



सत्यमेव जयते

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India 2023 Volume-II

Environment Accounts



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ACRONYMS AND ABBREVIATIONS

B	BHUVAN	Indian Geo-Platform of ISRO
	BMWM	Biomedical Waste Management
C	C&D Waste	Construction & Demolition Waste
	CAR	Consolidated Annual Report
	CARTOSAT	Cartography and Satellite
	CARTO_DEM	Indian National DEM generated from Cartosat-1 stereo data
	CBD	Convention of Biological Diversity
	CBWTF	Common Bio-medical Waste Treatment Facility
	CERC	Central Electricity Regulatory Commission
	CPCB	Central Pollution Control Board
	CPHEEO	Central Public Health and Environmental Engineering Organization
	CRT	Cathode-Ray Tube
	CTF	Captive Treatment Facility
	CUM	Cubic Metre
D	DE	Domestic Extraction
	DEM	Digital Elevation Models
	DFFDA	District Fish Farmers Development Agencies
	DGCIS	Directorate General of Commercial Intelligence and Statistics
	DISCOMS	Distribution Companies
	DMC	Domestic Material Consumption
	DMI	Direct Material Input
	DPR	Detailed Project Report
E	ECSWG	Environment and Climate Sustainability Working Group
	EEE	Electric and Electronic Equipment
	EPR	Extended Producer Responsibility
	ESRI	Environmental Systems Research Institute
	EU	European Union
	EW-MFA	Economy Wide Material Flow Accounts
F	FAO	Food & Agriculture Organization
	FAR	Floor Area Ratio
	FIDF	Fisheries and Aquaculture Infrastructure Development
	FPS	Fish Provisioning Service
	FSI	Forest Survey of India
G	GDP	Gross Domestic Product
	GHG	Green House Gases
	GIF	GRM Fissile Isotope
	GPS	Global Positioning System
	GRIHA	Green Rating for Integrated Habitat Assessment
	GSDP	Gross State Domestic Product
	GVO	Gross Value of Output
	GIS	Geographic Information System
H	HCF	Health Care Facilities

	HOWM	Hazardous and Other Waste Management
	HW	Hazardous Waste
I	IBM	Indian Bureau of Mines
	IGBC	Indian Green Building Council
	IISc	Indian Institute of Science
	INM	Integrated Nutrient Management
	IPCC	Intergovernmental Panel on Climate Change
	ISIC	International Standard Industrial Classification
	ISRO	Indian Space Research Organization
	IUCN	International Union for Conservation of Nature
K	KCC	Kisan Credit Card
	KG	Kilogram
L	LEED	Leadership in Energy and Environmental Design
	LISS-III	Linear Imaging and Self Scanning Sensor
	LTR	Litre
	LUCC	Land Use and Cover Change
	LUCI_SEEA	Land Utilization and Capability Indicator - System of Environmental-Economic Accounting
	LULC	Land Use Land Cover
M	MCC	Municipal Corporation of Chandigarh
	MFA	Material Flow Accounts
	MMT	Million Metric Tons
	MoEFCC	Ministry of Environment, Forests and Climate Change
	MoHUA	Ministry of Housing and Urban Affairs
	MOSPI	Ministry of Statistics & Programme Implementation
	MRF	Material Recovery Facility
	MSW	Municipal Solid Waste
	MTR	Metre
N	NCAVES	Natural Capital Accounting and Valuation of Ecosystem services
	NDVI	Normalized Difference Vegetation Index
	NIC	National Informatics Centre
	NOS	Numbers
	NRSC	National Remote Sensing Centre
	NSO	National Statistical Office
	NTFP	Non-Timber Forest Products
	NIF	National Indicator Framework
P	PCC	Pollution Control Committee
	PMMSY	Pradhan Mantri Matsya Sampada Yojana
	PRS	Pairs
	PSUT	Physical Supply and Use Table
	PTB	Physical Trade Balance
	PWD	Public Works Department
	PWM	Plastic Waste Management
R	RDF	Refuse Derived Fuel
	RME	Raw Material Equivalents

	RoHS	Restriction of Hazardous Substances
	RRRR	Reduce, Reuse, Recycle and Recover
	RS	Remote Sensing
	RUSLE	Revised Universal Soil Loss Equation
	3R	Reduce, Reuse and Recycle
S	SDGs	Sustainable Development Goals
	SEEA	System of Environmental-Economic Accounting
	SEEA- EA	System of Environmental-Economic Accounting - Ecosystem Accounting
	SEEA-CF	System of Environmental-Economic Accounting - Central Framework
	SLUSI	Soil and Land Use Survey of India
	SNA	System of National Accounts
	SOI	Survey of India
	SPCB	State Pollution Control Board
	SQM	Square Metre
	SWM	Solid Waste Management
T	THN	Thousand
	TKW	Thousand Kernel Weight
	TONS	Tonnes
	TPA	Tonnes Per Annum
	TPD	Tonnes Per Day
	TNFDC	Tamil Nadu Fisheries Development Corporations
U	ULB	Urban Local Bodies
	UN	United Nations
	UNEP	United Nations Environment Programme
	UNSC	United Nations Statistical Commission
	UNSD	United Nations Statistics Division
	UN-SDG	United Nations Sustainable Development Goals
W	WRD	Water Resources Department

Introduction



Chapter 1

Introduction

*The World is not to be put in order.
The World is in order. It is for us to put ourselves in unison with this order.*
-Henry Miller

Background

1.1 The use of natural resources and materials has always been the backbone of global economies and in turn of human development and well-being. In the fast pace of rapid economic and population growth, there has been increasing demand for the natural resources over the last few decades for achieving the accelerated economic growth. Due to this reason, natural resources have been extensively used which is adversely affecting the environment and biodiversity. The general narrative of growth and development of a country has been linked with the magnitude of both current flow of income and future flows of income. This approach can be deceptive given the fact that if natural resources are depleted for economic development, the income derived will not be sustainable. Managing natural resources sustainably allows countries to establish the foundation for long-term development and human well-being.

1.2 India exhibits immense diversity, not only in terms of its climate, physiogeography and ecological regime but also its people and culture. The country has an abundance of natural resources and biodiversity wealth that is closely interlinked with the lives and livelihoods of the people, especially in the rural and remote areas. Realizing this, the environmental issues are embedded in India's Constitutional guidelines adopted in 1950. The Article 48A¹ of the Directive Principles of State Policy, given in the Constitution of India, contain provisions that reflect the State's commitment to protect the environment and which enjoins upon the citizens of India the responsibility to protect and improve the environment and to safeguard the forests and the wildlife.

1.3 Today the cross-linkages between the resource use, climate change, land degradation and biodiversity loss has been scientifically well established. Concerns

¹ <https://www.india.gov.in/my-government/constitution-india/amendments/constitution-india-forty-second-amendment-act-1976>

about rapidly depleting vital resources and adverse impacts on natural environment have lately gained prominence, resulting in an increased focus on judicious use of the resources through a combination of conservation and efficiency measures and advocating transition towards circular economy.

1.4 The Union Budget 2023-24² included 'Green Growth' as one of the Government's major visions for the 'Amrit Kaal'. Many programmes for green fuel, green energy, green farming, green mobility, green buildings, green equipment and policies for efficient use of energy across various economic sectors are being implemented. Also, Hon'ble Prime Minister has provided a vision for 'LiFE' or Lifestyle for Environment, to spur a movement of environmentally conscious lifestyle. India is moving forward firmly for the 'Panchamrit' and net-zero carbon emission by 2070 to usher in green industrial and economic transition. In addition, the recently launched "National Green Hydrogen Mission"³ with an outlay of Rs. 19,700 crores, will facilitate transition of the economy to low carbon intensity, reduce dependence on fossil fuel imports, and make the country assume technology and market leadership in this sunrise sector. These green growth efforts help in reducing carbon intensity of the economy and provides for large- scale green job opportunities.

