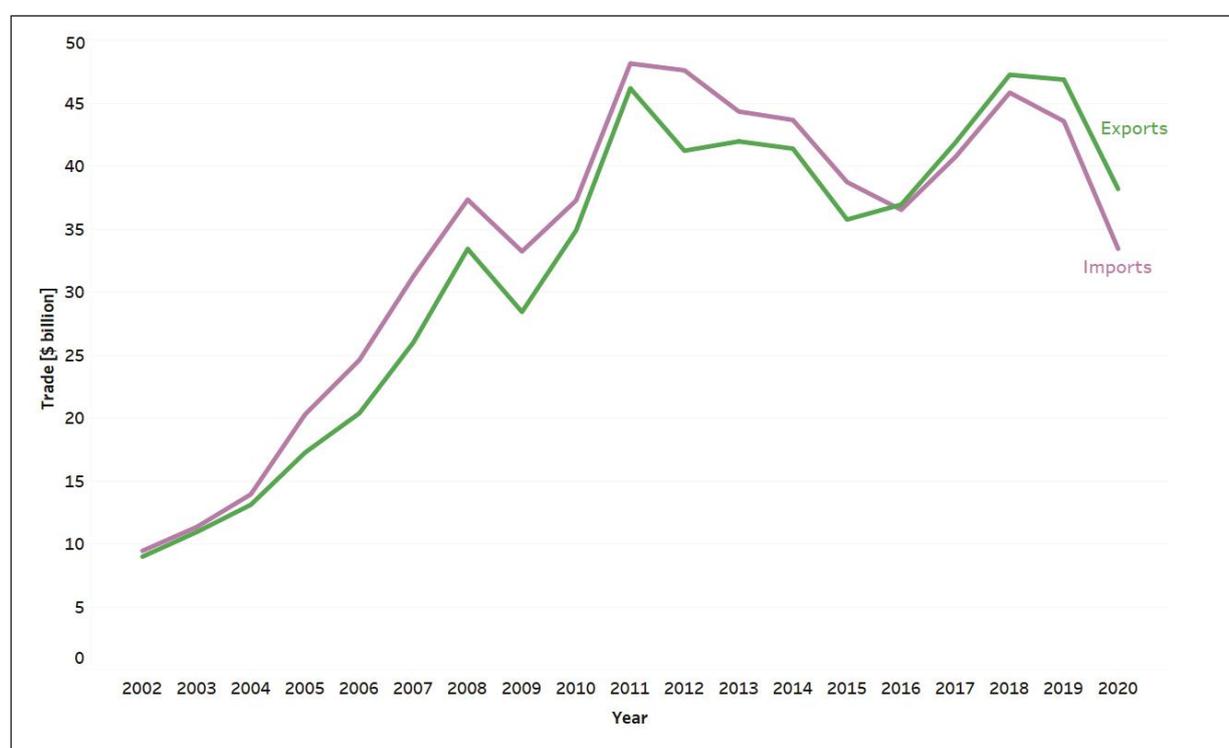
In the 27-member regional grouping, India's total trade was not only below its potential with the EU but also slowed down significantly. In 2020, only 6 countries including Germany, Belgium, Netherlands, Italy, France, and Spain, shared over 80 per cent of India's bilateral trade with the region as presented in Figure 2.2. Trade balance with these countries was mixed in 2020 where India registered a trade deficit with countries like Germany and Belgium, and a trade surplus with France, Netherlands, Spain, and Italy. With many East European EU member countries such as Croatia, Czech Republic, Bulgaria, Hungary, Poland, Slovakia and Slovenia, bilateral trade had just picked up and similar was the situation with the EU member countries from the erstwhile states of the USSR including Belarus, Estonia, Latvia, and Lithuania. Considering the existing pattern of trade between India and the EU countries, both sides have huge trade potential to be tapped (European Parliament 2020). The present level of trade has been spearheaded by the private sector initiative and the business agenda by the

official process is yet to be seen in a formal way. The B2B initiatives supported by the G2G drive may help in moving towards the desired goal of achieving optimal trade through harnessing existing synergies between the two partners.

Structural Changes in the Bilateral Sectoral Trade

The trade pattern of the EU with the world presents a very interesting insight. Global experiences reveal that intermediate goods are traded significantly among various regional groupings across the globe (OECD 2011). The trade of the region is mostly driven by intermediate and final consumer goods, and both the segments of trade are different in their sizes. While in the export sector, the broad segment of final goods had an edge over intermediate products, reverse was a case in the import sector in the past several years. Asian experience is not different from that of EU (WTO and IDE-JETRO 2011). Another feature of the region's trade with the world was the

Figure 2.1: India's Bilateral Trade in Goods with the EU (in \$ billion)



Source: Estimation based on Direction of Trade Statistics (DoTS), IMF, 2021.

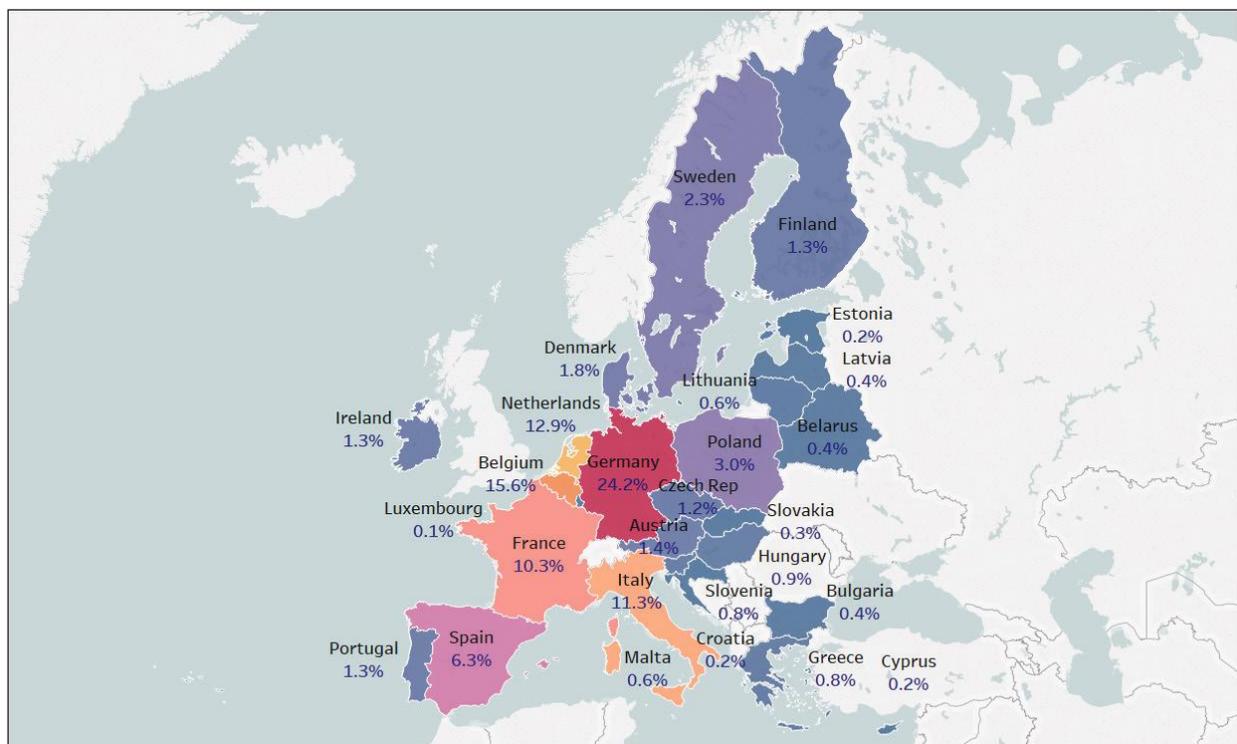
negligible export of primary goods to the rest of the world, but primary imports from the world were significant for the region. Because of significant imports of primary goods, there were lesser imports of final and intermediate goods in relative terms for the region. As a fall out of the significant primary goods imports, reduction of relative imports was much sharper in final goods imports compared to intermediate goods.

In 2020, total trade in intermediate goods was \$3.52 trillion, sharing 37 per cent of the region’s trade with the world whereas final goods constituted 38.2 per cent of the total trade worth \$3.6 trillion in the same year. Rae and Sollie (2007) also shared similar views with regard to intermediate and semi-finished products trade by the EU. Because of the pandemic, trade in all segments declined in 2020 compared to the past year. During the global buoyancy, trade in all segments boomed and recession in 2008 brought down trade in all segments. After the ‘Euro Zone crisis’ recovery

began in the EU, trade grew in all segments, but stagnation continued in the primary sector until 2013, and declined regularly until 2020. In the intermediate goods sector, trade in semi-processed sector was higher than that of the parts and components (P&C) sector in 2003, and the gap widened over the past two decades. In 2020, P&C trade was \$1.46 trillion whereas semi-processed trade was at \$2.7 trillion. In the final goods sector, trade in consumer goods was much larger than that of capital goods. As the severity of the pandemic has started falling in 2021, and the recovery process has commenced in most of the sectors.

Intermediate exports of the EU to the world were \$2.17 trillion in 2020 where the share of P&C was 757 billion and semi-processed sector was \$1.41 trillion. While exports in the semi-processed sector recovered in 2020 after a steady downturn in its share in the total exports due to pandemic situation, the share in P&C in exports did not recover. In the final goods exports, consumer goods sector continued to maintain

**Figure 2.2: India’s Bilateral Trade in Goods with the EU countries, 2020
(% in total trade with EU)**



Source: Estimation based on Direction of Trade Statistics (DoTS), IMF, 2021.

its edge over capital goods sector. In 2020, total exports of consumer goods were \$1.59 trillion compared to \$868.1 billion in capital goods segment. It may be noted that high export growth during buoyancy (2003-07) was mostly induced by two sectors, particularly semi-processed sector which grew at the rate of 16.1 per cent and primary sector by 18.4 per cent. At the initial phase of recession, growth rates of all end-use segments went red except agricultural sector. In the latter phase of recession (2013-20), most of the sectors registered a negative growth rate except consumer final goods. So far as region's imports from the world is concerned, it is similar to that of the export sector. Imports of intermediate sector was \$2.0 trillion where P&C covered \$699.7 billion and semi-processed sector \$1.3 trillion in 2020.

Among four major segments of intermediate and final goods sectors, final consumer goods and semi-processed goods were maintaining a similar level of imports whereas P&C and final capital goods imports were running almost at the same level over the years. Double-digit import growth of the EU during the global buoyancy (2003-07) was mostly on account of semi-processed and primary sectors. Eckhardt and Poletti (2016) observed that several companies from the EU are import dependent of intermediate components which are supplied by several emerging Asian countries, including India. During the first phase of recession (2008-13), primary sector imports posted a positive CAGR against all odds. The second phase of the global recession witnessed positive CAGR in certain import sectors such as P&C, final consumer, and capital goods. Therefore, in the whole of the recessionary phase, the most adversely affected EU import sectors were primary, semi-processed and P&C segments with the world economy.

India-EU Trade in Intermediate and other Sectors

India's bilateral trade with the EU declined significantly from \$87.1 billion in 2019 to \$69.9 billion in 2020 owing to the pandemic situation. Bilateral trade registered a 4½-fold rise between

2003 and 2019, though not many changes were noticed during 2002-19. However, a major leap in bilateral trade was noticed in P&C with a 7-fold increase, final capital goods by 5¹/₃ times and semi-processed goods by 4³/₄ times during 2003-19 as shown in Figure 2.3. In the intermediate sector, semi-processed trade was \$26.1 billion and P&C trade was \$11.8 billion in 2020. In the final goods sector, consumer goods dominated with \$13.3 billion bilateral trade and \$9.8 billion in final capital goods in the same year. In total trade, intermediate trade dominated over final goods trade, and divergence of trade share between these two sectors widened during the last two decades.

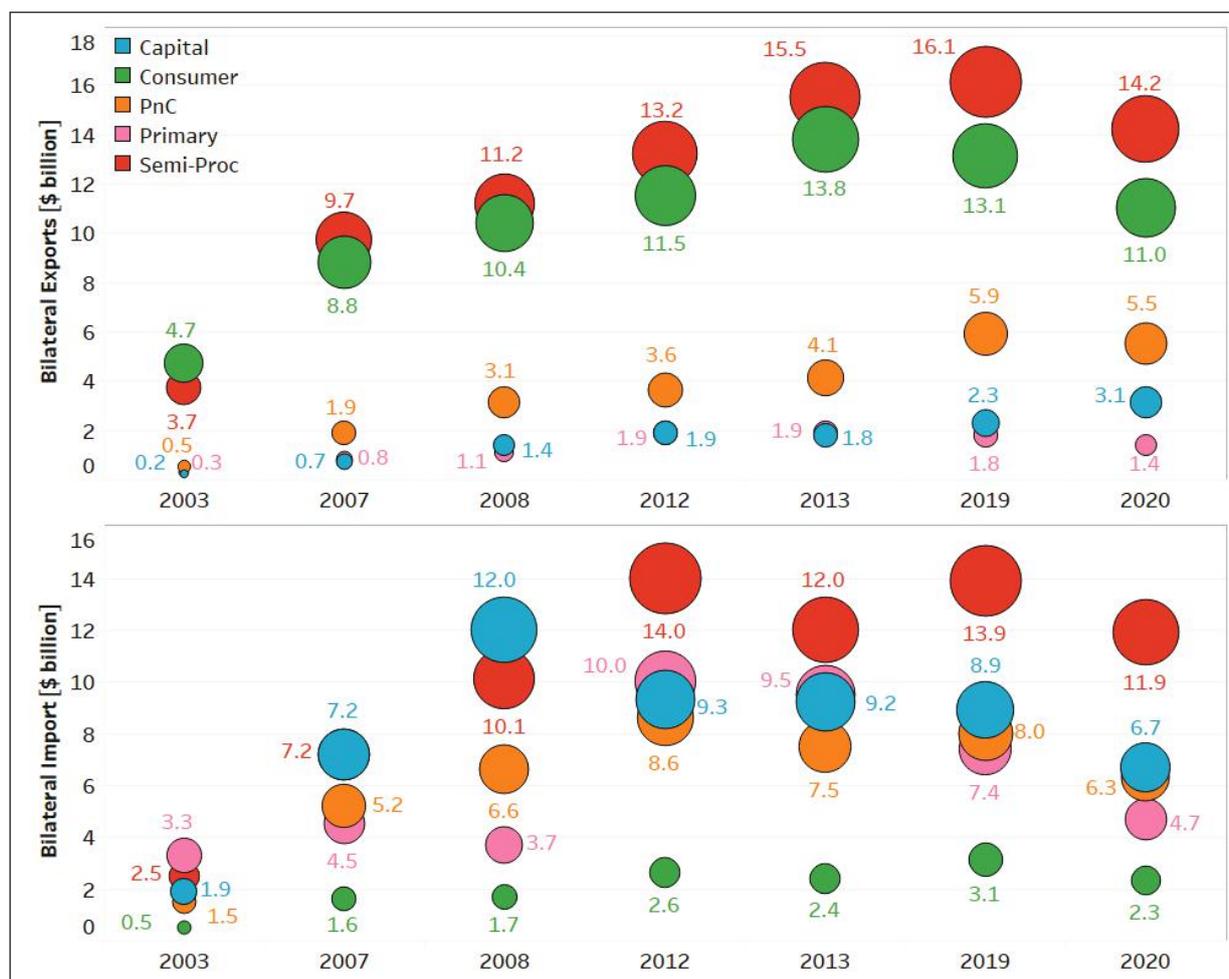
Between 2003 and 2020, the share of intermediate trade in the total trade increased from 41.8 per cent to 52.2 per cent and for final goods declined from 37.2 per cent to 33.0 per cent. In the intermediate trade segment, semi-processed segment overshadowed the P&C sector in terms of their market share. In the export sector, intermediate sector became strong vis-a-vis final goods and primary sectors. In India's total intermediate exports of \$19.7 billion in 2020, the contribution of the P&C sector was \$5.5 billion. Similarly, India's bilateral exports in the final goods sector were \$14.1 billion where consumer goods shared \$11 billion and capital goods \$3.1 billion.

Though small in the size of export proceeds, the share of P&C in the bilateral export leapfrogged from 5.1 per cent in 2003 to 14.5 per cent in 2020 whereas the share of semi-processed products remained around 37 per cent during the same period. During the period of buoyancy (2003-07), India's bilateral exports grew by 24.8 per cent which was propelled by exports in P&C with 39.6 per cent, followed by capital goods with 36.8 per cent, semi-processed with 27.2 per cent, primary with 27.8 per cent and consumer goods with 17 per cent. As the recession set in 2008, India's bilateral export remained buoyant during 2008-12, but most of the end-use sectors registered negative growth rates during 2013-20 except for P&C and final capital goods sector.

India’s bilateral imports in the intermediate sector stood at \$18.2 billion in 2020 where P&C import was \$6.3 billion. In the imports of final goods of \$9 billion, capital goods took the lion’s share of almost 75 per cent in 2020. During 2003-20, the bilateral import share of the semi-processed sector was the largest and growing consistently among other sub-sectors in the end-use classification of trade and was having 37.2 per cent share in 2020. Bilateral import share was growing initially and remained half of the import share of semi-finished products in 2020. Though import share started declining between 2004 and 2020, the sector continued to be important with an import share of 20.9 per cent in the pandemic year. Bilateral imports expanded at the rate of 27.6 per cent during 2003-07, mostly due to high growth posted by

sectors like final capital goods (39.5 per cent), P&C (36.5 per cent), final consumer goods (33.7 per cent), among others. The situation did not change much with the onset of recession and bilateral imports remained buoyant, though the EU received a certain setback from its trade with the world economy. However, the situation remained grim in the second episode of recession, where all import sectors experienced negative growth rate including final capital goods, primary sectors, etc. The sectoral balance of trade showed that India had an adverse trade balance in certain sectors such as primary, P&C and final capital goods whereas trade surplus in sectors like semi-processed and final consumer goods. As an emerging country, India would continue to depend on P&C and final capital goods from

Figure 2.3: India’s Bilateral Trade with the EU in End-Use Products (\$ billion)



Source: Estimates based on ComTrade Database, WITS, 2021.

the EU for focusing on its industrialising endeavours.