1.5 In addition, under India's G20 Presidency, in the G20 Environment and Climate Sustainability Working Group (ECSWG^{4,5}) held on 29th March, 2023 all the G20 countries deliberated on Arresting Land Degradation, Accelerating Ecosystem, Restoration and Enriching Biodiversity, Promoting a Sustainable and Climate Resilient Blue Economy and Encouraging Resource Efficiency and Circular Economy and expressed their commitment towards combating the environment and climate crisis, but with a renewed sense of urgency. During the G20 Summit, Hon'ble Prime Minister announced the launch of Global Biofuel Alliance. This will enable global biofuels trade, developing concrete policies on lesson-sharing and promoting provision of technical support for national biofuels programmes worldwide.

1.6 For a developing country like India with GDP of ₹235 lakh crore approximately for the year 2021-22 at current prices, it is important to balance

² https://www.indiabudget.gov.in/doc/budget_speech.pdf

³ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1907698>

⁴ <https://pib.gov.in/PressReleaselframePage.aspx?PRID=1911971>

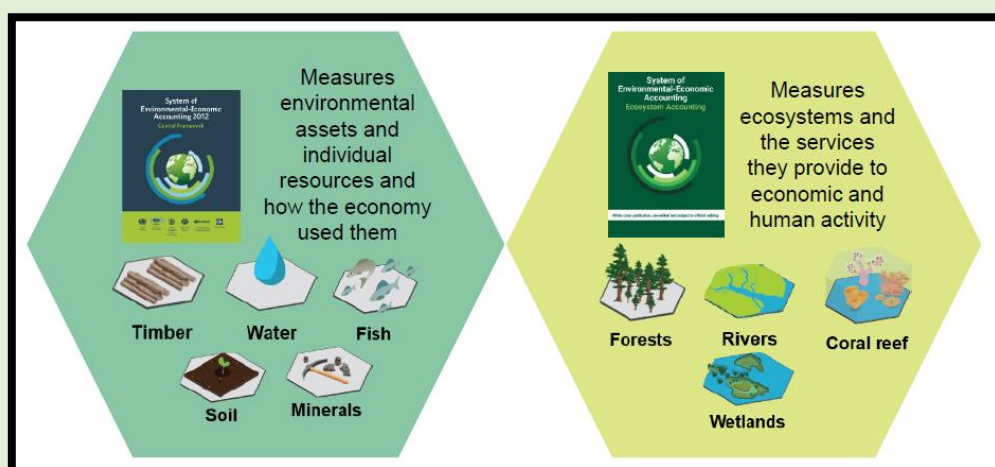
⁵ <https://pib.gov.in/PressReleasePage.aspx?PRID=1898304>

economic growth with environmentally sustainable practises, to temper growth with environmental equity, sustainability and social justice. It has become crucial to understand that when economic profits come at the expense of the people and the available natural resources in the country, we are left with an incomplete picture of the true cost of economic growth. It is therefore the need of the hour to think of alternative means to measure economic prosperity and progress and go 'Beyond GDP'.

The System of Environmental Economic Accounting (SEEA⁶)

1.7 The System of Environmental-Economic Accounting (SEEA) is an agreed international statistical standard for describing the interaction between the economy and the environment, and the stocks and changes in stocks of environmental assets. The SEEA uses a structure and classifications consistent with the System of National Accounts (SNA) to facilitate the development of indicators and analysis on the economy-environment nexus. SEEA also represents melding of many disciplines (e.g economics, statistics, energy, hydrology, forestry, fisheries and environmental science etc.), each with its own concepts and structures. Thus, while the underlying structure is the same as that used in the national accounts, the SEEA aims to integrate perspectives from other disciplines and where relevant, provide an improved body of information for environmental economic accounts. There are two sides of SEEA - SEEA-Central Framework (SEEA-CF) and the SEEA-Ecosystem Accounting (SEEA-EA) as illustrated in the **Figure 1.1** below.

Figure 1.1: SEEA-CF and SEEA-EA



Source: UN-SIAP

⁶ <https://seea.un.org/>

1.8 The SEEA-Central Framework (SEEA-CF), adopted as the International standard in 2012, organizes and integrates the information on the various stocks and flows of the economy and the environment in a series of tables and accounts. The Central Framework covers measurements in three main areas:

- (i) **Environment Flows:** The flows of natural inputs, products and residuals between the environment and the economy, and within the economy, both in physical and monetary terms.
- (ii) **Stocks of Environmental Assets:** The stocks of individual assets, such as water or energy assets, and how they change over an accounting period due to economic activity and natural processes, both in physical and monetary terms.
- (iii) **Economic Activity related to the Environment:** Monetary flows associated with economic activities related to the environment, including spending on environmental protection and resource management, and the production of 'environmental goods and services'

1.9 In the SEEA-CF, the focus is on the individual components of the environment that provide material and space to all economic activities. It, however, does not consider the non-material benefits from the indirect use of environmental assets (e.g. Benefits from ecosystem services such as water purification, storage of carbon and flood mitigation).

1.10 SEEA-Ecosystem Accounting, a complementary framework of SEEA-CF constitutes an integrated and comprehensive statistical framework for organising data about habitats and landscapes, measuring the ecosystem services, tracking changes in the ecosystem assets, and linking this information to economic and other human activity. SEEA-EA describes the measurement of ecosystems in physical terms and the valuation of ecosystems in so far as it is consistent with the market valuation principles. SEEA-EA, adopted by the UNSC in its 54th Session in 2021, also encompasses the environmental assets but focuses on the interactions between individual environmental assets within ecosystems and on the broad set of material and non-material benefits that accrue to the economy and other human activity from flows of ecosystem services. The SEEA-EA is built on 5 core accounts:

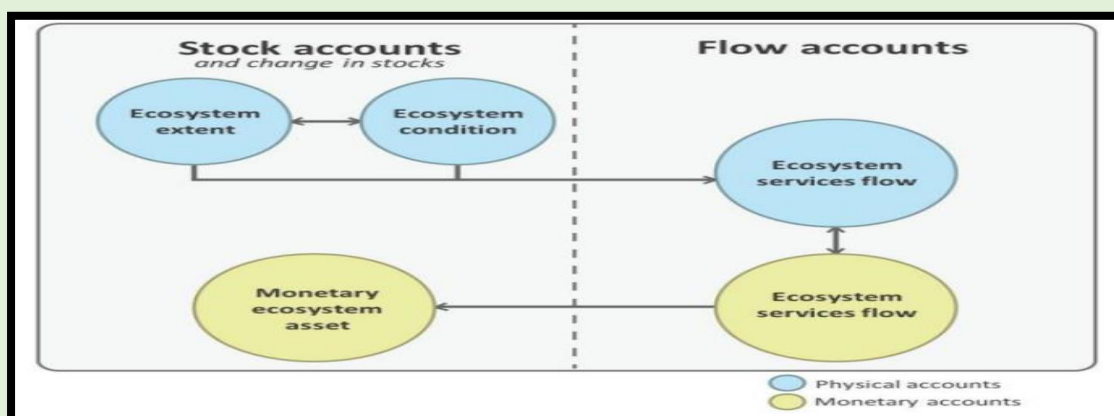
- (i) **Extent Accounts:** record the total area of each ecosystems, classified by type within a specified area (Ecosystem Accounting Area). Ecosystem Extent accounts are measured over time in Ecosystem Accounting Area (e.g. nations, province, river basins, protected area, etc.) by ecosystem

type, thus illustrating the changes in extent from one ecosystem type to another over the accounting period.