Surging Bilateral Technology Intensive Trade

The EU is a major global player so far as technology-intensive trade is concerned. In 2020, the region exported \$2.84 trillion worth of high and medium technology goods and imported \$2.42 trillion of the same set of goods from the rest of the world. These high and medium technology intensive goods shared 52.4 per cent of its total imports and 58 per cent of global exports in the year of the pandemic. India's trade engagement with the EU has been limited in terms of size of the trade, but the country's stake with the EU in technology-intensive trade were \$14 and \$18.9 billion in exports and imports, respectively, as shown in Figure 2.4. Sahu and Narayanan (2016) found the EU countries as major export destinations of India for technology-intensive goods. In the high and medium technology sector, imports were very high. Nevertheless, India was not insignificant in its exports to the EU. In the bilateral trade, India's imports of such sector were 59.1 per cent and export 37 per cent. In the high technology intensive trade alone, India's exports and imports from the EU were very much similar, but the gap is seemingly very high in case of medium technology intensive sectors.

During the period of buoyancy (2003-07), high trade growth was mostly triggered by the medium technology sector and the contribution of high technology intensive sector was relatively low. India's medium technology exports grew at the rate of 43.2 per cent and the high technology sector by 27.0 per cent during the period of boom. It is important to note that India's export growth rates during both phases of recession were positive, though imports were adversely affected. The results show that India has a high stake in the technology-intensive sectors in the EU. This is a positive development in the bilateral trade relationship.

Trends in Trade in Services

Service sector remained pivotal to the EU where manufacturing sector remained less dominant than the services sector (Francois *et al.* 2005). With more than 10 per cent contribution to GDP, trade in services in the EU and India is a critical area for bilateral engagements and provides opportunities for cooperation. Though the quantum of services trade is higher in the EU, in comparison to India, growth in services exports and imports have been greater in India during the period of global buoyancy. Services export and import of India to the world grew at the rate of 37.9 per cent and 29.6 per cent, respectively, in comparison to 18.1 per cent and 17.5 per cent for the EU's export and import in the services trade for 2003-07 respectively as shown in Figure 2.5. Though the global financial crisis affected services trade of both India and the EU, the impact was much severe for the EU where the export of total trade services grew at 0.3 per cent per annum and services import fell at -0.5 per cent per annum during the first phase of recession (2008-12).

India registered a growth of 8.3 per cent per annum and 9.5 per cent per annum for services export and imports, respectively, during 2008-12. However, in the second phase of recession (2013-19), the trade in services sector provided a required relief to the EU member countries with moderate growth rates in exports and imports of 4.3 per cent and 4.8 per cent, respectively. The EU trade in services revived with a moderate growth rate of 3 per cent for both services imports and export during the recessionary period of 2008-19 and the corresponding growth rates for India were 8.1 per cent and 6.6 per cent, respectively. This moderate to high growth rates of TIS in the EU and India provide promising avenues for comprehensive cooperation in services trade (Poitiers *et al.* 2021).

India's bilateral services trade with the EU has also increased from \$5.6 billion in 2007 to \$ 33.6 billion in 2019, as shown in Figure 2.6. In the entire period of 2005-15, EU had a positive trade balance in services trade, having the largest trade surplus of \$4.6 billion in 2010.

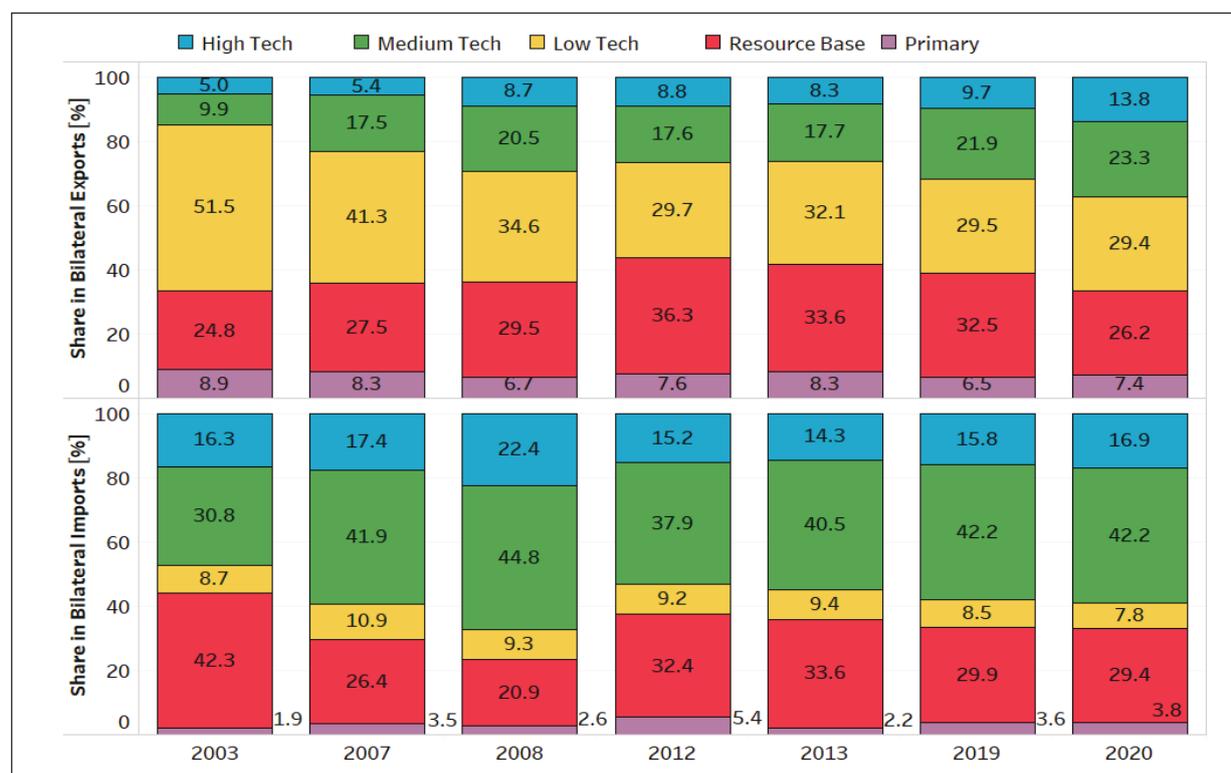
Since 2016, India had a positive trade balance with the region reaching the level of \$2 billion in 2019. India’s bilateral trade in services with the region was also affected by the first phase of recession, where the export grew at the CAGR of 5.4 per cent per annum and imports recorded a growth rate of 6 per cent. Indian exports of services to the EU were highly concentrated in sectors like telecommunication, computer and information services and other business services, accounting for more than 50 per cent of India’s total services exports to the EU in 2019.

However, in the case of services imports, more than 50 per cent of the total imports were accounted for three sectors, namely transport services, telecommunication services and other business services in the same period. A similar result was observed by Poitiers *et al.* (2021) where it highlighted that more than 80 per cent of the EU services export to India and more than 90 per cent of EU’s services imports from India were covered by four sectors, namely, transport, travel, IT, and other business

services. Navarra (2020) pointed out that other transport equipment constituted a major share of India’s imports from the EU. Major export destination for India in the EU was Germany, followed by Netherlands and France whereas the import destinations were Germany, Ireland, and France in 2019. India had a trade surplus with major EU partners like Germany, France, and Netherland in services trade in 2019, whereas it had a trade deficit with Ireland in the same year.

Estimates of revealed comparative advantage (RCA) show that telecommunication, computers and information services and transport freight services are two sectors where India is globally competitive. There are many other services sectors like passenger transport, personal and business travel, other business services, etc. where India is dependent on imports. However, many EU countries are also having global competitiveness in these sectors. For example, 10 countries including Germany in passenger transport, 15 EU countries such as Germany

Figure 2.4: India’s Trade in Technology-intensive Products in the EU (in \$ billion)



Source: Estimation based on ComTrade Database, WITS, 2021.

and the Netherlands in business travel, 14 EU countries including France, Italy, Germany, etc. in personal travel, and seven countries, including Belgium, Germany, Netherland, etc. in other business services had demonstrated their global competitiveness in 2019 and India may import several such services from the EU countries given India’s global dependence on such services. As many regional countries exhibited their global competitiveness in selected services sectors, having India’s interest in them, there could be deeper engagement between India and the EU in the services sector trade in future. There are considerable levels of complementarities existing between them in the trade in services sector.

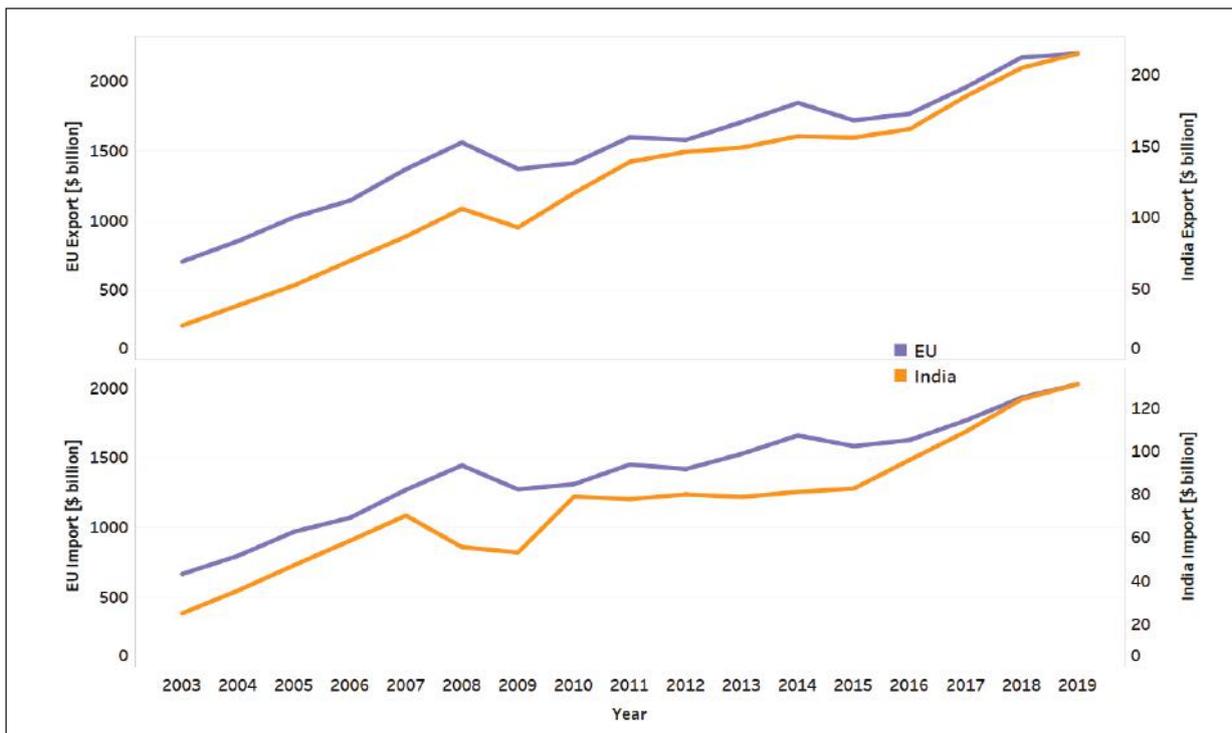
Bilateral Investment Trends

The EU region is one of the major investors in India and the investment is rising over time with an increase in the share of India’s total inflows of FDI from 10.39 per cent in 2008 to 17.43 per cent in 2020, investment ties between

them can be observed as shown in Figure 2.7. The region invested around 24 per cent of India’s total investment during 2000-17, which was more than combined investment from the USA, Japan, China, and Russia together (Jain and Sachdeva 2019). The EU was the third-largest investor in India in 2020, after Singapore and the USA, and the fourth largest in India’s outward investment ranked after Singapore, the USA and Mauritius. However, cumulative investment from 2008-20, Inflows of FDI from the EU was the largest in India, where the outflows were ranked the second largest after Singapore.

The flow of investment from the EU was persistent over the years, where European companies invested around €180 billion in India between 2004 and 2013 (Charlie 2014). Likewise, India was also investing in the EU accounting for more than €56 billion since 2003, out of which more than 30 per cent was invested in Greenfield projects covering 51 projects. However, the rest 70 per cent of the investment was in mergers

Figure 2.5: Trends in Trade in Services of India and the EU with the World (in \$ billion)



Source: Estimation based on Balance of Payment Statistics (BoPS), IMF, 2020.

Note: Services trade of the EU in the left Y-axis and India in the right Y-axis.

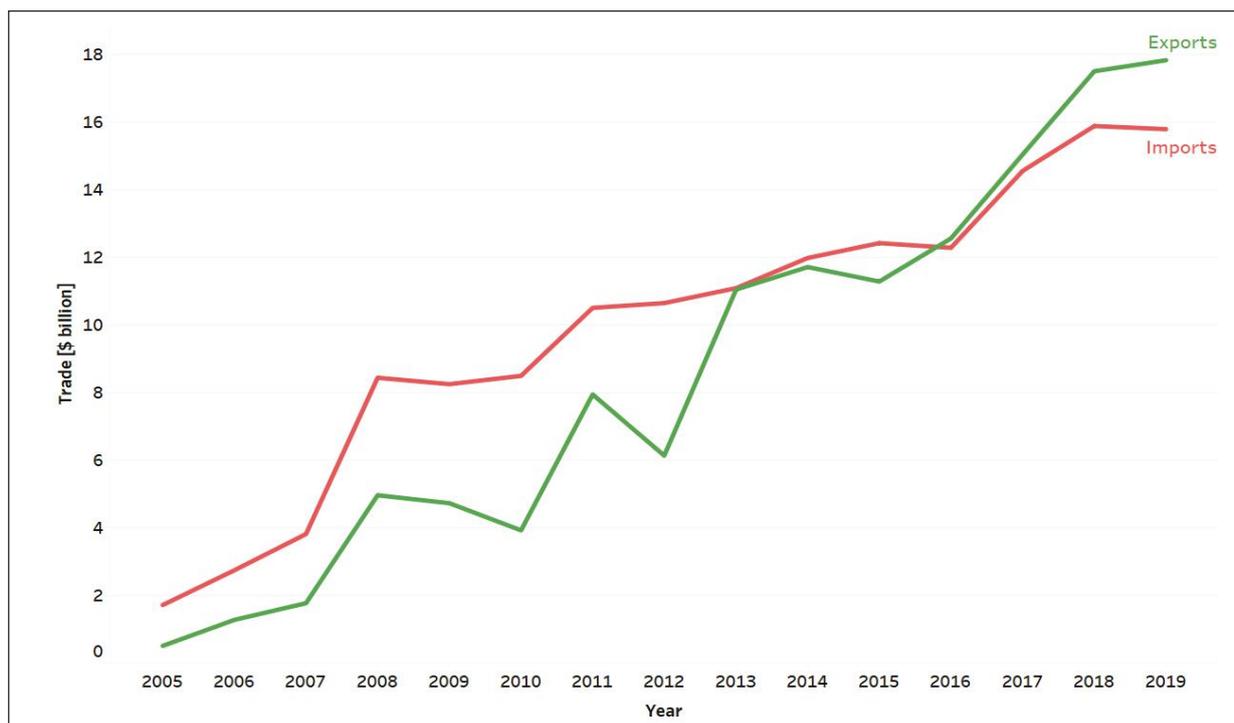
and acquisitions (M&A) with 411 companies (Charlie 2012). Ranbaxy Laboratories Limited acquired French-based pharma company, RPG Aventis SA, which was one of the largest overseas M&A venture of India (Pradhan and Abraham 2005)

India has been experiencing an increase in both bilateral inflow and outflow of FDI from the EU till 2014, following which the inflow of FDI continued from \$5.8 billion in 2014 to \$11.27 billion in 2020. However, the outflow of FDI experienced a huge fall from \$13.47 billion in 2015 to \$2.86 billion in 2020. Volatility in bilateral FDI outflows from India was more than FDI inflows. In the entire recessionary period (2008-2020), the bilateral inflows from the EU grew at the rate of 13.2 per cent, whereas FDI outflows grew at the rate of 1.4 per cent per annum. The resilience of bilateral FDI flows between India and the EU is witnessed through growth rates of more than 20 per cent in the first phase of the recession (2008-12).

During this period, the world economy was adversely affected by the global financial crisis and India's FDI growth with the world was ranging between 9 and 10 per cent per annum.