- (ii) **Condition Accounts:** record the condition of the ecosystem assets in terms of selected characteristics at specific points in time. Over time, they record the changes to the ecosystems' condition and provide valuable information on the health of the ecosystem.
- (iii) **Flows of Ecosystem Service (Physical and Monetary):** record the supply of ecosystem services by ecosystem assets and the use of those services by economic units, including households.
- (iv) **Monetary Ecosystem asset account:** describes the information on stocks and changes in stocks (additions and reductions) of assets and records this information in monetary terms for ecosystem assets based on the monetary valuation of ecosystem services and applying the net present value approach to obtain opening and closing values in monetary terms for ecosystem assets at the beginning and end of each accounting period. This includes accounting for Ecosystem degradation and enhancement.
- (v) **Thematic accounts:** organizes the data on themes of specific policy relevance. For examples - biodiversity, climate change, oceans and urban areas. Other important thematic accounts would include accounting for protected areas, wetlands and forests etc.

1.11 While the extent and the condition accounts describing the spread and the health of the ecosystems are the stock variables, the ecosystem service flows which help to understand the benefits derived from the ecosystems in the economy are the flow variable. A diagrammatic representation (**Figure 1.2**) for the same is presented below for better understanding.

Figure 1.2: Set of Ecosystem Accounts



Source: UN-SIAP

1.12 The supply of ecosystem services and the use of these services by economic units, including households, is one of the central features of ecosystem accounting. Ecosystem services are only recorded in case there are actual beneficiaries for the services, i.e. when there is a demand. This is similar to the system of national accounts, which is based on transactions or actual exchanges in the economy.

1.13 It is a well-conceived fact that the 'Nature' provides several valuable services to the mankind, but despite having immense value in the lives of human beings they are often beyond the scope of valuation. The prime motivation for ecosystem accounting is that the analysis of 'ecosystems' and the 'economy' separately does not reinforce the vital nature of the relationship between mankind and the environment. The standard approaches to the measurement of the economy focus largely on economic and other human activities that is reflected in the transactions of the markets. Ecosystem accounting aims to shed light on the non-market activities that relates to ecosystems and integrate this information with relevant market related data. It is understood that individual and social decisions concerning the use of the environment may be better informed by developing information sets based on recognition of the relationship between ecosystems and economic and other human activities. The contribution of the environmental goods and services duly measured enables robust and sustainable decisions and policies.

1.14 The valuation of ecosystem services and ecosystem assets is a complex process, but it is essential to frame, prioritise and justify the sustainable development policies oriented towards the protection or restoration of ecosystem. Ecosystem services accounts are a very useful tool that provides pertinent information on the role of ecosystems in delivering services which in turn benefits the society. Ecosystem services contribute to two types of benefits- System of National Accounts (SNA) benefit, or non-SNA benefits.

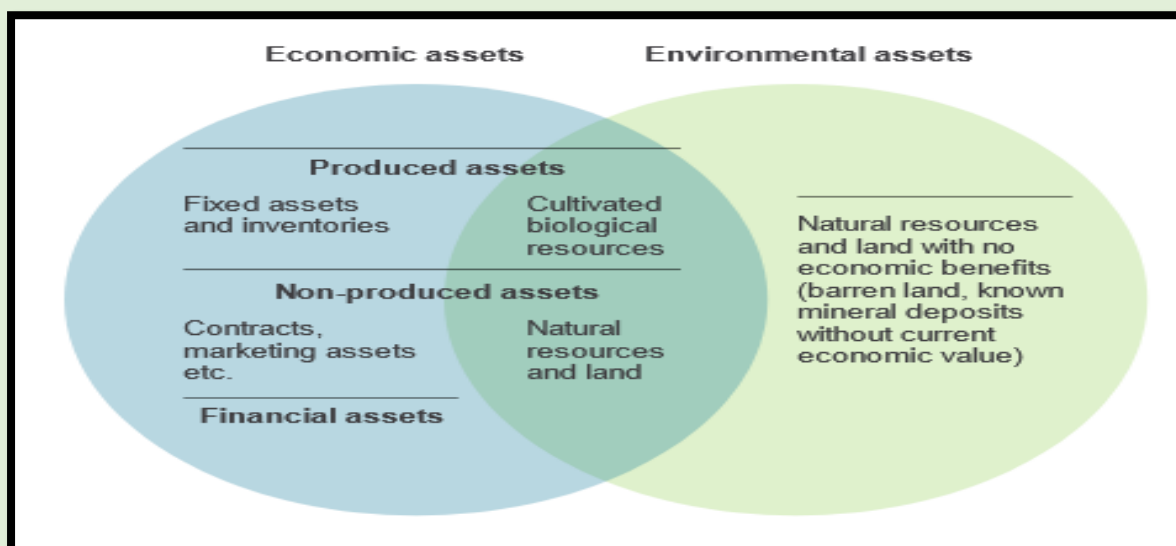
- i. The products produced by economic units (e.g., food, water, clothing, shelter, recreation) are referred to as SNA benefits, since the measurement boundary is within the production boundary used to measure Gross Domestic Product (GDP) in the System of National Accounts (SNA).
- ii. The benefits that accrue to individuals that are not produced by economic units (e.g., clean air) are referred to as non-SNA benefits, reflecting the fact that the receipt of these benefits by individuals is not the result of an economic production process defined within the SNA.

1.15 Some ecosystem services are already included in GDP (as they contribute to products, for example timber which fall in the production boundary), but others (e.g. carbon retention) fall outside the SNA production boundary.

Linkages of SEEA with the SNA

1.16 The System of National Accounts (SNA) is the internationally agreed standard set of recommendations on the compilation methodology of the measures of various economic activities. SEEA was initially developed as a satellite account of SNA and therefore the underlying concepts, definitions are the same for both SEEA and SNA. SEEA is similar to SNA in the sense that SEEA organises and integrates the information on various stocks and flows of the economy and the environment in a series of tables and accounts. SEEA has the capacity to coherently present information in both physical and monetary terms. SEEA enables to include all the goods and services which may or may- not have a market value and this makes SEEA have a broader scope of coverage as compared to the SNA which is restricted to the SNA production boundary. The following **Figure 1.3** shows the distinction between the economic and the environmental assets:

Figure 1.3: Economic and Environmental Assets



Source: UN-SIAP

Environment Accounts in India

1.17 The National Statistical Office (NSO) under the Ministry of Statistics and Programme Implementation (MoSPI) is mandated with the “Development of

Environment Statistics and Development of methodology, concepts and preparation of National Resource Accounts for India". In accordance with this mandate, the Ministry constituted an Expert Group in 2011 under the chairmanship of Prof. Sir Partha DasGupta, Frank Ramsey Professor Emeritus of Economics, University of Cambridge, U.K for advising on an implementation plan for compiling "Green National Accounts in India". The Expert Group submitted its report in 2013 and recommended compilation of the accounts following the SEEA Framework in a phased manner, i.e. starting with the asset accounts followed by the physical and the monetary flows.

1.18 India also participated in the 'Natural Capital Accounting and Valuation of Ecosystem services (NCAVES)' launched by the United Nations Statistics Division (UNSD), the United Nations Environment Programme (UNEP) and the Secretariat of the Convention of Biological Diversity (CBD) in 2017. This European Union (EU) funded project, through its partnership instrument, aimed to assist the five participating countries namely Brazil, China, India, Mexico and South Africa, to advance the knowledge agenda on environmental-economic accounting in particular ecosystem accounting. NSO, MoSPI implemented the NCAVES project in close collaboration with Ministry of Environment, Forest and Climate Change (MoEF&CC), the National Remote Sensing Centre (NRSC), the Soil and Land Use Survey of India (SLUSI) and Indian Institute of Science (IISc)- Centre for Ecological Sciences. Under the NCAVES Project, NSO, India took up several activities towards compilation of the Environment Accounts.

1.19 In adherence with the recommendations of the Sir Partha DasGupta Committee Report, the first layers of the Environment Accounts (i.e., asset accounts) were released in the year 2018, in the publication, EnviStats India 2018 – Supplement on Environment Accounts⁷, detailing the physical asset accounts of land cover, minerals, water and forests, at the state and national levels.

1.20 Since then, the Ministry has continuously strived to enhance the scope and coverage of environmental accounts, including those of extent and condition accounts. Further, in order to translate the physical values using an economic yardstick, the Ministry evaluated some ecosystem services-such as Crop Provisioning Services, Timber and Non-timber Forest Products Provisioning

⁷ <https://mospi.gov.in/download-reports>

Services, Fish Provisioning Services, Carbon Retention Services provided by Forests and Nature-Based Tourism services in monetary terms. These accounts, along with the extent and the condition accounts, present a systematic glimpse of the State of Environment in India in respect of various environmental assets and ecosystems. Several accounts that have been released in the form of the annual publication “EnviStats India: Vol. II- Environment Accounts” are presented in the **Table 1.1** below:

Table 1.1: List of Accounts Published

Type of account	Topics covered (Year of publication given in parentheses)
Ecosystem extent	<ul style="list-style-type: none"> • Change matrix of Land Use – Land Cover (LULC) from 2005-06 to 2011-12 and 2011-12 to 2015-16 (2018, 2020) • Asset Account for Land Use-Land Cover (LULC), 2005-06, 2011-12 and 2015-16 (2018, 2020) • Accounts related to the Land Degradation, 2005-06 and 2015-16 (2020) • Wetland Extent Account- 2006-07, 2016-17 (2020, 2022)
Ecosystem condition	<ul style="list-style-type: none"> • Soil nutrient indices -2015-17, 2017- 19 and 2019-20 (2019, 2021) • Water quality accounts -2015-16 to 2018-19 (2019, 2021) • Forest condition account -2015-16 and 2017-18 (2020) • Cropland condition account -2005-06, 2010-11 and 2015-16 (2020) • Wetland Condition account -2019-20 (2020)
Ecosystem services	<ul style="list-style-type: none"> • Crop provisioning services (monetary) from 2005-06 to 2017-18 (2019, 2021) • Timber provisioning services (monetary) -2011-12 to 2019-20 (2020, 2022) • Non-Timber Forest Products (NTFP) provisioning services (monetary) -2011-12 to 2019-20 (2020, 2022) • Fish Provisioning Services (monetary) -2015-16 to 2021-22 (2022) • Carbon retention services provided by forests (physical

Type of account	Topics covered (Year of publication given in parentheses)
	<ul style="list-style-type: none"> and monetary) -2015-16, 2017-18 and 2019-20 (2020, 2022) • Nature-based tourism (monetary) -2008-09 and 2014-15 (2019) • Soil erosion prevention services provided by croplands (physical) for 2005-06, 2011-12 and 2015-16 (2020)
Thematic Accounts	<ul style="list-style-type: none"> • Biodiversity - The extent of protected areas -2020 (2020) • State-wise floral and faunal species accounts -2020 (2020) • Species Richness of IUCN Red List species - versions 2020-2, 2020-3, 2021-1, 2021-2, 2021-3 and 2022-1 (2020, 2021, 2022)
Individual environmental asset accounts (SEEA CF)	<ul style="list-style-type: none"> • Forests – Growing Stocks of Timber and Carbon -2006-07, 2010-11, 2015-16 and 2017-18 (2018, 2020) • Water (2018) • Minerals -2005, 2010 and 2015 (2018) • Energy -2015-16 to 2020-21(2022) • Solid Waste Accounts -2020-21 (2022)

1.21 In order to conclude the project activities in India and to highlight the users to which the natural capital accounts can be put, especially in the areas of decision making and policy analysis, NSO, India conducted the NCAVES India Forum in January, 2021, where line Ministries, State Governments, Multilateral Organizations and Research Institutions had participated. During the Forum, MoSPI had announced to release the ‘Strategy for Environmental Economic Accounting in India’ in order to provide a road-map for development for Environmental Accounting in India. In line with the announcement made and also to further expand the coverage of the Environmental Accounts in India, NSO, MoSPI released the ‘Strategy for Environmental Economic Accounts in India: 2022-2026’⁸ where some of the potential areas for work as given below has been identified:

- (a) Energy Accounts
- (b) Material Flow Accounts
- (c) Ocean Accounts

⁸https://mospi.gov.in/sites/default/files/publication_reports/Environment%20Accounting%20Strategy%202022-2-261638528460762_0.pdf

(d) Thematic accounts for Biodiversity and Urban Area Accounts

1.22 The current publication which is sixth in series covers Material Flow Accounts, Soil Erosion Prevention Services provided by the Forests, Fish Provisioning Services and Solid Waste Accounts. A brief description about the remaining chapters are provided in the subsequent paragraphs.

Chapter 2. Material Flow Accounts

1.23 It is an undeniable fact that that the world has a finite volume of natural resources and a limited ability to produce new resources. Extraction and processing of materials, fuels and food causes significant greenhouse gas emissions, biodiversity loss and water stress. It is therefore important to rethink how we exploit/utilize the available resources, how the cities and infrastructure are built, how the food is grown and how the residuals are managed.

1.24 Material Flow Accounts provide a statistical framework measuring natural resource extraction, trade in natural resources, waste disposal and emissions. Domestic material consumption and material footprint, including by extraction type (biomass, fossil fuels, metal ores and non-metallic minerals) are seen as a proxy for overall environmental pressure within a national economy and the impact of a domestic economy on the environment.

1.25 In order to sustainably manage these resources, it is important that the natural resources are optimally utilized i.e. by minimizing the use of the natural resources and maximizing the economic growth and social benefit. Developing policies which promotes circular economy and decoupling economic growth can only be done through efficient tracking mechanism revealing how materials are being used and by identifying opportunities for improving efficiency, reducing material use and waste, promoting recycling and changing processes.

1.26 India adopted a circular economy path to bring in substantial annual benefits, along with significant reduction in congestion and pollution, which would consequently have a snowball effect on the economy. The aim is to maximize the national resource efficiency, minimise the consumption of finite resources as well as provide impetus to the emergence of new business models and entrepreneurial ventures. All these will enable providing a spur to the transition towards self-reliance of the country. Also, the Government has been actively formulating policies

and promoting projects to drive the country towards a circular economy. It has already notified various rules, such as the Plastic Waste Management Rules, e-Waste Management Rules, Construction and Demolition Waste Management Rules, Metals Recycling Policy, etc., in this regard.

1.27 The chapter 2 of the publication talks about the Core Accounts of the Material Flow Accounts which includes Domestic Extraction, Exports and the Imports. The residual part (only the solid waste accounts) has been covered in the Chapter 3 of the publication. The primary data source for the Core MFA accounts is the M/o Agriculture, Indian Bureau of Mines and Directorate General of Commercial Intelligence and Statistics (DGCIS).