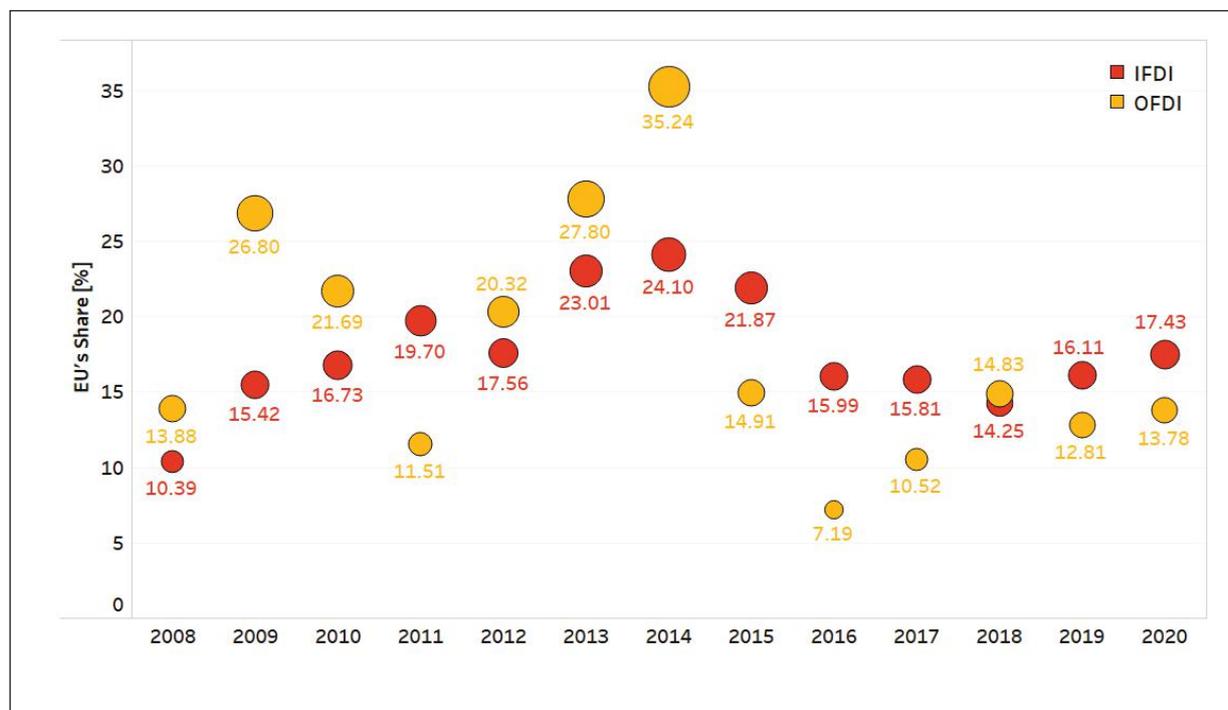
The growth in outflows of FDI from India to the EU was largely affected in the second episode of the recession (i.e., 2013-2020), which led to a huge gap in the inflows and outflows of FDI where the inflows and outflows grew at the rate of 11.8 per cent and -14 per cent per annum, respectively. This was due to a sudden increase in FDI outflows to the Netherlands in transport, storage, and communication services in 2014. The outflows in the sector were \$4.6 billion in 2013 and were doubled in a year to \$9.4 billion in 2014 to the EU member country. Transport, storage, and communication sector alone covered around 92 per cent of the hike in the total outflows of FDI to the country in 2014. The fluctuations in the sector were mostly due to variability in investment by Bharti Airtel Limited in the Netherlands.

Figure 2.6: Trends in India's Bilateral Trade in Services with the EU (in \$ billion)



Source: Estimation based on Trade in Services, UNCTADStat, UNCTAD, 2021.

**Figure 2.7: Share of FDI flows: Role of the EU in India
(in percentage)**



Source: Estimation based on Overseas Investment, RBI, 2021 and SIA Newsletter, DIIPP, 2021.

India's outward investment in the Netherlands has witnessed an interesting turn since 2010. India's bilateral share in its total investment in the EU was highest in 2008 and was accounting for 40.9 per cent followed by Cyprus (26.5 per cent) and Denmark (11.7 per cent). India's OFDI decelerated to 34.1 per cent in 2009, following the onset of the global financial crisis in 2008. However, it recovered exceptionally well in the next year, where the outflow of FDI to the Netherlands increased approximately 5 times in a year, that is 2009-10, leading to a rise in the share of the Netherlands to 90 per cent of India's total outward FDI to the EU. With a little downward trend in the subsequent years, the share again soared to 92 per cent in 2014 and continued to remain more than half of India's FDI to the region throughout the period and touched the level of 80.5 per cent in 2020. Other than the Netherlands, India invested in Germany between 8 and 10 per cent of total FDI to the region during the period 2017-19. India's investment in the EU is concentrated in sectors like manufacturing and financial, insurance and business services.

In the case of FDI inflows to India, the Netherlands emerged as the largest investor since the second episode of the recession (i.e., since 2013). It contributed 36 per cent of total FDI inflows from the region and retained its lead investor's position with 47.9 per cent in 2020. During the first phase of recession, countries like Cyprus, Germany, and France also invested in India with a total share of 58.5 per cent in 2008 and increased to 62.8 per cent in 2012. The EU is also among the top source of technology transfer to India, and Germany is the leading country with India in this regard (Bava 2010, Sachdeva 2012, Sachdeva 2019). During 2004-13, 18.5 per cent of total Greenfield investment by the EU in India was contributed by Germany (Charlie 2014). However, the share of Cyprus, Germany, and France declined gradually since 2014 with an exception in the case of France, where the country's share increased abruptly to 23.7 per cent in 2020. In the total FDI flows from the EU since 2008, the Netherlands, Cyprus, Germany, and France accounted for almost 80 per cent of the total flows to India.

A comprehensive trade and investment agreement between India and the EU may open new avenues for economic partnership between them and may deepen their deep-rooted economic linkages. So far surge in India-EU economic relationship was driven by the private sector. But several sectors need to be strengthened with the support of the government. For understanding the synergies existing between the two partners, new and detailed studies to be initiated in specific sectors. While undertaking such initiatives, mutual sensitivities in different sectors are to be handled carefully.

3

Connectivity for Sustainable Development and Green Transition: Leveraging Science, Technology and Innovation (STI)



Introduction

The India-EU Strategic Partnership: A Roadmap to 2025 released in July 2020 and the subsequent India-EU Connectivity Partnership adopted in May 2021, call for clear roadmap for implementation. STI forms the most critical pillar of inclusive and sustainable transitions that have been comprehensively articulated by the SDGs. The framework of SDGs is central to the idea of inclusive connectivity spanning physical, social and digital infrastructure. The emphasis on sustainable transition, technology driven development transformations and collective development commitment is amply clear in the strategy documents adopted by both sides. Therefore template for comprehensive connectivity architecture should streamline SDG modalities by mainstreaming development, deployment and diffusion of appropriate and cost-effective technologies. Both the EU and India are favourably disposed to partnership models that address this priority.

The EU level innovations across major areas of socio and environmental priorities are major toolkit globally. Such consistent supply of innovation is backed by innovation funding pipelines. However, affordability has been of less concern given higher levels of per capita incomes and the fact that market failures in the innovation process and commercialisation hurdles are cushioned through very high levels of intellectual property protection and

well integrated regional and technological innovation systems. India has developed unique strengths in low cost technology alternatives across a variety of fields and is increasingly focusing on collaborative innovation models with mission orientation towards public-private consortium approaches. India has successfully rolled out low cost innovative solutions in a variety of fields from agriculture to healthcare. India's private sector ICT leadership is well acknowledged and India is now emerging as a global leader of digital public goods for accelerating the progress on the SDGs.

Towards ensuring a secure, clean, affordable and reliable energy supply as required for sustainable economic growth and for mitigating and adapting to climate change, both India and the EU recognised their common interest to promote clean energy generation and increased energy efficiency, as a core pillar in the *EU-India Clean Energy and Climate Partnership Joint Declaration* of 2016. The objective has been to support the respective capabilities of India and the EU for implementing their ambitious INDC commitments following the 2015 Paris Agreement.¹ In 2020, the *EU-India Strategic Partnership: A Roadmap to 2025*², endorsed by the Leaders after the 15th EU-India Summit, called for strengthening the EU-India Clean Energy and Climate Partnership and pitched for energy research and innovation and support of a just

energy transition. India remains committed to environmental and climate causes with a massive thrust on deploying renewable energy and energy efficiency measures.

Energy cooperation forms the key pillar of India and EU's connectivity partnership and their collective aspiration to undertake joint infrastructure projects both at the bilateral and multilateral levels. India is on track to achieve 450 GW target of renewable energy generating capacity by 2030 and the diversification of its energy basket would be the key lever to enable this transition. India is envisaging an aspirational goal of producing cost-effective Green Hydrogen where generation cost is of less than USD 2 per kg; storage plus refuelling cost of less than USD 1 per kg and replacement of end use technology with green hydrogen technology in less than 2 years.³ Similarly, the *EU-India partnership* focuses on addressing large-scale deficit in clean energy technologies and to offer viable financial alternative to foster clean energy transitions through "normative" regulations, standards, and requisite financial safeguards. The deployment of such technologies is also crucial for EU and India's efforts to meet their existing Paris Climate targets and to undertake more ambitious commitments for the future. This chapter maps the broad contours of EU-India partnership towards promoting sustainable development and clean energy transition through transformative partnerships in science, technology and innovation commensurate with the defining aspirations of bilateral partnership. Some indicative actions areas have also been proposed.

The STI pivot in India-EU Connectivity and Accelerating SDGs

The mounting global challenges, be it the COVID-19 pandemic, climate change, or equitable social development, all require meaningful solutions derived from the combined power of (STI) and the convergence of wide-ranging technology domains. For example,

material science or drug discovery today is critically dependent on precision equipment, computable algorithms and data processing. The importance of STI is acknowledged for SDGs as the means of implementation targets among other targets under each SDGs. The 169 targets against 17 SDGs collectively define the scope of individual goals and the extent of interconnectedness among the goals. Technology, along with financial resources and robust monitoring frameworks are the most important means to implement the Agenda 2030. The universal nature of the SDGs and the global nature of challenges are expected to push the world toward deeper STI collaborations, sharing of information and data, and capacity building. The robustly evolving India-EU partnership should bring in effective technology collaboration with renewed focus on achievement of SDGs globally.

This calls for further strategising on STI interventions based on priorities, especially with regard to achieving SDG targets. It is well known that the Horizon 2020 has been the largest ever European funding programme for research and innovation. It had a budget of EUR 79 billion euros. Subsequently, the follow-up programme Horizon Europe has a budget of EUR 95.5 billion for the period from 2021-2027. The use of effective policy tools beyond traditional STI policy means is however urgently needed. The most important incumbent framework could be that of the SDGs, wherein the urgency for integrated approaches often leads to the identification of technology needs beyond immediate and visible priorities. An illustration of policy convergence for STI for SDGs is presented in Figure 3.1.

Dedicated STI missions have been found effective in this regard in some developing countries like India. STI missions could be helpful in terms of optimizing resources as well as directing skill-building in a desired direction. While STI missions are not expected to solve a wider range of pre-existing gaps, they could help in bridging information asymmetries, create partnerships and generate

incentives for dedicated STI efforts in select sectors. India-EU partnership on STI missions is surely an important area for consideration. The intention for using STI for SDGs is to carry forward successful experiences in a more integrated and convergent manner, which can enable sustainable development transformations; promote sustainable consumption and production; create greater equity in development; improve all parameters of human development; deepen resilience against emerging challenges; and chart a futuristic course of development for the 21st century. The timelines for SDGs should trigger such aspirations in all nations and societies. Proactive policy measures in this direction would strengthen the resolve and streamline deliverables.

Agriculture, health, water, energy, urbanization, and mobility solutions all need sustainable, inclusive, and affordable technologies that can be scaled. In the near-to medium-term, the focus should be on “strengthening national capacities for science-based decision making, enhancing public trust in science, sharing knowledge for more collaborative research, ensuring universal access

to solutions, and acting with greater urgency on global scientific assessments” (Roehrl, Liu, and Mukherjee 2020, p. 1). The most defining character of the 21st Century as it unfolds is about new technologies driven by super-computing, big data, artificial intelligence, nano-technology, material sciences, integrative sciences to biotechnology of the most advanced kind. In several developing countries, national schemes for developing digital technologies are being pursued with rigor. The ICT revolution, apart from reducing transaction costs for reaching consumers and business partners in value chains, has also enabled greater choices and a larger information base. Therefore, there is a growing faith in digital technologies as one of the key STI intervention areas even as countries continue to lack access to innovations in other fields. For compelling reasons, ICT tools are increasingly ubiquitous and are looked upon as enabling technologies. Box 3.1 illustrates India’s leadership in large scale application of digital technologies in the healthcare sector which has also greatly boosted India’s fight against the Covid-19 pandemic.

The Covid-19 pandemic has thrown up several examples of accelerated development

Figure 3.1: UN Technology Facilitation Mechanism: Global Pilot Programme on STI for SDGs Roadmaps



Source: Compiled by Authors.

of targeted STI solutions to mitigate the effect of the pandemic through collaboration and partnerships across similar countries and institutions (both from public and private sectors with much reduced barriers to knowledge flows). While earlier policy recommendations have suggested proactive roles for the government in facilitating innovation ecosystems, a variety of reasons beyond constraints of physical capital, namely a weak private sector, inadequate skills and information asymmetries, have been cited as

the main barriers. It is in this context that the EU is guided by Smart Specialisation strategy for accelerated socio-economic development through adoption of wider definition of innovation (Box 3.2).

However, newer policy 'mix' that offer more flexibility in terms of jump-starting innovation as well as attaining scale by catering to local development needs are increasingly becoming popular. New policies focused on technology-led entrepreneurship development and start-

Box 3.1: India's leadership in Digital Technologies in Healthcare

Technologies have already done wonders in many areas of health care to improve access and quality. The e-health programme in Africa, with cooperation of India, is a model for use of digital platforms for specialist consultation and medical education. An area in which technology has made dramatic changes in healthcare is in the management of health records and their easy transportability. This makes consultation with specialists anywhere in the world easier and almost on real time basis. It also helps patients in remote and rural places to maintain their health records without fear of losing them. Electronic Health Records (EHRs), once it is generated, can be saved in highly secure servers and made accessible to anyone with the authorisation. They also enable medical professionals to get automatically alerted about any side effects like allergies on their patients caused by drugs or other conditions. Prime Minister of India flagged off the Ayushman Bharat Digital Mission (ABDHM). This Mission has four components namely, Health ID, Healthcare Professionals Registry (HPR), Health Facility Registry (HFR), Health Records (PHR). The idea of ABDHM is to "develop the backbone necessary to support the integrated digital health infrastructure of the country. It will bridge the existing gap amongst different stakeholders of Healthcare ecosystem through digital highways. Similarly, India's large-scale application of Co-WIN as a comprehensive digital tool offering end-to-end solution connecting beneficiaries, delivery agents and suppliers of vaccine has been a global model.

Source: James (2021) & Ayushman Bharat Digital Mission (ABDHM).

Box 3.2: Smart Specialisation Strategy of the EU

Smart specialisation has made a real difference in the way European regions are designing their innovation strategies, creating or reinforcing cooperation at all levels, especially with local business spheres.

The five pillars of this strategy are:

- Governance
- Entrepreneurial Discovery Process
- Monitoring and Evaluation
- Smart Specialisation Strategies for Sustainability (S4)
- Guidance

Source: Official Webpage of the Smart Specialisation Platform.

ups and associated financial incentives are proving beneficial in the context of developing countries, for example in India and Kenya. There is also scope to leverage the existing pool of excellence, however limited in supply (for smaller countries) and focus attention on select public sector initiatives for achieving absorptive capacities and triggering a faster diffusion of appropriate technological solutions. Illustrative guidelines for comprehensive mapping of such efforts at the country level are already available (See, Table 3.1).

Technology Facilitation Mechanism (TFM) of the Agenda 2030 as a leadership platform for the EU and India

The G20 Osaka Summit has made the most important contribution in recent times in acknowledging importance of science, technology and innovation (STI) in achieving the Agenda 2030 and the Sustainable Development Goals (SDGs), and the larger aspirations of inclusive and sustainable economic growth. The G20 Summit declaration in 2019 endorsed the draft UN “Guiding Principles for the Development of STI for SDGs Roadmaps” in this regard. Under the ongoing efforts of the Technology Facilitation Mechanism (TFM) of the Agenda 2030, the UN has already launched the first phase of the Global Pilot Programme on STI for SDGs Roadmaps in 2019, initially with five pilot countries: Ethiopia, Ghana, India, Kenya, and Serbia. The European Union (EU) and Japan have joined the Programme to strengthen the international knowledge partnerships for deployment of technologies for global good.

The EU has already pledged support for Global Pilot Programme on STI for SDGs Roadmaps that has India and Serbia as pilot countries. This provides ample opportunity for India and Serbia (supported by the EU) to explore meaningful partnership in the area of STI for SDGs. In addition, with the strong ownership articulated by the G20 leaders in promoting STI for SDGs, it is important that

this mandate is taken forward by the EU and India that have significant influence on global governance architectures and the means to implement SDG 17 in order to support the STI for SDGs Roadmaps and take concrete steps towards operationalising a global TFM. An analysis of opportunities and challenges would inform and shape collective actions by the EU and India in a post-COVID-19 world, with lessons from the ongoing pandemic. Currently, several distinct policy frameworks have been outlined in the EU as well as in India for connecting STI with SDGs. These mainly include the concepts like EU’s Responsible Research and Innovation (RRI) and India’s Scientific Social Responsibility (SSR) policy (See, Box 3.4).

India-EU Partnership in Green Hydrogen

Within the energy connectivity theme, this Partnership is intended to contribute to the implementation of the *EU-India Clean Energy and Climate Partnership* to promote access to and dissemination of clean energy and climate friendly technologies and encourage research and the development of innovative solutions. It guides the energy and climate policy dialogue between the EU and India and helps supporting joint projects and joint research. Offshore wind energy, roof top solar and solar parks, integration of renewable energy and storage, smart grids, biofuels and energy efficiency in buildings were listed as specific areas of cooperation in the 2016 Partnership. In the latest Connectivity Partnership Agreement, advance cooperation in newer areas such as floating solar, offshore wind, hydrogen and energy storage have also been identified. This section intends to provide a brief overview of the present landscape of the development in the hydrogen energy sector (especially green/renewable hydrogen) both in the EU and India in terms of broad policy contours, initiatives, main actors, modalities and research and innovation while enlisting few potential areas for cooperation.

Renewable (Green) Hydrogen in Europe

In July 2020, the EU came out with a “*Hydrogen Strategy for a Climate-Neutral Europe*”⁴, which discussed the rationale and motivation behind pushing for hydrogen and the roadmap till 2050. In its introduction itself, this document elaborated in detail on why Europe needs a strategic roadmap for hydrogen. It states that hydrogen offers a solution to decarbonise industrial processes and economic sectors where reducing carbon emissions is both urgent and hard to achieve, thus making hydrogen essential to support the EU’s commitment to reach carbon neutrality by 2050 and for the global effort to implement the Paris Agreement while working towards zero pollution. Large-scale deployment of clean hydrogen at a fast pace is projected as a key for the EU to achieve its higher climate ambition, reducing greenhouse gas emissions by minimum 50 per cent and towards 55 per cent by 2030 (*Fit for 55*), in a cost effective way.

Hydrogen has also been placed as a key priority to achieve the *European Green Deal* and

Europe’s clean energy transition. In its strategic vision for a climate-neutral EU, the share of hydrogen in Europe’s energy mix is projected to grow from the current less than 2 per cent to 13-14 per cent by 2050. Therefore, it needs to achieve a far larger scale and its production must become fully decarbonised. Cumulative investments in renewable hydrogen in Europe are planned up to EUR 180-470 billion by 2050, and in the range of EUR 3-18 billion for low-carbon fossil-based hydrogen.

The Strategy document also stated that combined with EU’s leadership in renewable technologies, the emergence of a hydrogen value chain serving a multitude of industrial sectors and other end uses could employ up to one million people, directly or indirectly. In order to implement the ambition of the European Green Deal and building on the Commission’s *New Industrial Strategy for Europe* and its recovery plan, this Strategy document sets out a vision of how the EU can turn clean hydrogen into a viable solution to decarbonise different sectors over time. Box 5 provides an overview of the roadmap developed by the EU.

Table 3.1: UNCTAD and UNESCO approaches on STI and SDGs Policy Convergence

UNCTAD	UNESCO
<p>Science, Technology and Innovation Policy (STIP) Reviews</p> <p>UNCTAD framework builds on the established approach of addressing the fundamental issue of how STI can support the economic development goals of growth, higher productivity, structural transformation and economic diversification, and considers the role of STI in reorienting development towards more inclusive and environmentally sustainable outcomes.</p>	<p>Go-SPIN:</p> <p>Mapping Research and Innovation country profiles and on-line survey of STI policies and policies instruments as part of the Go-SPIN platform. Go-SPIN is a methodological tool to map national STI landscapes and analyses STI policies and their implementation.</p> <p>“UNESCO Science Report” provides every 5 years a comprehensive scientific landscape at global, regional and national level, reflecting the insights of socio-economic, geopolitical and environmental trends.</p>

Source: Implementing Science, Technology, and Innovation (STI) for SDG Roadmaps at the Country Level: Operational Note (2020) published by the UN

The Strategy document has also provided a detailed investment agenda towards realizing the goals as outlined in the strategic roadmap. From 2020 to 2030, investments in electrolyzers could range between EUR 24 and EUR 42 billion. In addition, over the same period, EUR 220-340 billion would be required to scale up and directly connect 80-120 GW of solar and wind energy production capacity to the electrolyzers to provide the necessary electricity. Investments in retrofitting half of the existing plants with carbon capture and storage are estimated at around EUR 11 billion. In addition, investments of EUR 65 billion will be needed for hydrogen transport, distribution and storage, and hydrogen refuelling stations. Thus, from 2020 to 2050, investments in production capacities would amount to EUR 180-470 billion in the EU.

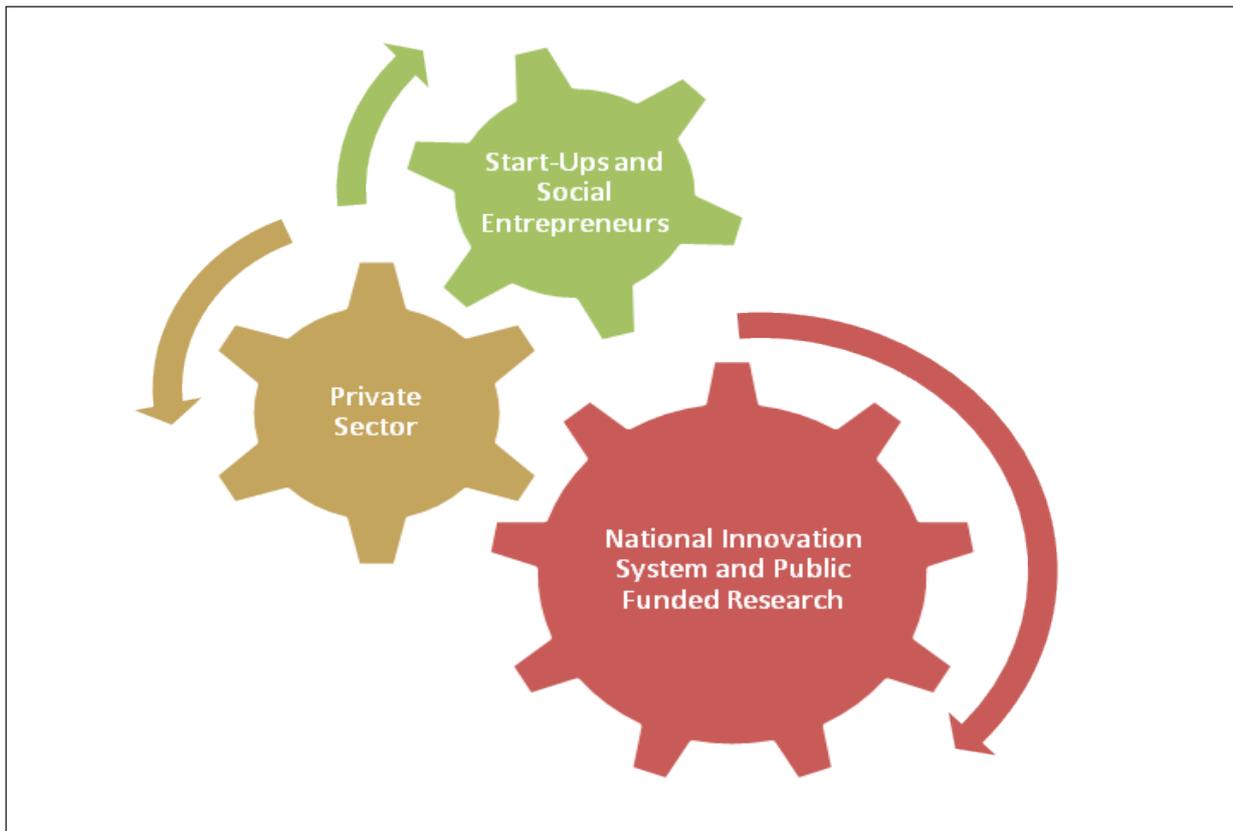
Towards advancing supply diversification and helping design stable and secure supply

chains, this Strategy document has argued for re-designing Europe’s energy partnerships with both neighbouring countries and regions and its international, regional and bilateral partners. In line with the external dimension of the European Green Deal, the EU has a strategic interest in placing hydrogen high on its external energy policy agenda, continuing to invest in international cooperation on climate, trade and research activities but also broadening its agenda to new areas.

Main Actors and Modalities

In the domain of green hydrogen, main actors in the EU include the European Commission, national governments, private sector, research institutions, financial institutions and civil society organisations. All actors, public and private, at European national and regional level, are working together, across the entire value chain, to build a dynamic hydrogen ecosystem in Europe.

Figure 3.2: Linkages between National Innovation System and Technology led Entrepreneurship



Source: Authors’ illustration.

Almost all Member States have included plans for clean hydrogen in their National Energy and Climate Plans, 26 have signed up to the “Hydrogen Initiative”, and 14 Member States have included hydrogen in the context of their alternative fuels infrastructure national policy frameworks, new lead markets, sustained research and innovation into breakthrough technologies and for bringing new solutions to the market, alongside a large-scale infrastructure network that only the EU and the single market can offer.⁵ Since driving hydrogen development past the tipping point needs critical mass in investment, the EU industry is rising to the challenge and has developed an ambitious plan to reach 2x40 GW of electrolyzers by 2030. Within the EU, Germany has been particularly outspoken advocate of green hydrogen. It has strong electrolyser manufacturers such as Siemens, thyssenkrupp, Sunfire and others. Germany’s leads the current share of electrolyser production in the world with around 20 per cent. In June 2020, Germany rolled out a national hydrogen strategy that aims to achieve a 200-fold increase in electrolyser capacity – of up to 5 GW by 2030.

The European Regional Development Fund and the Cohesion Fund, which will benefit from a top-up in the context of the new initiative REACT-EU (*Recovery Assistance for Cohesion and the Territories of Europe*) will be made available to support the green transition. In the framework of the next funding period 2021-2027, the Commission will be working with Member States, regional and local authorities, the industry and other stakeholders so that these funds contribute to support innovative solutions in the field of renewable and low-carbon hydrogen, with technology transfer, public-private partnerships, as well as pilot lines to test new solutions or perform early product validation.

The European Clean Hydrogen Alliance, announced in the European Commission’s *New Industrial Strategy*, is expected to play a crucial role in facilitating and implementing the actions of the EU’s Hydrogen Strategy and supporting investments to scale up production and demand for renewable and low-carbon hydrogen. It is

strongly anchored in the hydrogen industrial value chain from production. This Alliance has more than 900 companies, 90 research organisations, 20 financial institutions and 25 CSOs as its members.⁶ At this point, already 1.5-2.3 GW of new renewable hydrogen production projects are under construction or announced and an additional 22 GW of electrolyser projects are envisaged and would require further elaboration and confirmation. To foster further private investments into the hydrogen sector, “Hydrogen Europe” has also been established, which is a coalition of more than 200 private companies, 40 research institutions and more than 30 national agencies.

India’s Bold Transition to Green Hydrogen

In October 2020, while speaking at the India Energy Forum, the Indian Prime Minister laid down India’s energy map comprising of seven key drivers. One of them was ‘*moving into emerging fuels including hydrogen*’. Subsequently, while inaugurating the 3rd Renewable Energy Investors’ Meet and Expo on 26 November 2020, PM announced that India is proposing to launch a comprehensive *National Hydrogen Energy Mission*. Taking this forward, the Union Budget 2021-22 proposed to launch a Hydrogen Energy Mission in 2021-22 for generating hydrogen from green power sources. In August 2021, PM announced the launch of the National Hydrogen Mission (NHM) on India’s 75th Independence Day, stating that the aim is to make the country a Global Hub for the production and export of “Green Hydrogen”.

The proposed National Hydrogen Energy Mission is expected to lay down Government of India’s vision, intent and direction for hydrogen energy and suggest strategy and approaches for realising the vision. The Mission would put forward specific strategy for the short term (four years), and broad strokes principles for long term (10 years and beyond). The aim is to develop India into a global hub for manufacturing of hydrogen and fuel cells technologies across the value chain. Toward this end, a framework to support manufacturing via

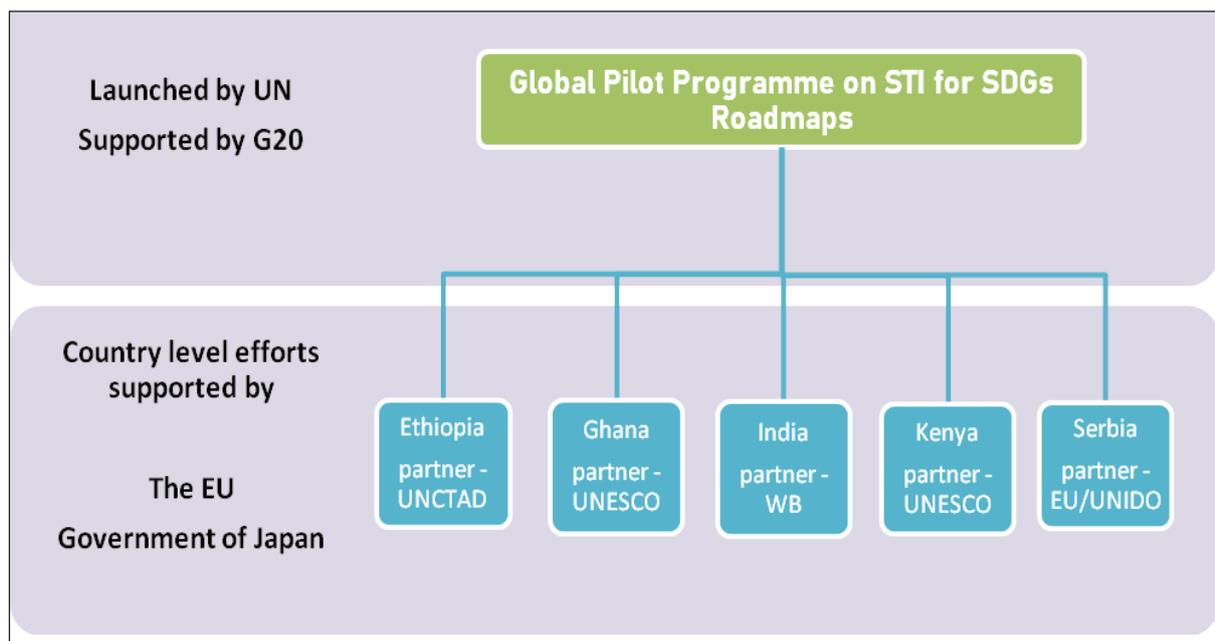
suitable incentives and facilitation aligned with *Make in India* and *Atmanirbhar Bharat* will be developed. It will provide necessary flexibility to capture benefit from advances taking place in technology landscape. The Government will facilitate demand creation in identified segments. Possible areas include suitable mandates for use of green hydrogen in industry such as fertilizer, steel, petrochemicals etc. Major activities envisaged under the Mission include creating volumes and infrastructure; demonstrations in niche applications (including for transport, industry); goal-oriented Research & Development; facilitative policy support; and putting in place a robust framework for standards and regulations for hydrogen technologies.⁷ The draft Mission document has already gone through consultation process and is expected to be finalized soon.

Parallel measures to support the proposed National Hydrogen Energy Mission are also been contemplated. Production-linked Incentive (PLI) scheme may be extended to the domestic manufacturing of electrolyser

machines, which is the primary equipment that is used to electrolyze water to produce hydrogen. If the scheme is implemented, it is certain to reduce the cost of such equipment, thereby boosting the production of green hydrogen.⁸ Similarly, the Ministry of Power, Government of India, has indicated that purchase of green hydrogen will be made mandatory for certain sectors similar to the Renewable Purchase Obligation (RPO).⁹

The Ministry of New and Renewable Energy is coordinating with the Ministry of Road Transport & Highways (MoRTH), Bureau of Indian Standards (BIS) and Petroleum and Explosives Safety Organization (PESO) for putting in place a regulatory framework for deployment of hydrogen and fuel cell technologies in India. In July 2020, MoRTH notified draft standard for the safety evaluation of the vehicles being propelled through hydrogen fuel cells under the Central Motor Vehicles Rules, 1989. Eighteen per cent blend of Hydrogen with CNG was notified as automotive fuels vide GSR 461 in July 2020.

Figure 3.3: UN Technology Facilitation Mechanism: Global Pilot Programme on STI for SDGs Roadmaps



Source: Compiled by Authors.

Main Actors and Modalities

Major stakeholders in green hydrogen ecosystem in India include ministries (Ministry of New and Renewable Energy, Ministry of Petroleum and Natural Gas, Ministry of Power, Ministry of Road Transport and Highways), departments (Department of Science and Technology and Department of Scientific and Industrial Research) and research/academic institutions. Alongside, both public and private Indian companies are also increasingly getting actively engaged in building the ecosystem. Several major government-owned and private entities in the Indian renewable energy sector,

such as National Thermal Power Corporation (NTPC), Indian Oil Corporation (IOC), Reliance Industries Limited, Adani Group, etc., have also announced initiatives/ investments regarding green hydrogen. IOC has recently announced the setting up of a green hydrogen plant to power one of its largest refineries in Mathura, and over the last six months, both NTPC and IOC have issued tenders for procurement of electric buses powered by hydrogen fuel-cell technology.

The Ministry of Petroleum and Natural Gas has committed to augment the hydrogen supply chain infrastructure in the country. Petroleum

Box 3.3: Responsible Research and Innovation (RRI) & Scientific Social Responsibility (SSR)

Responsible Research and Innovation (RRI)

Foundations of RRI were laid in the 6th Framework Programme of the EU [2002-2006], when the EC began to pay increased attention to building knowledge on better aligning science and society in research. In the 8th Framework Program (Horizon 2020 [2013-2020]), RRI has emerged as a more advanced “process for better aligning R&I with the values, needs and expectations of society. It implies close cooperation between all stakeholders in various strands comprising: science education, definition of research agendas, access to research results and the application of new knowledge in full compliance with gender and ethics considerations.” The EC has also formulated Responsible Research and Innovation in terms of six key areas: (a) public engagement; (b) gender equality; (c) science literacy and science education; (d) open access; (e) ethics; and (f) governance. Indian institutions like RIS have been involved in some RRI projects of EU.

Scientific Social Responsibility (SSR)

The main objective of India’s SSR Policy, 2019 is to harness the voluntary potential that is latent in the country’s scientific community to strengthen science and society linkages so as to make S&T ecosystem vibrant. This primarily involves bridging science-society, science-science and society-science gaps, thereby bringing trust, partnership and responsibility of science at an accelerated pace towards achieving social goals. This specifically implies:

- *Science-society connect*: Facilitating inclusive and sustainable development by transferring the benefits of scientific work to meet existing and emerging societal needs.
- *Science-science connect*: Creating an enabling environment for the sharing of ideas and resources within the knowledge ecosystem.
- *Society-science connect*: Collaborating with communities to identify problems and develop scientific and technological solutions.
- *Cultural change*: Inculcating social responsibility among the individuals and institutions practicing science; creating awareness about SSR within society; and infusing scientific temperament into day-to-day social existence and interaction.

Source: Adapted from EU and India’s approaches on RRI and SSR.

sector is the largest producer of hydrogen for various refinery process operations. Hence petroleum sector's capability to produce hydrogen molecules stored and traded as gas, making it a natural votary of this new energy form. Hydrogen is also capable of aligning with the Ministry's other flagship schemes, like the promotion of compressed biogas under the Sustainable Alternative for Affordable towards Transportation (SATAT) scheme. The maturity of the ecosystem can be accelerated through its usage as a decarbonizing agent for a range of sectors, including industry covering chemicals, iron, steel, fertilizer and refining, transport, heat and power.

Refineries are planning to leverage the available surplus hydrogen capacities in grey form for meeting the initial demand in mainstreaming hydrogen. One of such projects is underway at the Indian Oil refinery in Gujarat wherein the combination of hydrogen production through natural gas and its hyphenation with the carbon capture technology will result in the production of Blue hydrogen. Efforts are also underway to leverage the vast CNG pipeline infrastructure to reduce the transportation cost of hydrogen.