Chapter 3: Solid Waste Accounts

1.28 As a subset of the Material Flow Accounts, NSO India had attempted compilation of the Solid Waste Accounts for the Union territory of Delhi in the EnviStats India Vol.II: Environment Accounts 2022⁹. In the current publication, the accounts have been developed for 7 more states viz. Jammu and Kashmir, Maharashtra, Mizoram, Rajasthan, Tamil Nadu, Chandigarh and Gujarat. The Solid Waste Accounts provides organized information on the generation of solid waste and the management of flows of solid waste to recycling facilities, to controlled landfills or 'to the environment'. The main idea behind the compilation of the solid wastes is to get a glimpse of the collection and management mechanism of the solid waste in the area. The exercise can be further expanded for other states based on the data availability.

1.29 The Chapter 3 of the publication provides estimates for the Solid Waste Accounts- Physical Supply and Use Table (PSUT) using the SEEA framework. Five different types of wastes have been considered in the publication- Municipal Solid Waste, Bio-medical Waste, Hazardous Waste, Plastics and E-waste. These accounts would provide a basis for identifying the amount of wastes that enter the environment and given the harmful effects of the residuals on the earth, these accounts pave the way towards the adoption of a circular economy model wherein the wastes are reduced to a minimum.

⁹ <https://mospi.gov.in/download-reports>

Chapter 4: Fish Provisioning Services

1.30 SEEA-EA defines ecosystem services as the contribution of the ecosystems to benefits used in the economic and other human activity which is categorized into 3 categories: Provisioning Services, Regulating & Maintenance Service and Cultural Services.

1.31 Using the information provided by the States on the Rent/Lease of the rivers/ponds where the fishes thrive, an estimate of the Fish Provisioning Services had been computed in the EnviStats India Vol.II Environment Accounts 2022¹⁰ for the States of Andhra Pradesh, Rajasthan and Haryana. Fish Provisioning Services have been compiled for some more states such as Bihar for the years 2017-18 to 2021-22, Kerala for the block years 2020-21 to 2025-26 and Tamil Nadu for the years 2016-17 to 2020-21 and are presented in the Chapter 4 of this publication.

Chapter 5: Soil Erosion Prevention Services by the Forests

1.32 One of the regulatory services provided by the Forests Ecosystem Services is the Soil Erosion Prevention Services. An attempt has been made in the current publication to compute the soil erosion prevention services provided by the Forests using data from the National Remote Sensing Centre (NRSC), Soil and Land Use Survey of India (SLUSI) and Global Rainfall Data with the technical support of the SLUSI.

1.33 NSO, India had earlier compiled experimental estimates of soil erosion prevention services due to Croplands using the global and National datasets for the years 2005-06, 2011-12 and 2015-16 for the States of India. The findings of the analysis were published in EnviStats India Vol. II 2020¹¹. In the current publication, a comparative study on soil erosion prevention services by forest for two districts- Gondia, Maharashtra and Balrampur, Chhattisgarh has been made on an experimental basis considering two different scenarios- Bare land and Forests.

Conclusion

1.34 The subject matter of 'Environment' is not only vast and diverse, but is intermingled with multiple other disciplines. It is a huge challenge to understand the inter-relationships and also to put a 'numeric value' to its services. Nevertheless,

¹⁰ <https://mospi.gov.in/download-reports>

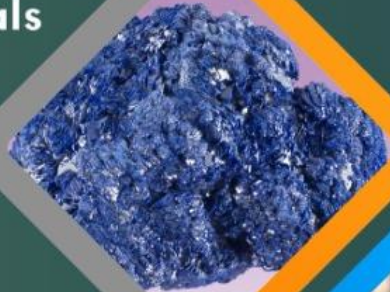
¹¹ <https://mospi.gov.in/download-reports>

NSO, India has been gradually expanding the scope and coverage of environmental accounts in terms of time, domains and geographic coverage since the time of its inception. However, it is pertinent that understanding the intricacies of the data sources and methods used to compile accounts will evolve over time as a result of engagement with the data sources agencies and the users, especially the policy makers. Lastly, as with all statistical products, with the availability of updated data, the accounts presented so far do have a scope of further revision and refinement to depict better connection between environment and economic and human activities.

1.35 EnviStats India: Environment Accounts is an attempt to acknowledge the value of 'nature' in the lives of mankind both in physical and in monetary terms. This will help to provide the right push towards having a sustainable future emanating from a healthier environment in sync with 'Better Environment, Better Tomorrow'.

Material Flow Accounts

Minerals



Timber



Agriculture



Horticulture



Material Flow



Chapter 2

Material Flow Accounts

Infinite growth of material consumption in a finite world is an impossibility.

-E.F. Schumacher

Background

2.1 Human society cannot function without drawing in natural resources from the environment and using the environment to absorb the unwanted by-products of the economic production and of consumption. Natural resources and other inputs from the environment, as well as the capacity of the environment to act as a sink to absorb the residuals and unwanted by-products from economic productions, are necessary considerations for sustainable development. Driven by rapid economic and population growth, the demand for natural resources, especially materials have grown manifolds over the last few decades. In the endeavour for economic growth, natural resources have been largely unequally distributed, adversely impacting the environment and the biodiversity. Further, resource use, climate change, land degradation, biodiversity loss, air and water pollution are closely related. The growing concerns regarding the depletion of the vital resources resulting in adverse impacts on natural environment have lately gained greater prominence. This has helped shift the focus on judicious utilization of the resources globally through a combination of conservation and efficiency measures and aim for transitioning towards the circular economy.

2.2 India, one of the fastest growing economies with GDP of around ₹235 lakh crore for the year 2021-22 at current prices, has increased its material consumption at an enormous pace. However, this economic growth has been coupled with an inherent cost to the natural environment. Material consumption is expected to grow more in order to provide for increasing population, rapid urbanization and growing aspirations. The projected pace of economic development is going to put pressure on an already stressed and limited set of resources and may lead to resource depletion and environmental degradation affecting the economy, livelihoods and the quality of life. Further, material use is also closely associated with the problem of increasing wastes, which when suitably processed could deliver valuable secondary resources.

Therefore, it is the time to rethink how we exploit resources, how we build our cities and infrastructure, how we grow our food, and how we manage our waste.

2.3 In order to sustainably manage these resources, there is a need to identify ways to minimize the use of natural resources while at the same time maximizing the economic growth and social benefits of natural resource used. Developing policies which promotes circular economy and decoupling economic growth can only be done by tracking how materials are being used and identifying opportunities for improving efficiency, reducing material use and waste, promoting recycling and changing processes.

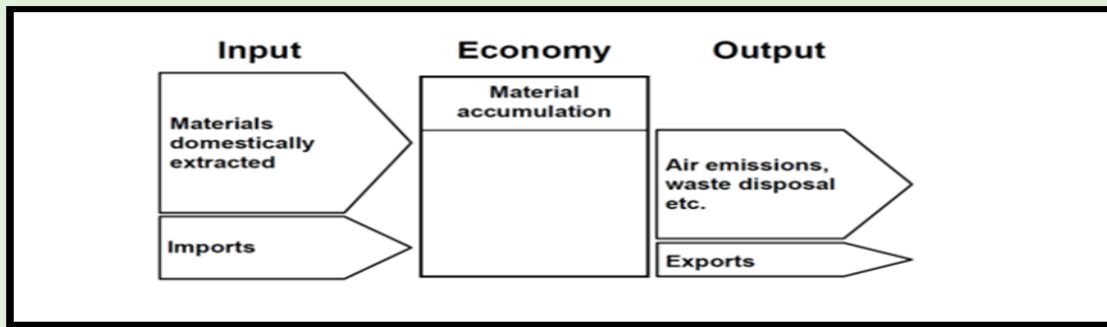
The Economy-Wide Material Flow Accounts (EW-MFA)

2.4 The Economy-Wide Material flow accounts (EW-MFA¹) provide a physical measurement of the relationship between the economy and the environment through an aggregate overview, in tonnes, of the material inputs and outputs of an economy, including inputs from the environment, flows of materials back to the environment, and the physical amounts of imports and exports. Through the measurement of these flows, the EW-MFA and associated balances constitute the basis for a summary overview based on the derivation of a variety of material flow-based indicators.

2.5 The general purpose of the economy-wide material flow accounts is to describe in terms of the material flows, the interaction between the national economy, the natural environment and the rest of the world economy. Only those flows crossing the system boundary of the national economy, either on the input side or on the output side, are counted. Material flows within the economy are not represented in the EW-MFA. **Figure 2.1** provides an illustration of the flows recorded in the accounts.

¹ https://seea.un.org/sites/seea.un.org/files/mfa_final_draft.pdf

Figure 2.1: Scope of Economy-Wide Material Flow Accounts (EW-MFA)



Source: SEEA Technical Notes

2.6 The EW-MFA account for the flow of materials excluding bulk flows of water and air into and out of the economy. The economy is demarcated by the conventions of the System of National Accounts (including resident units).

2.7 EW-MFA follow the SEEA Central Framework’s standard approach to physical flow accounting, which lays out a set of accounting principles and boundaries within which all types of physical flows relating to economic activities can be consistently recorded. The SEEA CF defines three generic types of physical flows as depicted in **Figure 2.2**, namely natural inputs, products and residuals. While the definition of products aligns with the national accounts' definition², natural inputs and residuals are concepts which do not exist in national accounts. They are included in the SEEA CF in order to account for the physical inter-relations between the national economy and the natural environment.

Figure 2.2: Natural inputs, products, and residuals: types of physical flow in relation to the production boundary of the economy



Source: SEEA-CF

² Being those goods and services created through a production process and have economic value (SEEA CF §1.40; see also SNA 2008 §§ 6.26-48 for the definition of the production boundary).

2.8 **Natural Inputs** refer to physical flows from the environment into the economy. Natural inputs include all physical inputs that are moved from their location in the environment as the part of economic production processes, or are directly used in production. The SEEA CF separates natural inputs into three sub-types:

- Natural resource inputs are material resource extractions from the natural environment. They include materials actually used in production as well as natural resource residuals. These are natural resource inputs that do not subsequently become products but instead immediately return to the environment.
- Natural inputs from renewable energy sources include, for example, solar energy captured by economic units (often non-material, rather energy flows).
- Other natural inputs include, for example, inputs from soil (e.g. soil nutrients) and inputs from air (e.g. oxygen taken up in combustion processes or CO₂ absorbed by cultivated plants).

2.9 **Products** are goods and services that result from a process of production in the economy. Generally, products are evidenced by a transaction of positive monetary value between two economic units. Products are relevant for EW-MFA in as much as they constitute physical trade flows (imports and exports). Product flows within the economy are not recorded in EW-MFA.

2.10 **Residuals** refer to flows of solid, liquid and gaseous materials and energy that are discarded, discharged or emitted to the environment (e.g., emissions to air and water) through economic processes of production, consumption or accumulation.

Linkages of System of Environmental Economic Accounting (SEEA)

2.11 Environment Accounts following the SEEA Framework describe the total scale of socio-economic activities in physical quantities but are fully compatible with economic national accounts. EW-MFA³ are conceptually embedded into the framework of the SEEA, which extends the monetary national accounts by a physical and environmental dimension.

³ <https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/36253/UNRE.pdf?sequence=3&isAllowed=y>

2.12 The integration of material flow accounts into the SEEA central framework achieves complementarity with national accounting principles to the extent possible. EW-MFA is a part of the physical flow accounts of the SEEA Central Framework. The SEEA-CF establishes PSUT (in parallel to monetary supply and use tables) as the accounting framework for physical flows. It introduces a set of accounting principles and boundaries that enable internally consistent recording of all types of physical flows that go hand in hand with economic activity. The physical flow accounts have two important features that are relevant for material flow accounting. The accounting framework of physical supply and use tables, and the delineation of three types of physical flows which are natural inputs, products and residuals relate quite directly and/or overlap with the EW-MFA accounting principles.

2.13 The division into natural inputs (domestic extraction of materials), products (traded materials or internal flows) and the division of residuals into waste and emission according to environmental gateway (water, air and soil) all resonate with EW-MFA terminology and accounting principles.

2.14 Physical supply and use tables (PSUT) provide an accounting framework to completely and consistently record physical flows related to a national economy, including 1) flows from the environment into the economy, 2) flows within the economy, and 3) flows from the economy to the environment. Physical flows within the environment, such as natural flows of materials and water, are out of the scope of the PSUT and by extension the EW-MFA.

2.15 The PSUT framework is illustrated in **Figure 2.3**. It consists of a pair of tables with the same structure. Row-wise, the two tables show the various types of physical flows (namely natural inputs, products, and residuals). Column-wise they show the various origins and destinations supplying and using these flows, namely industries (i.e. production activities), households (i.e. consumption activities), accumulation (i.e. changes in stocks of produced assets and product inventories), rest of the world and environment. The physical supply table shows physical flows by origin. The physical use table shows physical flows by destination. MFA accounts are not fully articulated PSUT as introduced in the System for Environmental and Economic Accounting Central Framework (SEEA-CF). Establishing a full PSUT system would be an extremely time-consuming activity and will require various levels of reporting on physical flows by specific industries which are either not currently in existence, or not made available, and so are not made part of the EW-MFA accounts. **Figure 2.3** highlights those cells which are recorded in EW-MFA (shaded cells).

Figure 2.3: Physical Supply and Use Tables (PSUT) and the Economy-Wide Material Flow Accounts (EW-MFA)

PHYSICAL SUPPLY TABLE						
	Production; Generation of residuals		Accumulation	Flows from the rest of the world	Flows from the environment	TOTAL SUPPLY
	Production; Generation of residuals by industries (incl. household production on own account) - classified by ISIC	Generation of residuals by households	Industries - classified by ISIC			
Natural inputs					A. Flows from the environment (incl. natural resource residuals)	Total Supply of Natural Inputs (TSNI)
Products	C. Output (incl. sale of recycled and reused products)			D. Imports of products		Total Supply of Products (TSP)
Residuals	I1. Residuals generated by industry (incl. natural resource residuals)	J. Residuals generated by household final consumption	K1. Residuals from scrapping and demolition of produced assets K2. Emissions from controlled landfill sites	L. Residuals received from rest of the world	M. Residuals recovered from the environment	Total Supply of Residuals (TSR)
	I2. Residuals generated following treatment					
TOTAL SUPPLY						
PHYSICAL USE TABLE						
	Intermediate consumption of products; Use of natural inputs; Collection of residuals	Final consumption*	Accumulation	Flows to the rest of the world	Flows to the environment	TOTAL USE
	Industries - classified by ISIC	Households	Industries - classified by ISIC			
Natural inputs	B. Extraction of natural inputs					Total Use of Natural Inputs (TUNI)
	B1. Extraction used in production					
	B2. Natural resource residuals					
Products	E. Intermediate consumption (incl. purchase of recycled and reused products)	F. Household final consumption (incl. purchase of recycled and reused products)	G. Gross Capital Formation (incl. fixed assets and inventories)	H. Exports of products		Total Use of Products (TUP)
Residuals	N. Collection and treatment of residuals (excl. accumulation in controlled landfill sites)		O. Accumulation of waste in controlled landfill sites	P. Residuals sent to the rest of the world	Q. Residual flows to the environment	Total Use of Residuals (TUR)
					Q1. Direct from industry and households (incl. natural resource residuals & landfill emissions) Q2. Following treatment	
TOTAL USE						

Source: SEEA Technical Notes

2.16 The cells captured in the EW-MFA are described as follows:

- (i) *Sub-matrix A* presents the supply of natural inputs from the natural environment to the economy. This is termed as domestic extraction in EW-MFA and is broken down by type of material and excludes natural resource residuals.
- (ii) *Sub-matrix D* presents the supply of products by the rest of the world which is termed as imports in EW-MFA. This is measured in physical terms.
- (iii) *Sub-matrix H* presents the supply of products to the rest of the world which is termed as exports in EW-MFA. This is measured in physical terms.
- (iv) *Sub-matrix Q* presents the flows of residuals from the economy to the environment. This is termed as domestic processed output in EW-MFA, and is broken down by type of residual.