Recently, India Hydrogen Alliance (IH2A) has also been established, which is an industry-led coalition that will work together with policy makers, industry players, energy-sector experts, research agencies, think-tanks, and the media, to support concerted public policy and private sector actions to developing the hydrogen economy and a domestic hydrogen supply chain in India. IH2A is committed to the creation of a national 'Bharat H2' roadmap and implementation plan, aligning it to the national renewable and electric vehicles plans to meet India's energy transition and net-zero carbon pathways. In May 2021, IH2A has submitted a six-point agenda to the Government of India for creating a domestic 'Bharat H2' supply chain and to build hydrogen systems at scale. The submission was made jointly by IH2A Steering Committee co-leads, Chart Industries and Reliance Industries, to the NITI Aayog and Ministry of New and Renewable Energy (MNRE), Government of India.¹⁰

Green Hydrogen Research and Innovation Scenario in the EU and India

Many research and academic institutions along with private sector companies are engaged in

Box 3.4: EU Hydrogen Roadmap

The Strategy document has elaborated on a roadmap for the EU encompassing the following three phases towards developing a hydrogen ecosystem in Europe.

First Phase: In the first phase, from 2020 up to 2024, the strategic objective is to install at least 6 GW of renewable hydrogen electrolyzers in the EU and the production of up to 1 million tonnes of renewable hydrogen, to decarbonise existing hydrogen production. The European Clean Hydrogen Alliance is being setup, which will help in building up a robust pipeline of investments.

Second Phase: In a second phase, from 2025 to 2030, hydrogen will be made an intrinsic part of an integrated energy system with a strategic objective to install at least 40 GW of renewable hydrogen electrolyzers by 2030 and the production of up to 10 million tonnes of renewable hydrogen in the EU.

Third Phase: In the third phase, from 2030 onwards and towards 2050, renewable hydrogen technologies is expected to reach maturity and be deployed at large scale to reach all hard-to-decarbonise sectors where other alternatives might not be feasible or have higher costs.

Source: EU Hydrogen Strategy Document (2020).

research and innovation activities on green hydrogen in Europe. The 2020 Hydrogen Strategy document has highlighted the need for promoting research and innovation in hydrogen technologies in a big way, especially in the domain of generation (cost-effective electrolyzers), infrastructure (transportation, distribution channels), and safety and standards development. Under the Research and Innovation Framework Programme “Horizon Europe”, an institutionalized Clean Hydrogen Partnership has been proposed with main focus on renewable hydrogen production, transmission, distribution and storage, alongside selected fuel cell end-use technologies.

While the Clean Hydrogen Partnership will support research, development and demonstration of technologies to bring them to market readiness, the Clean Hydrogen Alliance will pool resources to bring scale and impact to industrialisation efforts, in order to achieve further cost reductions and competitiveness. The Commission has also proposed to increase the support for research and innovation in the end-use of hydrogen in key sectors through synergies with important partnerships proposed under Horizon Europe, notably on transport and on industry. In addition, the ETS Innovation Fund, which will pool together around EUR10 billion to support low-carbon technologies over the period 2020-2030, has the potential to facilitate first-of-a-kind demonstration of innovative hydrogen-

based technologies. The Table 3.2 gives a list of some of the leading research centres/academic institutions in Europe which are involved in R&D related to Green Hydrogen.

For many years, research has been the basis for international cooperation on hydrogen. The EU, together with the US and Japan, developed the most ambitious research programmes addressing different segments of the hydrogen value-chain, and the International Partnership for a Hydrogen Economy (IPHE) was established as a first vehicle in this respect. The EU is already highly involved in IPHE, and co-leads the new clean hydrogen mission under Mission Innovation and the Clean Energy Ministerial Hydrogen Initiative (CEM H2I).

In India, some public and private universities and research centres are actively pursuing research on various areas related to green hydrogen. MNRE’s Research, Development and Demonstration (RD&D) programme on Hydrogen Energy and Fuel Cells focuses on hydrogen production from renewable routes; development of materials and techniques for safe and efficient storage of hydrogen; development of indigenous and affordable fuel cells; and, demonstration of hydrogen and fuel cell technologies in various applications. Ongoing projects include pilot scale hydrogen production facility through biomass gasification at Indian Institute of Science (IISc), and development of LT-PEM Fuel Cells at the International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI),

Table 3.2: Leading European Research Centres/Universities involved in Green Hydrogen R&D

Sl. No.	Research Institution	Country
1	Helmholtz Institute Erlangen-Nuremberg for Renewable Energies	Germany
2	University of Technology of Belfort-Montbéliard	France
3	Institut für Klimaschutz, Energie und Mobilität	Germany
4	Delft Technical University	Germany
5	Eindhoven Institute for Renewable Energy Systems (EIRES)	The Netherlands

Source: Authors’ own compilation from various sources

Centre for Fuel Cell Technology. Department of Science and Technology is also funding basic research projects in Hydrogen and Fuel Cell. The Table 3.3 provides a list of some of the leading research centres/academic institutions in India which are involved in R&D related to Green Hydrogen.

MNRE is developing a collaborative proposal to demonstrate hydrogen fuel cell vehicles in Leh as part of the initiative to make the high-altitude region of Ladakh a “Carbon Neutral Destination”. Council of Scientific and Industrial Research (CSIR) and KPIT Technologies successfully ran trials of prototype car running on an indigenously developed fuel cell stack.

In India, work on few pilot projects on Blue Hydrogen, Hydrogen CNG (H-CNG) and Green Hydrogen are being undertaken. Under a pilot project on Blue Hydrogen, blending of hydrogen with CNG for use as transportation fuel as well as an industrial input to refineries is being undertaken. 50 buses have been rolled out as part of a pilot project in Delhi that use blended hydrogen in compressed natural gas (H-CNG) with plans to scale it up in the coming months across the country.

Recently, in June 2021, during the 6th Mission Innovation (MI) Ministerial /12th Clean Energy Ministers (CEM) Summit at Chile, a new Mission on ‘Clean Hydrogen’ was launched which is being led by Australia, Chile, the UK, the US and the European Union.

Table 3.3: Leading Indian Research Centres/Universities involved in Green Hydrogen R&D

Sl. No.	Research Institution	Projects
1	Indian Institute of Science (IISc), Bengaluru	<ul style="list-style-type: none"> Using biomass gasification for fuel cell applications. Multi-fuel gasification system which uses woody biomass or biomass briquettes. Developing semiconductor Nano-composites for Photo-catalytic water splitting under solar light irradiation etc.
2	Indian Institute of Technology (IIT) Madras	<ul style="list-style-type: none"> Electrocatalysis and photocatalysis for hydrogen production, generation of solar hydrogen.
3	University of Petroleum and Energy Studies (UPES), Dehradun	<ul style="list-style-type: none"> Establishment and demonstration of H₂ production and utilization facility through photovoltaic-electrolyser system at NISE, New Delhi
4	International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)-Centre for Fuel Cell Technology, Hyderabad	<ul style="list-style-type: none"> Novel electro catalysts, depolarizers for water electrolysis, sea-water electrolysis.
5	Indian Institute of Technology (IIT) Kharagpur	<ul style="list-style-type: none"> Mission mode project will explore hydrogen production using biological routes

Source: Authors’ own compilation from various sources

This Mission aims to make clean hydrogen cost competitive to the end user by reducing end-to-end costs to USD \$2 per kilogram by 2030. The Mission will increase research and development in hydrogen technologies and deliver at least 100 hydrogen valleys across production, storage and end use of hydrogen worldwide. Since India is also a Member of both MI and CEM, India-EU partnership would stand to gain much through these institutional mechanisms too.

Energy Cooperation in India-EU Connectivity Partnership

The India-EU connectivity partnership is advancing the development of sustainable energy networks in three important ways. First, the dissemination of clean energy technologies is contributing to develop energy infrastructure and markets in India as well as in other developing countries. The extant energy infrastructure in much of the developing world is structured around fossil energy sources such as coal, natural gas, and petroleum which make the transition towards clean energy highly challenging. Furthermore, the lack of requisite technological and industrial capacities to harness clean energy technologies poses a serious challenge for creating “energy mix” based on clean energy sources. The India-EU partnership is critical to bridge these gaps and to forge cooperation in clean energy research and innovation and to further energy-based connectivity.

Second, the India-EU connectivity partnership aims to foster the development of markets and regulatory regimes for various existing and emerging clean energy technologies. The creation of such regimes is critical for rapid diffusion and uptake of clean energy capabilities and to transition towards de-centralised energy systems. Furthermore, the connectivity partnership can be instrumental to promote investments in regional energy infrastructure development and bring about much-needed investments by developing market friendly guidelines

and regulatory structures. The development of transparent regulatory framework and associated standards constitutes a first step towards enabling the flow of development finance for large infrastructure projects such as regional energy interconnections and to incentivise the both public and private sector to address systemic failures in the ways of building clean energy markets.

Third, the connectivity partnership offers an important avenue for furthering multilateral dialogue around energy and climate policy initiatives and to identify new opportunities for cooperation. The focus on critical sectors like offshore wind turbines, off-grid and grid-connected solar systems, barratry and storage devices, smart grids, and also alternate resources like biofuels, etc. offers immense opportunities to stimulate both technological and infrastructure-related innovations by private sector. The connectivity partnership thus recognises the central role of private sector in furthering the “development of renewable energy, underpinned by modernised and efficient and smart electricity systems” and for financial institutions in EU and its member states including the European Investment Bank (EIB) to support projects for bringing about transformative changes (EU, 2016).

India-EU Sectoral Energy Cooperation

Under the India-EU Clean Energy and Climate Partnership framework agreed upon by two sides in 2016, the energy cooperation between India and EU-member states has progressed rapidly in renewable energy sector as well as in other areas of clean energy cooperation such as green investments, resource efficiency, policy planning, regulation, etc. India is currently pursuing an ambitious target of installing up to 450 GW of renewable energy by 2030. Towards achieving this goal, India’s energy mix has shown rapid transformation by accelerating the deployment of solar units in households and industrial domains. The bilateral partnership has so far focussed on a) promoting energy

efficiency and investments in sectors such as offshore wind energy; b) engage public and private sector stakeholders to support offshore wind energy deployment; and c) support the International Solar Alliance spearheaded by India (MEA, 2021). Table 3.4 give the list of current India-EU cooperation in clean energy.

Since 2008, the EU has launched several renewable energy partnerships and financing initiatives in India. The bilateral cooperation is facilitated through the annual meeting of senior officials and working groups on renewable energy, efficiency, and energy security actively promote various bilateral initiatives. The European Investment Bank (EIB) is supporting a large number of projects in India. About 40 percent of EIB's projects amounting to 1.486 million euro are devoted to energy sector (EIB, 2021a). The EU member states like France and Germany are implementing in several Indian states. The French energy giant EDF has built and commissioned solar and wind farm projects that generate about 476 MW and total of 2366

MW projects are currently in the pipeline (EIB, 2021a). The notable EDF projects in solar sector include three photovoltaic parks in Rajasthan, 120 MWp Thar desert solar farm project, and 105 MW wind farm commissioned in Gujarat (EIB, 2021b).

Similarly, German development agency GIZ and development Bank KfW have built strong cooperation in the areas like energy efficiency, development of the Energy Conservation Building Code (ECBC) for multi-storey residential buildings, large-scale grid integration of renewable energies, Green Energy Corridor (GEC), and photovoltaic (PV) roof systems (IGEN, 2021). The International Solar Alliance (ISA) founded by India together with France on the sidelines of COP21 emerged as an important platform for cooperation in solar energy. The EIB European Investment Bank (EIB) is one of the largest sources of financing in solar energy in India has approved solar projects worth €640 million to meet the energy needs of over four million households in India (EIB, 2018). Besides

Table 3.4: List of cooperation and project examples

• Eco-Cities (Mumbai, Bengaluru, Pune, Chennai, Bhubaneswar, including public lighting, waste to energy, rooftop solar) [EU]
• EIB-IREDA Renewable Energy & Energy Efficiency Loans [EU]
• Green Energy Corridors (7700 km new transmission lines, 165 substations, total project costs €1.7bn) [DE]
• NEEV II fund (State Bank of India) receiving €25m EIB equity investment for small businesses including solar PV, onshore wind and small hydropower. [EU, IN]
• IELECTRIX (smart grids, co-financed under Horizon 2020, implemented by Enedis). [EU, FR, others]
• India-Denmark Green Strategic Partnership (technical cooperation for efficient and sustainable rural water supply) [DK]
• Rajasthan Solar (ENEL Green Power) [IT]
• Regional Centre of Excellence on Offshore Wind Energy (virtual centre, to gather expertise on offshore wind and use it in India and regionally) [DK]
• Smart grids joint research, co-investing €12m for increased storage capacity of mixed energy sources [EU, IN]

Source: European External Action Service.

development of physical infrastructure, the bilateral cooperation also focuses on capacity development through knowledge sharing on technologies, policies, and regulations. As part of the ongoing EU-India Clean Energy and Climate Change Partnership, the two sides have taken several steps to explore ‘policy and regulatory approaches’ for promoting business solutions and support joint innovation activities’ (MEA 2021). Furthermore building on the EIB partnerships with the Indian Renewable Energy Development Agency and the State Bank of India (SBI), the two sides can expand the scope of financing mechanisms for stimulating green investments and in sectors such as hydrogen and energy storage.

Cooperation in Off-Grid Solar Systems

India’s ambitious vision to transform its energy systems presents large-scale requirement for clean energy finance. It is estimated that India will need about \$2.3 trillion to meet its climate targets, and stronger EU-India cooperation in directing private finance flows towards climate change mitigation becomes crucial (KAS, 2020). Furthermore, the clean energy transition also makes India one of the largest markets for technologies like on-grid and off-grid solar systems. The key stakeholders in India’s domestic energy ecosystems namely the Ministry of Science & Technology (MoST) and Ministry of New and Renewable Energy (MNRE) are leading the efforts to promote the expansion of off-grid solar solutions through

partnership with EU and its member states.

India’s Ministry of New and Renewable Energy (MNRE) has partnered with global financial institutions such as European Investment Bank (EIB), World Bank, Asian Development Bank (ADB), GIZ, and USAID to provide technical assistance and support for its roof-top solar programme. Table 3.5 gives the details of international development finance in India’s clean energy sector. The MNRE has already established a dedicated PV rooftop-cell for furthering technical cooperation with the European Union. The off-grid solar is one of the critical areas that offer immense opportunities for cooperation between EU and India. The decentralised off-grid solar systems are crucial for providing electricity access to large suburban and rural populations and to address the problems of greenhouse emissions around the world. India has identified ‘off-grid solar systems’ as an important area of cooperation with EU for joint R&D and innovation. India’s off-grid R&D priorities mainly focus on de-localised power management, delivery, regulation, market development, awareness, business models, etc.

As a member of ‘Mission Innovation’, a global clean energy initiative of 22 countries including EU, India has outlined many joint research & development projects for fostering off-grid-related technological capability building in India (DST, 2018). Under Mission Innovation, India’s Ministry of Science and

Table 3.5: Clean Energy Financing (\$ Million)

Bank/Year	2017	2018	2019	2020	2021
Asian Development Bank	175	105	702	-	-
Asian Infrastructure Investment Bank	260	-	-	-	304
European Investment Bank	200 (Euros)	230 (Euros)	103 (Euros)	8.7 (Euros)	-
New Development Bank	-	-	300	-	-

Source: Data collected from websites of individual banks.

Technology (MoST) has made investments through collaborative funding models involving academia, industry, and international partners. The collaborative R&D programme has so far resulted in 75 joint R&D projects with participation of various MI member countries. This also includes the joint funding opportunity of US \$17 million by India's Ministry of Science and Technology. In addition, India has also funded about 26 Projects and three virtual centers for developing smart and off-grids solutions (Mission Innovation, 2021).

The partnership between EU and MNRE also has enormous potential in the area of India's rural energy market. In recent years, India governments have accorded strong emphasis on providing last mile electricity access through deployment of off-grid and rooftop solar applications. Towards meeting lighting and electricity needs, India is supporting the deployment of solar study and street lamps, power packs, etc. in rural areas as well as in the North-Eastern states. In 2020, the MNRE has launched the renewable energy service company (RESCO) model for implementing off-grid solar power plants of individual size up to 25 kilowatt (kW) (MNRE, 2020). Furthermore, PM-KUSUM scheme is promoting the installation of solar pumps, and solarization of existing agricultural pumps through financial support. The non-availability of affordable storage solution however poses significant challenge and EU-India partnership can undertake joint R&D projects and establish centres of excellence for promoting smart and integrated energy solutions (MNRE, 2020).

Offshore Wind Project of India (FOWPI)

India's long coastline of about 7600 kms offers vast potential for generating offshore wind energy. Considering this, the MNRE has announced the goal of achieving 5GW offshore wind energy target by 2022 and 30 GW by 2030 (MNRE 2021). The announcement of these targets followed by the invitation of proposals to set-up India's first 1GW offshore wind project has signalled tremendous

opportunity for market players in this sector. First Offshore Wind Project of India (FOWPI) is a project funded by European Union (EU) provide technical assistance in preliminary implementation of first off-shore wind farm project of India, on a sea bed area of 70 sq. Km. The project aims to support MNRE and India's National Institute of Wind Energy (NIWE) to strengthen country's offshore wind energy sector.

To harness offshore wind in Indian states like Gujarat and Tamilnadu, the MNRE has undertaken preliminary studies to set-up wind farms. The successful commercialisation and deployment of these technologies by European giants such as Germany, Denmark, Netherlands, etc. offers immense scope for technological adaptation and development of offshore wind industry in India. The market competitiveness of tariffs from offshore wind terminals offers good scope for harnessing this technology under India-EU connectivity partnership and EIB aims to support viable proposals from private sector. The European Investment Bank is ideally placed to finance offshore wind projects in India with adequate provisions for risk mitigation, and technical assistance for development.