2.17 The Core Account of the MFA is presented in following **Figure 2.4**. This consists of information on the Domestic extraction, Imports and Exports (sub-matrices A, D, H of the above **Figure 2.3**). In the present chapter, the coverage has been restricted to the compilation of the Core Accounts only.

Figure 2.4: Core Accounts for the Economy-Wide Material Flow Accounts (EW-MFA)

PHYSICAL SUPPLY TABLE				
	Total Economy	Rest of the world	Flows from the environment	TOTAL SUPPLY
Natural inputs (tonnes)				
Biomass			Domestic Extraction	
Metal ores (gross ores)				
Non-metallic minerals				
Fossil energy materials/carriers				
TOTAL				
Products (tonnes)				
Biomass and biomass products		Imports		
Metal ores and concentrates, raw and processed				
Non-metallic minerals, raw and processed				
Fossil energy materials/carriers, raw and processed				
Other products				
Waste imported for final treatment and disposal				
TOTAL				
TOTAL SUPPLY				
PHYSICAL USE TABLE				
	Total Economy	Rest of the world	Flows to the environment	TOTAL USE
Natural inputs (tonnes)				
Biomass				
Metal ores (gross ores)				
Non-metallic minerals				
Fossil energy materials/carriers				
TOTAL				
Products (tonnes)				
Biomass and biomass products		Exports		
Metal ores and concentrates, raw and processed				
Non-metallic minerals, raw and processed				
Fossil energy materials/carriers, raw and processed				
Other products				
Waste imported for final treatment and disposal				
TOTAL				
TOTAL USE				

Source: SEEA Technical Notes

2.18 The various components of the core accounts are explained in the subsequent paragraphs:

- I. **Domestic Extraction (DE)** (sub-matrix A) is the amount of used material inputs from the environment to the economy. Domestic extraction as defined in EW-MFA includes only the used extraction of material; that is material extracted from the environment by humans and further processed in the economy. DE excludes unused extraction (termed natural resource residuals in SEEA CF). DE can be broken down into the following four categories:
 - (i) **Biomass** in general comprises of organic non-fossil material of biological origin. Not all generated biomass is considered DE, but the following two major types of biomass can be identified;

- a. biomass generated within the environment by a natural process which is outside human control, such as non-cultivated forests or the growth of wild animals, and
 - b. biomass generated by a cultivation process which takes place more or less under human control, like the production of agricultural crops and plants.
- (ii) **Metal Ores** are recorded in terms of gross ore (also known as crude ore), based on their chemical classification as a metal in the periodic table of elements.
- (iii) **Non-metallic minerals** include flows of minerals that are non-metallic based on their chemical classifications, such as marble, limestone, sand and gravel. It is important to keep in mind that this does not include the extraction of gases from the atmosphere for industrial purposes.
- (iv) **Fossil fuels** include flows of natural inputs of fossil energy, such as coal, peat, petroleum, and natural gas. Whereas energy statistics/balances show a comprehensive picture of the supply and use of all energy carriers, the domestic extraction of energy materials/carriers in EW-MFA is limited to the extraction of fossil energy carriers only. While in the SEEA Energy accounts measurement is in joules, in the EW-MFA measurement is in mass.
- II. Imports and Exports** (in physical terms) are product flows between the economy of concern and the rest of the world. They are recorded in terms of product weight and based on categories that, to the greatest extent possible, mirror the main categories used for domestic extraction. EW-MFA estimates of physical flows of imports and exports are typically based on international trade data.

2.19 Some conventions need to be respected when compiling imports and exports. (Physical) imports and exports exclude goods in transit through a country, which is consistent with the SNA and the SEEA.

2.20 There are some important differences between the SEEA-CF and the system boundaries of EW-MFA which are especially important in the domain of agriculture, where the SEEA conceptualises agricultural area and plants as part of the economy (cultivated biological resources) and EW-MFA as part of the environment. Consequently, the SEEA treats water, carbon dioxide, and nutrients as a natural input whereas EW-MFA interprets the harvest of crops as natural input.

2.21 Similar to the system of national accounts, material flow accounts serve two major purposes. The detailed accounts provide a rich empirical database for many

analytical studies. They are also used to compile different extensive and intensive material flow indicators for national economies at various levels of aggregation. EW-MFA is also closely related to other physical flow modules of the SEEA system, such as the Air Emissions Accounts, Physical Energy Flow Accounts, Water Accounts, etc. EW-MFA concepts, accounting rules and classifications are harmonized as far as possible with SEEA and the above-mentioned sub-modules. A more explicit integration of EW-MFA into the SEEA framework in the future would be worthwhile to yield the full explanatory strength of both approaches.

Linkages with the Sustainable Development Goals

2.22 Being a signatory to UN Sustainable Development Goals ⁴ India is committed to provide for sustained economic growth along with sustainable use of natural resources and safeguarding the environment. Resource efficiency has a vital role to play towards mitigation of climate change, land degradation and biodiversity loss. It is thus, imperative for India to charter and take the path of economic development supported with efficient use of resources and minimum negative impacts on environment, ultimately leading to sustainable development.

2.23 The United Nations 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) state that sustainable natural resource use and management is a necessary condition to achieve a better future for current and future generations. In two SDGs – Goal 8 “Decent work and Economic Growth”, and Goal 12, “Sustainable consumption and production” – sub-targets have been defined (Target 8.4 and Target 12.2), which specifically require material flow-based indicators for monitoring. Data on economy-wide material flow accounts (EW-MFA) are necessary to inform policies not only for the management of natural resources and waste, but also policies related to circular economy, resource use and ecosystems.

Indicators derived from the MFA

2.24 A large number of indicators can be established from economy-wide material flow accounts. These indicators generally correspond to the main variables of the EW-MFA accounts and describe material use at different stages of economic

⁴ <https://moef.gov.in/wp-content/uploads/2019/07/Draft-National-Resourc.pdf>

activities, from material extraction via international trade and material consumption to the generation of waste and emissions. In line with the materials balance scheme, the main types of indicators can be defined as input indicators, consumption indicators, trade and balancing indicators and output indicators. These different types of indicators deliver complementary information about various aspects related to national material use. They can also be combined to provide a more comprehensive depiction of the related issues. Furthermore, these indicators can be combined with economic indicators, such as Gross Domestic Product (GDP), to construct indicators of material productivity. Depending on the scope of material flows considered, the indicators can be grouped into several categories:

- A. Indicators based on accounts of direct material flows, i.e. domestic material extraction and physical imports and exports.
- B. Indicators which also include indirect material flows associated with direct imports and exports – these flows are also called raw material equivalents (RME).
- C. Indicators which in addition consider unused material extraction, both of domestic and foreign origin.