Energy Efficient Buildings

The EU-India cooperation has strong potential to expand in area of resource efficiency and energy efficient buildings. The EU has funded various projects in the areas of energy efficient buildings, which involves adoption, enforcement of and compliance with the ECBC (Energy Conservation Building Code) in India by facilitating the transfer of knowledge and technological know-how.

Regional Energy Interconnections

As envisaged under the EU-India clean energy partnership, the idea to promote "market-driven clean energy transformation" including through "national" and "regional" level interconnections offers significant potential for furthering EU-India connectivity partnership. At the regional levels, India has accorded

strong emphasis on attracting investments in regional electricity infrastructure development. Towards facilitating regional energy trade, India has launched a series of policy reforms for creating regional power transmission and distribution infrastructure to enhance clean energy flows between India and its neighbours. Widening regional transmission and distribution infrastructure, however, holds a key to fully reaping the benefits of cross-border energy trade and calls for resolution of several technical, administrative, and financial divergences. Currently, much of the cross-border energy trade between India and its neighbours is governed through intergovernmental agreements signed in the sub-region of BBIN including countries of Bangladesh, Bhutan, India and Nepal and there is much scope for market-driven models of clean energy development and transmission through commercial agreements between private companies.

The EU-India clean energy connectivity partnership can be particularly beneficial in terms of creating transmission infrastructure including power grids, gas terminals, etc. Developing a regional transmission infrastructure could optimize the overall generation potential and achieve cost efficiency through market-based price discovery system and enable substantial cost savings across the region. At its core, the development of regional energy infrastructure requires not only soft infrastructure of harmonized grid codes and regulatory framework but also sustainable and credible financing mechanisms. The participation of European Investment Bank in this regard, offers a key to furthering regional energy connectivity in a sustainable manner and to realise the vision of achieving 'one-sun', 'one-region', and 'one-grid' objective. India-EU leverage the potential of EIB and other financial institutions in EU Member States' for bringing expertise and finance to developing regional energy interconnections.

India-EU Dialogue on STI Connectivity: Emerging Contours & Action Areas

The India-EU Strategic Partnership roadmap clearly advocates enhancing the India-EU partnership through a wide range of cooperation tools and activities, including through financial and technical assistance (such as with development banks and investment banks from both sides, including the European Investment Bank), consistent with and in pursuance of respective obligations and responsibilities under major international agreements such as Agenda 2030, the Addis Ababa Action Agenda, UNFCCC and the Paris Agreement as well as the United Nations Convention on Biological Diversity.

The priorities of access, equity, and inclusion are of paramount importance and, therefore, traditional knowledge-sharing models need re-engineering based on a larger and universal development purpose. The EU can play an effective role in influencing financial institutions and MDBs to develop guidelines and define progressive norms of global technology governance to facilitate technology transfer and support established innovation systems, as well as advanced models, such as mission-oriented projects, open innovations, and innovation networks. Further, financial institutions and MDBs, combined, have significant influence over technology transfer, specifically, the manner in which technology reaches developing countries through the private sector. This would enhance the credibility of UN-led processes, particularly the SDGs as a common goal. The EU can act as a guiding force in bringing multiple international agencies together, including UN agencies that are working on rigorously leveraging STI to expedite sustainable and inclusive development globally.

While developing countries have made significant progress in leveraging technology for catch-up, leadership from developing

countries on innovation for a vast cohort of technologies is yet to come. Local skills and capacities should be developed, keeping in mind SDG gaps and STI capabilities. Beyond technologies, cross-country cooperation that urgently builds absorptive capacities is extremely important, especially as technology transfers are accompanied by knowledge transfers on policy and ecosystems on best practice methods. This is something that India is practising in terms of creating digital public goods and their wider applications in fellow developing countries.

When mapping SDG gaps and tallying those with STI resources, one often finds that the enormity or the complexity of the challenge is daunting and pre-existing STI solutions are inadequate (and all necessary solutions are not sufficient). This makes STI enterprise even more complex and localization efforts more challenging. The India-EU partnership could be a realistic strategy to overcome such problems. Increasingly, faster diffusion of ICT technologies has raised hopes and expectations, but digital divides are still impeding progress. This can also be said for ICT solutions for user interfaces driven by local customization, even as core technologies defining Industry 4.0 (that aid both producers and consumers) are still beyond the reach of several countries. The ecosystem approach on matching wider R&D efforts and access to the Industry 4.0 cohort of technologies would enable fuller realization of SDGs (Chaturvedi, Rahman and Srinivas, 2019).

Action Areas to deepen India-EU Connectivity on Technology and Development

The COVID-19 pandemic has created unprecedented momentum and cooperation in leveraging Science, Technology and Innovation (STI) through, for example, vaccine research, improvisation on therapeutics, and the development of affordable diagnostic kits, as well as other solutions that enable safety and hygiene. The EU as well as India have been at the forefront of STI, and are leading such efforts.

The EU and India should explore specific areas of STI collaboration for vaccine research with immediate focus on improving global supply of Covid-19 vaccine. India and the EU should also explore long term collaboration for future pandemic surveillance, preparedness and mitigation.

The EU and India should develop means to build an ecosystem of institutions and processes for STI-SDGs, aided by data- and indicator-driven technology foresight, gap analysis, priority interventions, and qualitative information. They must also focus on developing inventories and mapping mechanisms for technologies, financial resources, expenditure reviews, and capabilities, suited to (and dynamically adjusted to) existing and evolving ecosystems. Additionally, developing appropriate technology classification, in terms of use, stage of development, cost of development, ethical and socio-economic assessments, and ownership and technology transfer models. Wider application and potential of technologies in solving longstanding challenges should trigger faster adoption.

India and the EU should strongly focus on partnering with the private sector to improve development, deployment, and access to STI products and services; ensuring greater participation of the private sector in the Innovation System; encouraging the private sector to invest more in R&D and contribute to technology development aimed at fulfilling the objectives of the SDGs. Possibilities offered by inclusive, frugal, and responsible innovations in meeting the SDGs should also be explored.

As part of India-EU partnership, skill and capacity building in STI need to be connected to the priorities outlined, in the SDGs. As already outlined this would be facilitated through thorough mapping exercises and strengthening of institutional, policy and business deliverables. It is noted that the prospects of knowledge hubs and incubators (under Goal 9) would further enhance the innovation ecosystems in keeping with successful global trends leading to plethora

of technology led solutions to social sector development as well as sustainability. These would enable shift to low carbon trajectories, equity in terms of promoting inclusivity and access; and moving from informal to formal processes of economic activities, resource mobilization, promotion of local solutions and social entrepreneurship.

In case of India, supply of industrial innovations have been less encouraging and hence appropriate proven technology solutions for mitigating complex socio-sustainability challenges are not locally available. While India offers a huge market for technology led products and services, the notional 'deficits' on appropriate technologies would stagger both development and sustainability transitions. It is important that the India and EU explores possibilities of technology collaboration across public and private sectors to solve technological challenges linked with sustainability transitions and human wellbeing. EU can tap on India's 'talent pool' and set up technology accelerator labs, design hubs, and open innovation partnerships for mutual benefit.

The EU and India should create multiple platforms of bilateral and regional engagements on technology cooperation on STI for global public goods. This may be utilized as a tool not only to strengthen alignment, review and resource mapping for national STI for SDGs efforts but also as a conscious agenda to trigger international cooperation on knowledge, technology transfer, capacity, network and finance for the operationalization of the TFM. One key element in the faster creation, consolidation or propagation of global public goods is that of accelerated diffusion of proven technologies.

As outlined, in the India-EU Connectivity Partnership document, this will include cooperation in normative regulations, standards and physical projects, and will incentivise private sector actions and investments in all dimensions of the sustainable connectivity partnership, including with the European Investment Bank (EIB) and public and private financial institutions of the EU Member

States and India. Technology facilitation, innovation, availability and access should be integral to norm setting on physical and digital connectivity.

The Climate Technology Centre and Network (CTCN) of the UNFCCC; National Cleaner Production Centre Initiative; Green Industry Platform; Global Environment Facility (GEF); and the Green Climate Fund (the GCF) need to be strengthened manifold to make any meaningful impact. This cannot happen without financing mechanisms; need assessment, stakeholder participation and most importantly relevant actors who make up for science, technology and innovation value chains are strongly connected for creation and propagation of global public goods (that address public health, climate change, food security, watershed management, environmental pollution etc.). The EU has a special role in terms of facilitating the above, while developing countries like India should lead the way in demonstrating technology driven approaches in development and sustainability interventions.

In the field of green hydrogen, EU-India joint R&D projects, technology development projects on advance fuel cell technologies can be undertaken. India, being Member of the International Partnership for a Hydrogen Economy (IPHE), Mission Innovation and Clean Energy Ministerial Hydrogen Initiative (CEM H2I), where the EU is already highly involved, can leverage these institutional mechanisms to promote advance R&D in green hydrogen in the country.

The potential for setting up of Joint Ventures (JVs) in Electrolysers for Green Hydrogen Production can be considered since EU is the leader in electrolysis industry to augment India's manufacturing capacities. The EU has many funding mechanisms within its various Programmes and Initiatives such as Horizon Europe, Mission Innovation, etc. which can be leveraged to fund projects on green hydrogen technology development. Collaboration on Standards, Safety and Regulatory Framework: India could partner with the EU to gain

greater insights on setting up of standards and safety measures for green hydrogen. The industrial capabilities would enable the export of affordable green hydrogen from India to the neighbouring and other developing countries in future.

Furthermore, the prospects for triangular cooperation to promote joint infrastructure projects in Africa, Central Asia and the Indo-Pacific converges can be considered based on provision of alternate finance in transparent, sustainable, and efficient manner. The idea to deliver 'public goods' through provision of clean energy development across developing countries represents a new dimension of India-EU partnership. The scaling-up of off-grid solar across Africa can unlock the potential for private sector to deploy small-scale solar energy systems in African countries and to realise the energy needs of in rural areas including refugee camps, urban areas and remote villages across Africa. The extant barriers including investment gaps and financial barriers need expeditious resolution.

The EU and India can consider different models to overcome financing, technical and customer challenges to scale up off-grid solar deployment. With support from European Investment Bank, the two sides can scale-up the existing off-grid solar projects across Sub-Saharan Africa. The regional energy interconnection in India's neighbourhood offers immense prospects for furthering investments and cooperation. The lack of regional energy interconnection poses significant barriers for cross-border energy trade between India and its neighbours and to fully harness clean energy endowments in the region.

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4

Development Finance



Introduction

As both India and EU are exploring new areas of cooperation, development finance would play a critical role in realising the goals envisaged in the India-EU Strategic Economic Partnership. Both the economies are embarking on the new sources of economic growth, for which access to finance needs to be diversified and enhanced. Moreover, the ensuing economic transformation owing to production fragmentation, growth of services sectors, spread of new digital technologies, higher trade and investment flows, and rapid rise of Fintech and financial services sectors requires sustained flows of finance to critical economic sectors especially infrastructure and connectivity sectors. Along with traditional infrastructure sectors such as roads, railways and urban utilities, the importance of building quality and resilient infrastructure, for example digital infrastructure, green infrastructure has grown significantly over the years. Both sides are keen to promote the inclusive and sustainable infrastructure as a means to achieve sustainable development goals and provide necessary impetus to the emerging services sectors such as digital financial services.

India has been an attractive destination for foreign direct investment for past several years. In recent years, FDI flows to India has

grown remarkably which could be attributed to liberal FDI policy regime by the incumbent government at the centre particularly lifting caps in different economic sectors except a few strategic sectors and enabling faster clearance of investment proposals through automatic route and single window clearance system. During the first quarter (April-June) of 2021-2022, FDI equity inflows have increased by 168 per cent marking 90 per cent over the previous year. Automobiles, computer software and hardware and services sectors are the top sectors for foreign investment. Further, improved business environment in the country manifested in dramatic elevation in 'Ease of Doing Business' in past few years, streamlining investment procedures and arbitration formalities, enactment of Insolvency and Bankruptcy Code, trade facilitation and logistics reforms and other forward-looking reforms are key enablers of the economic transformation in the Indian economy.¹

India has set an ambitious agenda for infrastructure development which encompasses all three important components of physical, social and digital infrastructure. National Infrastructure Pipeline (NIP)² for 2019-2025 and subsequent National Monetisation Pipeline (NMP)³ announced a few months back capture the seriousness and intent of the Government

of India on infrastructure development and improvement of connectivity corridors including cross-border connectivity projects such as Trilateral Highway and Kaladan Multi-Modal Transit Transport Project. As emphasized in NIP, 15 to 17 per cent of aggregate outlay of capital expenditure is to be financed through innovative financing mechanisms including Development Finance Institutions (DFIs). It would require widening the financing choices beyond concessional financing by the multilateral institutions and leveraging on innovative funding models by DFIs. India and EU should explore the new sources and instrument of funding connectivity and infrastructure projects.

Falling Dependence on Official Development Finance

Although Official Development Assistance (ODA) is a vital component of development finance for developing countries, India's dependence on ODA has gone down over time. ODA from EU and the individual member countries of EU has declined since 2010. Although it fluctuated during 2013-2015, in overall terms a declining pattern has been observed in the EU ODA flows in the past few years (Table 4.1). Likewise, assistance from the EU member countries exhibit mixed trends. Germany, one of the major countries within EU, has experienced a steep fall in its ODA to India whereas France and Italy have either maintained or increased their support to India.

Table 4.1: ODA Flows from EU to India

(\$ Million)

Country	2010	2015	2016	2017	2018	2019
Germany	388.5	809.4	237.3	542.7	236.8	555.5
France	2.6	57.2	144.1	183.5	290.6	214.7
UK*	631.8	257.5	125.8	120.1	123.4	137.5
Italy	10.7	12.7	15.7	11.6	17.1	16.7
Poland	0.2	0.1	0.1	1.3	1.3	7.6
Spain	10.1	2.3	3.6	5.1	4.9	6.1
Sweden	9.8	5.7	4.9	5.0	5.1	5.4
Austria	2.1	3.6	3.9	4.1	4.9	4.6
Hungary	0.2	1.7	1.2	1.3	3.5	4.0
Netherlands	2.3	2.3	0.8	0.4	1.4	2.6
Denmark	9.3	1.5	-2.3	3.4	0.8	1.8
Luxembourg	3.8	2.2	2.1	2.3	1.4	1.7
Belgium	7.0	3.1	2.3	1.3	1.6	1.1
Ireland	4.3	2.0	1.3	2.0	1.6	1.0
Finland	6.0	1.4	2.3	1.6	2.1	1.0
Portugal	0.4	0.3	0.3	0.4	0.4	0.4
Czech Republic	0.2	0.02		0.01	0.14	0.12
Greece	0.1	0.02			0.01	
Slovak Republic	..	0.02	0.02	0.03
EU	1089.3	1163.1	543.3	886.2	696.9	961.7

Source: OECD Stat. (extracted on 22 Oct 2021).

Notes: Net ODA disbursements are presented at 2019 constant prices. The United Kingdom withdrew from the European Union on 31 January 2020.

In essence, this pattern in ODA flows highlights an important policy imperative for both India and EU to consider in the coming years. There is a need for expanding access to commercial investments and financing windows of the DFIs. In addition, private capital can be better channelised by the DFIs on both the sides. Infrastructure sectors being high-risk sectors would demand specific funding models in general.

Thrust on Financing by Multilateral and Regional DFIs

Funding of development projects in India by multilateral and regional development banks has consistently increased in the past few decades. Besides traditional sectors of funding, there is growing appetite for project financing in solar, other renewables and clean energy sectors and projects dealing with sustainability in the country. Lending by the World Bank and the Asian Development Bank (ADB) constituted a lion’s share of development financing in India in the past, and the two entities continue to remain crucial sources of development financing for India.

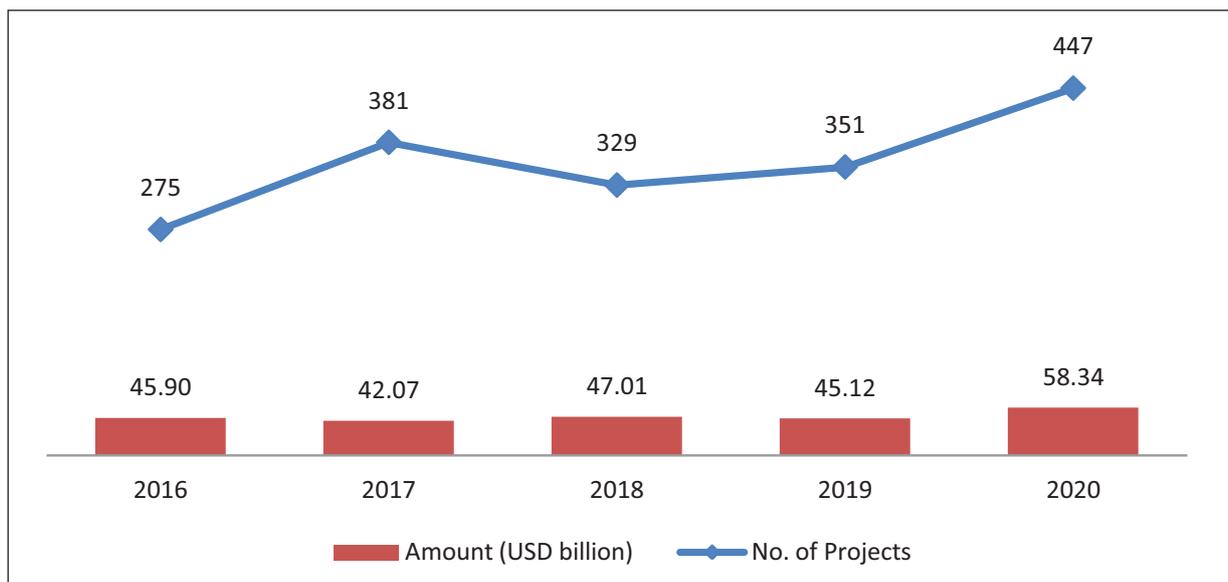
World Bank

The global lending portfolio of the World Bank has reached \$58.34 billion in 2020; 29 per cent higher than the previous year (Figure 4.1). Total projects approval also increased from 351 to 447 during the same time period. Cumulative lending by the Bank to member countries during 1945-2020 is estimated to be \$1.77 trillion comprising of \$0.75 trillion by IBRD and \$0.42 trillion by IDA.

The sectors with highest commitments by the World Bank over the period 2016-2020 were public administration (\$37.51 billion, 16 per cent) followed by energy and extractives sector (\$32.46 billion, 14 per cent), social protection sector (\$24.01 billion, 10 per cent), industry and trade services (\$23.22 billion, 10 per cent), transportation (\$22.85 billion), water, sanitation and waste management (\$21.08 billion) and health (\$20.76 billion).

For India, lending by the World Bank has gone up significantly from 2020 after steep decline 2018-2019. Over the five years, total lending in the country has doubled from \$4.3 billion in 2016 to \$10.9 billion in 2021. Projects

Figure 4.1: Development Finance Commitment by World Bank (IBRD & IDA) (\$ Billion)



Source: Author’s calculation based on the data from World Bank.

Note: Total amount is total amount of grant and loan commitment of IDA and IBRD.

covered a wide range of sectors like housing, water and sanitation, energy transmission and distribution, rural and inter-urban roads, health, irrigation and drainage, education, agriculture extension, social protection, among others (Figure 4.2).

Asian Development Bank

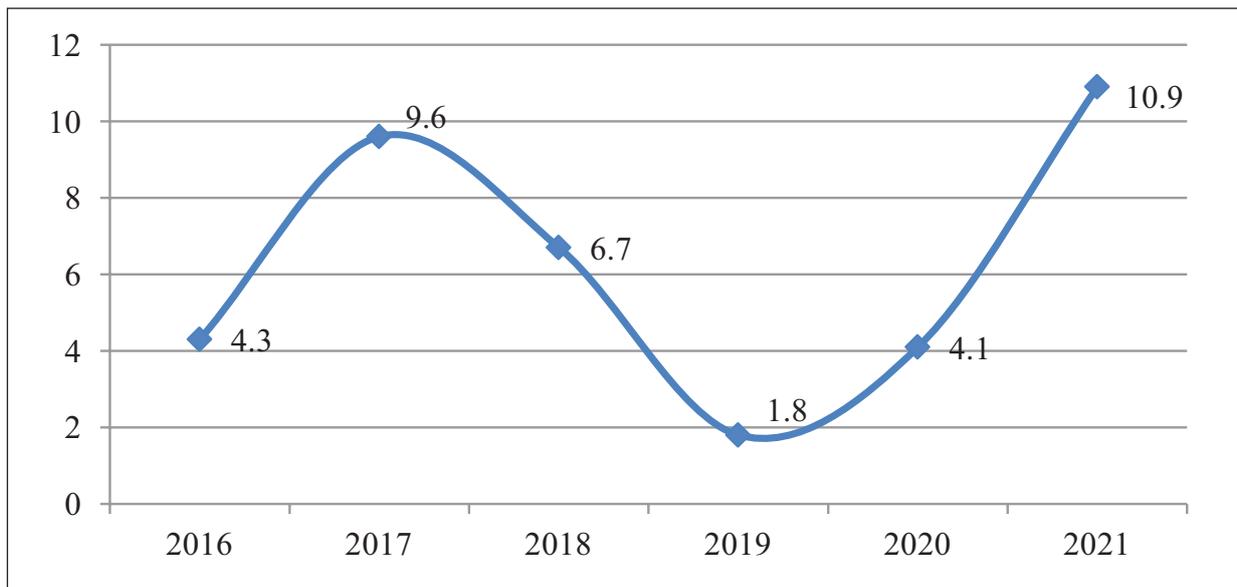
Total global operations of ADB have grown tremendously over the years. It has increased from \$14.93 billion in 2016 to \$31.6 billion in 2020 marking more than two-fold rise in five years. Likewise, co-financing by ADB has grown from \$12.2 billion to \$16.4 billion during the same period (ADB, 2020). The operations of ADB in India are quite large and diverse in terms of sectors. Assessment of trends in sovereign projects indicates that annual lending by ADB in India during 2010-2019 has been around \$3 billion, on an average, except 2015 when it dipped to \$1.5 billion (Table 4.3). The key sectors in those ADB lending has mostly concentrated are mostly agriculture and infrastructure sectors such as transport, energy, water and other urban infrastructure & services.

During 2015-2019, transport sector attracted a dominant share of ADB loans to India. Energy sector that has been a focus sector of funding by most of the DFIs has got equal attention of ADB in India as well (Figure 4.3).

Asian Infrastructure Investment Bank

Beginning operations in 2016, the Asian Infrastructure Investment Bank (AIIB) has significantly expanded its lending portfolio in 31 member countries in Asia and other regions. As of October 22, 2021, 147 projects have been approved and 50 proposals are in pipeline with total approved funding of \$28.98 billion and committed funding of \$21.43 billion. With an ambitious agenda of supporting infrastructure development in the Asian region, AIIB funding has primarily focused on Energy (20 per cent), Financial Institution (17 per cent), Transport (15 per cent), Economic Resilience/PBF (11 per cent), Public Health (9 per cent), and Water (7 per cent) and Urban sector (7 per cent). Financing of projects involve both sovereign (96 projects) and non-sovereign (51) funding constituting 65 per cent and 35 per cent of the total approved projects respectively.⁴

**Figure 4.2: World Bank Lending in India
(Total IDA and IBRD Commitment, All Sectors, \$ Billion)**



Source: RIS based on data from World Bank Website (www.worldbank.org) accessed on October 23, 2021.

India is a founding member of AIIB with the second highest contribution to its paid-up capital. As of now, with 27 projects India accounts for 18.4 per cent of the total approved projects of AIIB with total funding of \$6.67 billion; comprising of \$5.8 billion sovereign and \$0.865 billion non-sovereign funding. In terms of magnitude of loans, AIIB funding of projects in India has grown significantly from \$645 million in 2019 to \$1.75 billion and \$1.5 billion in 2020 and 2021 respectively (Table 4.3).

Although AIIB is a new generation bank, the sectoral composition of lending is not drastically different from traditional DFIs like ADB and the World Bank. Transport still constitutes a major sector even though energy and public health are gaining importance in the recent years. In terms of instruments, like ADB, AIIB relies on sovereign loans. The non-sovereign component is growing but still relatively low (Table 4.4).

New Development Bank

Like AIIB, the New Development Bank (NDB) is a new-generation regional DFI. Since establishment, it has focused sustainable development projects in the BRICS countries. In five years of its operations (2016-2021), the

total lending by the bank has reached \$25.7 billion with 72 approved projects. The volume of lending has expanded by almost seven times during this period from \$1.54 billion in 2016 to \$10.28 billion (NDB, 2020). Like other regional development banks traditional sectors still dominate the lending portfolio of NDB in India. Urban development and transport attract the bulk of funding with more projects than clean energy which is currently to the magnitude of \$300 million (Table 4.5).

European Investment Bank

The European Investment Bank (EIB) has been funding several projects in infrastructure and connectivity sectors within the European Union (EU) and in other regions including Asia and Africa. In general, EIB funding of projects outside EU account for close to 15 per cent of its global funding portfolio. In the non-EU funding component of EIB, Asia and Central Asia has consistently hovered around 1.5 per cent over the period 2016-2020. In 2020, EIB funding focused on five countries in South Asia and Southeast Asia such as Cambodia (3 projects), China (1 project), India (2 projects),

Table 4.2: ADB Sovereign Projects by Sector, 2015-2019

(\$ Million)

Sector	2015	2016	2017	2018	2019
Agriculture, Natural Resources and Rural Development	120	100	66	375	292
Energy	540	438	175	105	702
Health	301	-	-	-	-
Education	-	-	165	150	-
Transport	473	1151	1937	460	1956
Water and Other Infrastructure and Services	80	200	386	845	206
Public Sector Management	-	-	301	-	-
Finance	-	330	-	301	-
Industry and Trade	-	126	-	-	-
Multisector	-	748	-	331	-

Source: Author's Compilation from ADB (www.adb.org) accessed on October 22, 2021.

Notes: Multi-sector includes a few combined sectors including agriculture, natural resources and rural development; water and other urban infrastructure and services, transport, energy, and industry and trade.

Maldives (one project) and Nepal (1 project) and one country in central Asia (Uzbekistan-one project).

Although it is observed that project lending in India by multilateral development banks have, by and large, grown over the years with some fluctuations in the annual commitments. Unlike that trend, EU loans in India have declined steadily since 2017. It needs to be reversed preferably to the pattern observed during 2015-2017. The relatively low level of funding by EIB in India suggests better coordination among the investment promotion agencies and the business houses. Government intervention is need to create awareness about the potential sectors of investment and the modalities both the countries are considering to exploit that potential.

As observed in case of other development banks, transport and energy are basically the two broad sectors of EIB investment in India (Figure 4.5). While the India-EU connectivity partnership envisages investments in new sectors such as digital connectivity, energy connectivity especially in green hydrogen,

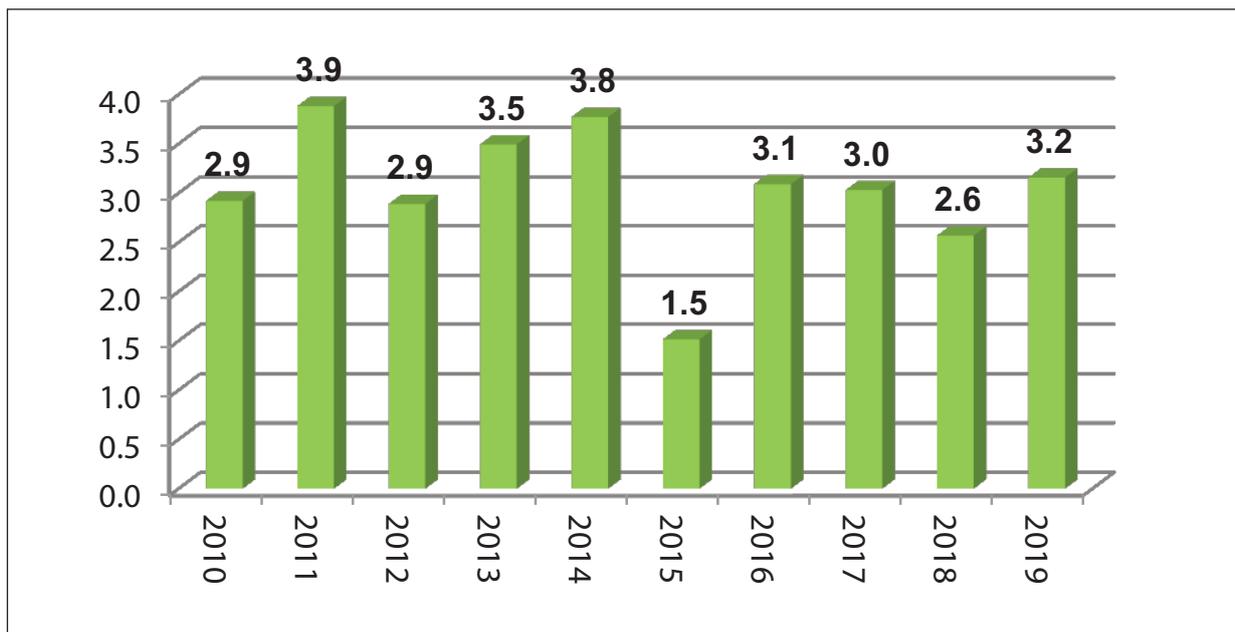
solar, etc, the current trends and pattern of investment by EIB is discouraging.

Banking

Besides development finance institutions, banks are important players in provision of industrial and development finance. Commercial banks worldwide extend credit to infrastructure sectors and fund connectivity projects. Along with domestic banks, a good number of foreign banks are operating in India. Given the growing demand for infrastructure financing, foreign banks can actually seize the opportunities in India’s booming infrastructure sector. As per the latest survey conducted by the Reserve Bank of India on international trade in banking services, it is observed that foreign banks are gradually expanding their business in India with stable performances of key banking indicators. For example, the total number of foreign banks branches has increased from 294 in 2018-2019 to 306 in 2019-2020 marked by a proportionate rise in total number of employees from 23,248 to 23,548 during the same period. Credit extended has fallen modestly even

Figure 4.3: ADB Sovereign Projects, 2010-2019

(\$ Billion)



Source: Author’s Compilation from ADB (www.adb.org) accessed on October 22, 2021.

though deposits witnessed a healthy rise. Total assets of all the foreign bank branches were estimated to the tune of \$166.3 billion as of March 2020 (RBI, 2021).

As far as EU is concerned, good number banks from EU countries are operating in India in major cities like Mumbai and New Delhi. As of July 14, 2020, 33 branches of 5 banks and 19 representative offices from EU countries have presence in India. Deutsche Bank and BNP Paribas are two leading banks from EU with 17 and 8 branches respectively. Germany, France and Netherlands are conducting their businesses through both bank branches and representative offices, other countries including Italy, Spain, Belgium, Portugal, Austria and Sweden are primarily operating through their representative offices. In nutshell, 9 EU countries are currently functioning in India which signals greater scope for EU banks in the country in the future (Table 4.6).

BNP Paribas and Societe Generale are two oldest EU banks operating in India. BNP Paribas, a French Bank, has over 2.5 million individual clients and more than Euro 1.4 billion capital invested in India. As of July 2021, there are 137 branches with 11,000 employees and more than 3400 franchises of Sharekhan across 634 cities as of July 2021. Global Capability Centres (GCCs) in Bengaluru, Chennai and Mumbai providing technology and operations support to BNP Paribas globally. BNP Paribas offers various corporate and institutional banking products and services, covering flow banking (transaction banking), financing, hedging, global markets, derivatives and investments. Cortex FX is a multi-product forex platform that offers range of FX swap, hedging, and innovative trading strategies.

Rabobank Group from the Netherlands has been operating in India since 1998. The main lines of business of the group in India

Table 4.3: AIIB Lending in India

Year	Sovereign		Non-Sovereign	
	No. of Projects	Amount (\$ Million)	No. of Projects	Amount (\$ Million)
2017	4	924	1	150
2018	3	995	2	150
2019	2	645	3	240
2020	3	1750	1	200
2021	6	1496	2	125
Total	18	5810	9	865

Source: Author's compilation.

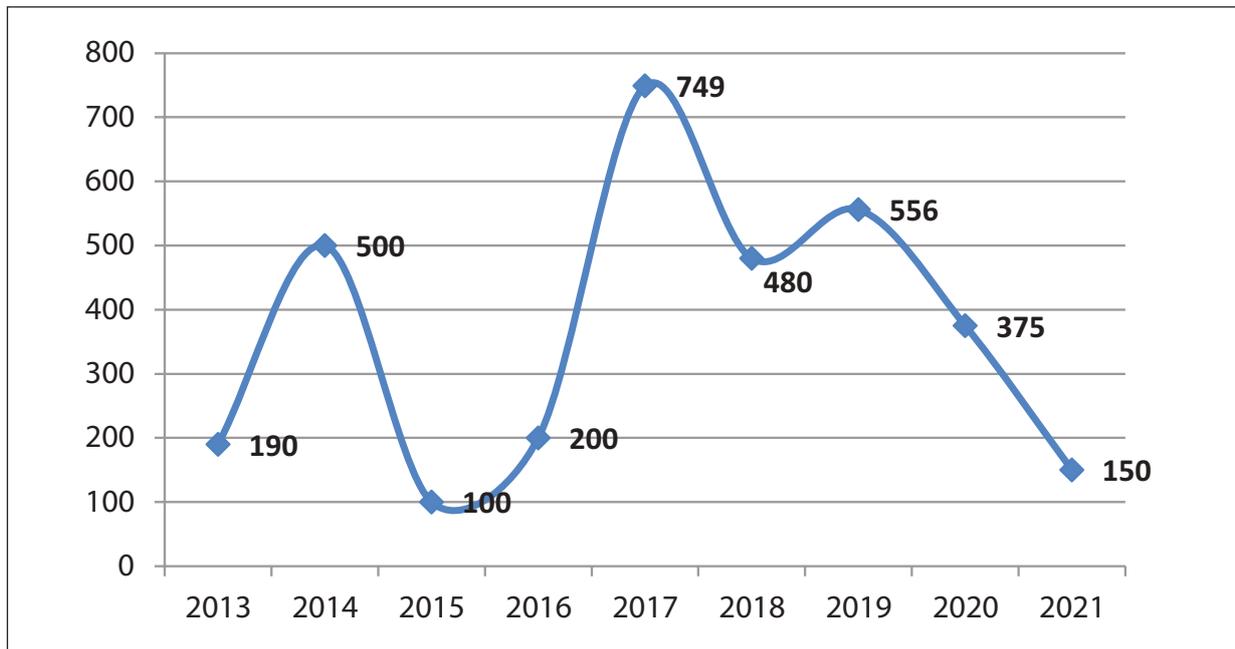
Table 4.4: Sectoral Composition of AIIB Funding (Cumulative, 2017-2021)

(\$ Million)

Sector	Sovereign	Non-Sovereign
Public Health	500	-
Transport	2616	50
Water	545	-
Urban	210	-
Energy	564	190
Economic Resilience	750	-
Other	625	-

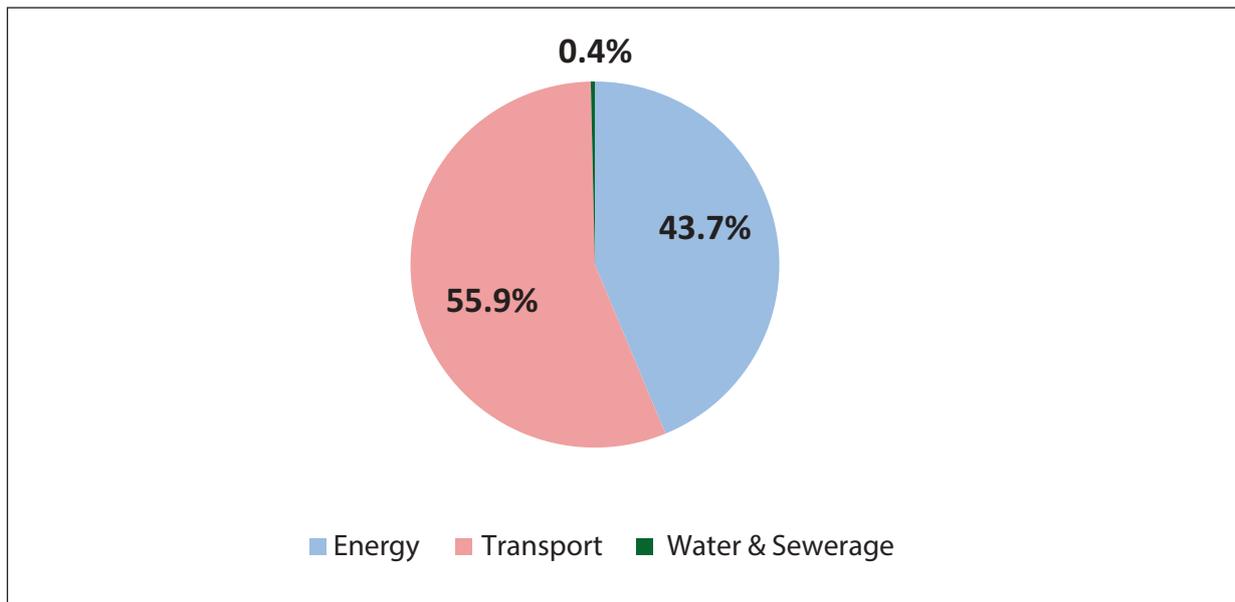
Source: Author's compilation.

Figure 4.4: EIB Funding in India, 2013-2021 (EUR Million)



Source: RIS based data from EIB website, accessed on October 22, 2021.

Figure 4.5: Major Sectors of EIB Funding



Source: RIS based data from EIB website, accessed on October 22, 2021.

Table 4.5: NDB Loans to India, 2016-2020

(\$ Million)

Sector	2016	2017	2018	2019	2020
Transport	350 (1)	-	875 (3)	646 (1)	-
Water Resource Management and Sanitation	-	815 (2)	-	312 (1)	-
Urban Development	-	-	260 (1)	525 (2)	1250 (2)
Clean Energy	-	-	-	300 (1)	-
Multiple Areas	-	-	-	100 (1)	
COVID-19 Emergency Plan	-	-	-	-	2000 (2)

Source: RIS based on data from NDB Website (www.ndb.int) accessed on October 23, 2021. Note: No. of projects are mentioned in the parentheses.

include corporate banking, Markets, project finance, food & agribusiness, trade finance, cash management and international banking. The banks build on its deep understanding of the local food and agribusiness and renewable energy sectors of the country. Total assets of the Bank has gone up from EUR 590,437 million in 2018 to EUR 632,258 million in 2020 and to EUR 650,997 million by first half (June 2021). Of which, private sector loan portfolio was EUR 414,197 million which more or less stabilized around this level in the last three years. Deposits have increased over time and non-performing loans have reduced from EUR 18,436 million in 2018 to EUR 12,276 million in 2021.

Credit Agricole CIB ranks amongst the major foreign banks in India in its core businesses including fixed income markets, export and trade finance, project finance and acquisition finance. The bank offers a wide range of products and services in cash management, investment banking, working capital and debt market segments. In addition, the Credit Agricole Group International Business Solutions “Asia-Pacific” located in Mumbai assists its mid-cap clients with their international operations, by providing expertise on the local environment as well as by securing access to a wide spectrum of

banking services abroad. The total capital ratio of the bank is up from 12.43 per cent in 2020 to 13.89 per cent in 2021.

Societe Generale serves a mixed clientele covering Indian corporates and financial institutions aiming to expand their footprint outside of India and global clients from Europe, US, Middle-East, Africa and Asia-Pacific to develop their operations in India. In India, the bank operates through Mumbai and New Delhi branches and provides value-added solutions in global markets, structured finance, cash management and trade finance services. The bank is actively participating in project finance market for the renewable power sector with its association in International Solar Alliance (ISA). Societe Generale Global Solution Centre (SGGSC), a 100 per cent subsidiary of Societe Generale provides services in the areas of application development and maintenance, infrastructure management, business process management, research & middle office and knowledge process management to Societe Generale’s business lines around the world.

With 16 offices Deutsche Bank business in India has expanded significantly over the years. Total capital invested in India and total assets of the bank is worth INR 84.43 billion

**Table 4.6: EU Banks and Representative Offices Operating in India
(As on July 14, 2020)**

Country of Incorporation	Name of Bank	No. of Branches	No. of Representative Offices
France	BNP Paribas	8	2
	Credit Agricole Corporate & Investment	5	
	Societe Generale	2	
Netherlands	Cooperatieve Rabobank U.A	1	-
Germany	Deutsche Bank	17	4
Spain	-	-	3
Italy	-	-	5
Portugal	-	-	1
Belgium	-	-	1
Austria	-	-	1
Sweden	-	-	2
Total		33	19

Source: Compiled from Reserve Bank of India Website.

and INR 1294.3 billion respectively. The bank is emerging as a crucial international player in the domestic banking arena of India. The current value of investments in India is reported to be INR 434.63 billion. The major areas of business in India are private banking and business banking, personal and business loans, investments, insurance and NRI banking.

Likewise, India is increasing footprint in global banking landscape. Although the number of Indian bank branches operating abroad has remained unchanged at 137 in 2019-2020 over the previous year, the number of subsidiaries of Indian banks has grown from 369 to 381 over this period. Assets and credit extended by Indian bank branches operating abroad were \$171 billion and \$56.5 billion in 2020. As of July 14, 2020, three banks namely Bank of Baroda, Bank of India and State Bank of India have branches in EU particularly in Belgium, France and Germany. In addition, State Bank of India has a representative office in Germany as well. Overseas branches of Indian banks generate fee income through services

such as credit related services, foreign exchange trading, and trade finance.

As it appears, the presence of banks and their operations by India and EU in each others' markets is currently low and concentrated. With an ambitious agenda for cooperation in connectivity sectors, both sides can explore the modalities of cooperation in banking and financial services sector.

Innovative Financing Solutions

Developing quality infrastructure through mobilisation of sustainable finance and green investments by aligning and leveraging the strengths of both public and private institutions of the EU member states and India is an underlying theme of bilateral Connectivity Partnership (Government of India, 2021). India and the EU, in this effort, recognises and supports the efforts of the G20 (Operational Guidelines for Sustainable Financing⁵ and its Working Group on the same⁶) as well as the International Platform on Sustainable Finance

(IPSF, of which the EU and India are members)⁷. The eventual goal is to “promote the transitions towards greener, more resilient and inclusive societies and economies” (G20, 2021).

Focusing on core business with revenue-enhancing and cost-reduction plans is an effective strategy to narrow the funding gap. Funding gap closure enables projects to get the attention of private sector financing. Policies encouraging greater transparency and adherence to corporate governance norms can help in risk mitigation as well as in narrowing or closing funding gaps. These measures can, in turn, help infrastructure projects access many private sector financing instruments - loans, bonds, equity, leasing - as well as consider PPP as a project delivery mechanism with financing (Lawrence, 2018).

With financial viability and effectiveness of investments being paramount in connectivity projects for better impact and outcomes, India’s ‘National Infrastructure Pipeline’ are being implemented through various financing mechanisms, many of them innovative in nature. These include: (i) long-term financing through credit-enhanced project bonds; (ii) National Investment and Infrastructure Fund (NIIF)-led project development; (iii) value capture financing; (iv) Design, Build, Finance, Operate and Transfer (DBFOT); (v) Build-Operate-Transfer (BOT); (vi) Build-Lease-Transfer (BLT); (vii) Build-Own-Lease-Transfer (BOLT); (viii) Rehabilitate-Finance-Operate-Transfer

(RFOT); (ix) Build-Own-Operate (BOO); (x) Viability Gap Funding (VGF); (xi) land leasing; (xii) asset monetization; (xiii) impact investing; (xiv) roping in banks and finance institutions with dedicated project finance units to finance green-field projects; (xv) getting pension funds and insurance companies “with access to long-term funds and a low risk-return preference to invest at the post-construction, operational stage when operational assets with an established track record of financial viability are refinanced”; and (xvi) opting for Infrastructure Investment Trusts (InvITs) to attract “patient capital, such as sovereign wealth funds, strategic investors and other long-term investors” including pension funds that can “help finance infrastructure without asset-liability mismatch usually associated with bank financing of infrastructure (Government of India, 2020).

Likewise, EU, through its ‘Multiannual Financial Framework’ (MFF) for 2021-2027, also has brought out new mechanisms such as the ‘European Fund for Sustainable Development Plus’ (EFSD+) fortified by EUR 53.4 billion ‘External Action Guarantee’ (EAG) to mitigate risks as well as a ‘Global Blending Facility’ for private capital mobilization to the tune of EUR 500 billion during the period under review (see Figure 4.6).

As recognized in the Addis Ababa Action Agenda, as part of infrastructure development efforts, there is a need to encourage greater

Table 4.7: Indian Banks and Representative Offices Operating in EU Countries (As on July 14, 2020)

Country	Public Sector Banks		Representative Offices
	Name	No. of Branches	
Belgium	Bank of Baroda	1	
	Bank of India	1	
	State Bank of India	1	
France	Bank of India	1	State Bank of India
Germany	State Bank of India	1	

Source: Compiled from Reserve Bank of India Website: www.rbi.org.in

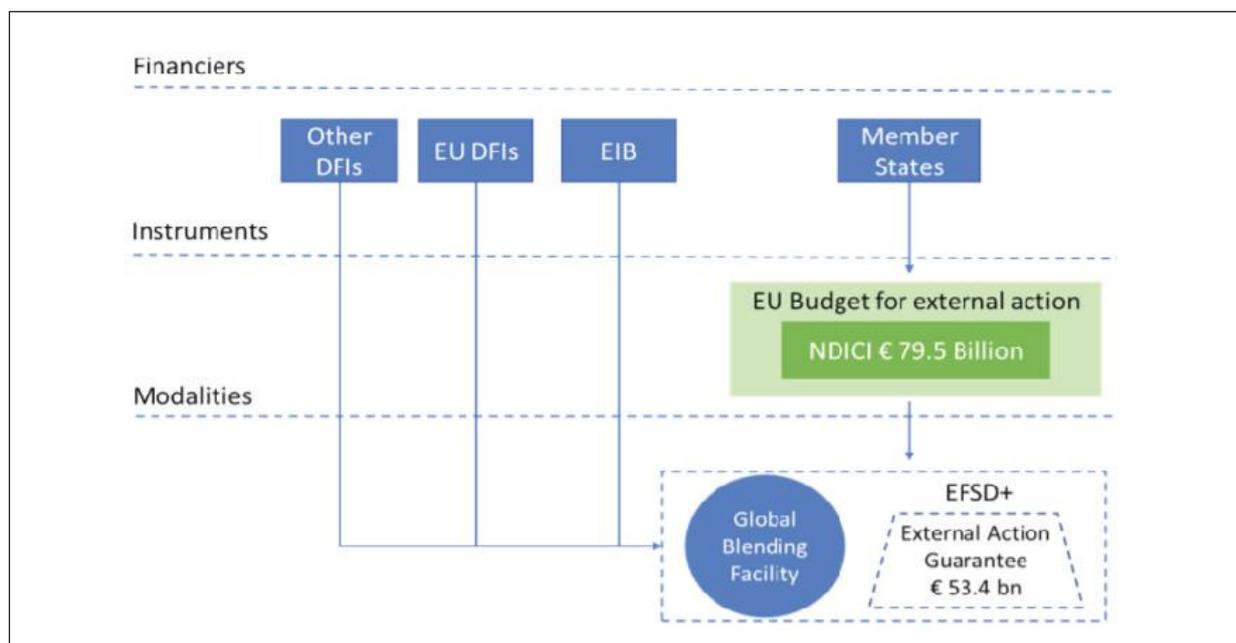
participation of the private sector and mobilization of funds through International Financial Institutions (IFI) and national and regional development banks as well as cooperation between public and private sectors and IFIs. However, the challenges include inadequate infrastructure plans and an insufficient number of well-prepared investable projects. Private sector incentive structures are not appropriate for investing in many long-term projects. Therefore, it is important for countries to imbed resilient and quality infrastructure investment plans in national sustainable development strategies. The mechanisms that are recognized and sought to be promoted by the international community include public-private partnerships, blended finance (which combines concessional public finance with non-concessional private finance and expertise from the public and private sector), special-purpose vehicles, non-recourse project financing, risk mitigation instruments and pooled funding structures (UN, 2015).

A major initiative with a goal to facilitate greater 'private financing for development needs' is the World Bank's 'Maximizing Finance

for Development' (MFD) (Lawrence, 2018). Incidentally, the MFD initiative is backed "by the Hamburg Principles adopted by the G-20 in 2017 and by other multilateral development banks". An important mechanism aimed at helping to enhance the performance of the infrastructure sector is the World Bank Group's Infrastructure Sector Assessment Program, or InfraSAP, which is now being used by various countries to review various infrastructure sectors to "identify opportunities within the country's goals and to develop a plan for financing and delivering on them" (World Bank, 2018).

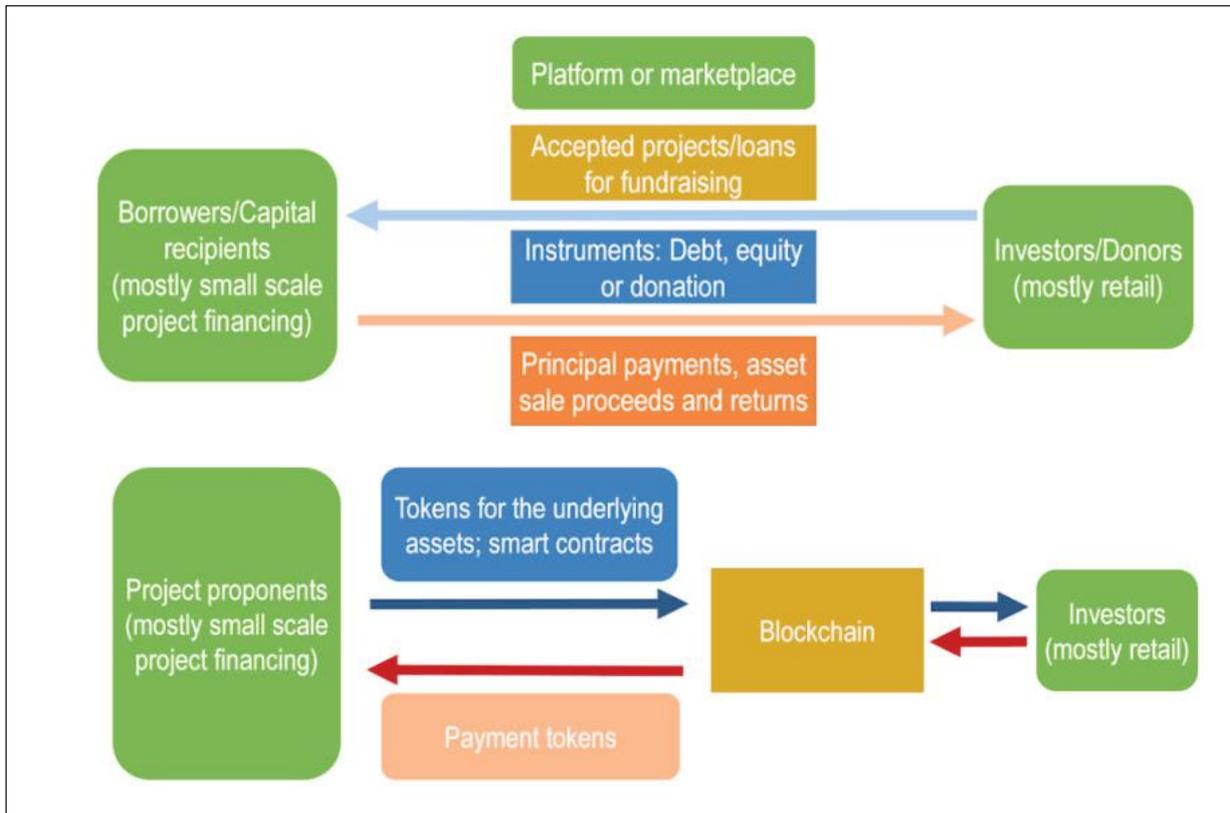
With broadband infrastructure building being capital intensive in nature, reliance on bank credit needs to be supplemented with equity funds for viable projects. However, in cases of development of such projects in rural and economically weak regions, government spending will be the mainstay in terms of financing. However, tax holidays as well as reduction of spectrum license fee are measures that incentivize private sector investment (UN, 2020).

Figure 4.6: EU's 'Multi-annual Financial Framework' (MFF) for 2021-2027



Source: Widmann (2021).

Figure 4.7: Crowd-funding and Tokenization Models



Source: OECD/ADBI/Mekong Institute, 2020

Globally, in addition to corporate finance (mainly to the major players) as well as project finance (AIIB, 2020), there are examples of municipal bonds being used for building a high-speed broadband network (as seen in Texas, US) (Jakimowicz, 2021). Then there are FinTech platform mechanisms such as crowd-funding (through ‘debt, equity, royalty, reward, or donation’) and blockchain-enabled fundraising (a tokenized version of crowdfunding) that help bring down the infrastructure development funding gap, and in the process enable greater retail investor participation in the infrastructure space (see Figure 4.7) (OECD/ADBI/Mekong Institute, 2020).

Endnotes

1. See Government of India, Economic Survey (Various Years).
2. Government of India, Ministry of Commerce and Industry.
3. NITI Aayog (2021)
4. See AIIB Website: www.aiib.org
5. For details, see https://www.bundesfinanzministerium.de/Content/EN/Standardartikel/Topics/world/G7G20/G20-Documents/g20-operational-guidelines-for-sustainable-financing.pdf?__blob=publicationFile&v=1
6. For details, see <https://g20sfwg.org/>
7. For details, see https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/international-platform-sustainable-finance_en#documents

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India-EU Connectivity Partnership for Development, Demand and Democracy

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