2.25 Since the accounts is restricted to compiling the core account of EW-MFA, three particularly important indicators can be derived based on the information provided in the core account Three particularly important indicators can be derived based on the information provided in the core account.

- **Direct Material Input (DMI)** measures the direct input of materials for use in an economy (excluding bulk flows of water and air). Note that parts of the production system's output are exported

$$DMI = DE + Imports$$

- **Domestic Material Consumption (DMC)** measures the total amount of materials (excl. bulk flows of water and air) that are directly/actually used in a national economy, i.e. by resident units

$$DMC = DMI - Exports$$

- **Physical Trade Balance (PTB)** measures the physical trade surplus (positive value) or physical trade deficit (negative value) of a given national economy;

$$PTB = Imports - Exports$$

Accounting identities inherent to EW-MFA

2.26 The above components and derived variables are linked by accounting identities. One important identity is the 'direct material input and use account'. Domestic extraction (DE) plus imports forms the direct material input (DMI). The use of DMI is composed of domestic material consumption (DMC) and exports:

$$DE + imports = DMI = DMC + Exports$$

2.27 The SDG Indicator 8.4.1 which is resource productivity [Domestic Material Consumption (DMC)/Gross Domestic Product in Market Prices (GDP)] can be compiled with the help of the MFA.

Material Flow Accounts in India

2.28 In this chapter the Core Accounts of the Material Flow Accounts which includes Domestic Extraction, Exports and Imports has been dealt with. The residual part (only the solid waste accounts) for some of the States has been covered separately in the Chapter 3 of the publication. The primary data sources for the Core MFA accounts is the M/o Agriculture, Tea Board of India, Coffee Board of India, Rubber Board of India, Narcotics Commissioner of India, Indian Bureau of Mines, Director General of Commercial Intelligence and Statistics (DGCIS) and National Accounts Division, MoSPI.

2.29 The core accounts, based on the available data for the MFA has been compiled for the years 2011-12, 2015-16 and 2020-21. **Table 2.1** presents the core accounts of the Material Flow Accounts for the year 2011-12, 2015-16 and 2020-21.

2.30 The prices for the biomass which includes agricultural crops, horticultural crops, fisheries etc. were not available in the required format of MFA, therefore the Gross Value of Output (GVO) of the respective item at an All-India level has been used as a proxy. Similarly, for those minerals where prices could not be obtained neither from the IBM or from the concerned Ministry, GVO has been used as a proxy. For cases where the production value was not available, only the price data has been compiled in the MFA. Also, as per the Gazette Notification ⁵dated 10th February, 2015 by Ministry of Mines some of the major minerals have been

⁵ <https://egazette.gov.in/WriteReadData/2015/162767.pdf>

categorized as Minor minerals. The data for major and minor minerals has been accordingly compiled.

Table 2.1: Core Account of Material Flow Accounts

Items	Quantity (Lakhs Tonnes)	Value (Crore)	Quantity (Lakhs Tonnes)	Value (Crore)	Quantity (Lakhs Tonnes)	Value (Crore)
	2011-12		2015-16		2020-21	
Domestic Extractions						
Biomass	9,987	14,20,336	9,291	20,13,348	11,066	31,14,219
Minerals	11,271	2,97,981	12,400	3,15,830	13,897	4,38,238
Total DE	21,258	17,18,317	21,691	23,29,178	24,963	35,52,457
Export						
Export-Standard Units*	2,028	9,82,170	1,849	11,39,197	2,859	14,58,346
Export-Others**		4,05,286		5,43,744		6,46,169
Total Export	2,028	13,87,456	1,849	16,82,941	2,859	21,04,515
Import						
Import-Standard Units*	4,201	18,30,650	6,171	18,06,872	6,430	20,14,238
Import-Others**		4,55,173		5,61,838		7,93,935
Total Import	4,201	22,85,823	6,171	23,68,710	6,430	28,08,174

*Units: Kilograms, Tonnes; **Unit: Other than Kilograms, Tonnes

Totals may not match due to rounding off.

2.31 For the exports and the imports, all the relevant commodities have been segregated into two categories- those commodities whose units could be converted into standard units and those which could not. For the latter, only the prices have been considered for the MFA. The details of the commodities for DE, Export and Import for years 2011-12, 2015-16 and 2020-21 are provided in **Annexures 2.1 to 2.12**.

2.32 It can be seen from **Table 2.1** that in the period of 3 years there has been an increase in the material consumption. Using the core account of MFA, the following indicators including Global SDG Indicator (Indicator 12.2.2: Domestic material consumption, domestic material consumption per capita, and domestic material

consumption per GDP) similar to Global SDG Indicator 8.4.2 has been derived for the years 2011-12, 2015-16 and 2020-21 and presented in **Table 2.2**.

Table 2.2: Derived Indicators from Core Account of MFA

Indicators	2011-12		2015-16		2020-21	
	Quantity ('Lakhs Tonnes)	Price (Crore)	Quantity ('Lakhs Tonnes)	Price (Crore)	Quantity ('Lakhs Tonnes)	Price (Crore)
Direct Material Inputs (DMI)	25,459	40,04,140	27,862	46,97,888	31,393	63,60,631
Physical Trade Balance (PTB)	2,173		4,322		3,571	
Global SDG Indicator 12.2.2 (similar to Global SDG Indicator 8.4.2)						
Domestic Material Consumption (DMC)	23,430	26,16,684	26,013	30,14,947	28,534	42,56,116
DMC per unit of GDP		0.30		0.22		0.21
Indicator	Quantity (Tonnes/capita)	Price (Rs./capita)	Quantity (Tonnes/capita)	Price (Rs./capita)	Quantity (Tonnes/capita)	Price (Rs./capita)
DMC per capita	1.92	21,445.23	2.03	23,474.50	2.10	31,364.62

Totals may not match due to rounding off.

2.33 From the Table 2.2 above, it has been observed that Domestic Material Consumption (DMC) in terms of quantity has increased by 22% from 2011-12 to 2020-21. However, in terms of Rupees, it has increased by around 63% for the same period. In terms of DMC per unit of GDP, it has decreased from Rs. 30 lakhs in 2011-12 to Rs. 22 lakhs in 2015-16 and further decreased to Rs. 21 lakhs in 2020-21. Similarly, DMC per capita in terms of quantity, has increased from 1.92 tonnes in 2011-12 to 2.10 tonnes in 2020-21. However, in terms of rupees, DMC per capita has increased from Rs. 21,445 in 2011-12 to Rs. 31,365 in 2020-21.

Conclusion

2.34 Environmental Impacts including climate change and pollution cannot be effectively mitigated by focusing on emission abatement alone. The level of resource use determines the magnitude of final waste and emissions released to the environment, making resource management and efficiency the key strategies for environmental protection.

2.35 Decoupling economic activity and human well-being from resource use- i.e. enhanced resource efficiency is necessary to achieve sustainability. To achieve effective decoupling, today's linear material flows must become circular through a combination of intelligent infrastructure and product design, standardization, reuse, recycling and remanufacturing. An approach towards shifting to Circular economy would help to keep resources in use for as long as possible extracting the maximum value, recovering and regenerating products and materials at the end of each service life; so as to limit the extraction of natural resources to the maximum extent possible.

2.36 The MFA accounts helps to address the issue of resource efficiency, which means creating more output as products/services using lesser inputs. Resource Efficiency reduces waste, drives greater resource productivity, delivers a more competitive economy, addresses emerging resource security/scarcity issues, and helps reduce the associated environmental impacts.

2.37 The complete set of the Material Flow Accounts includes the Residuals part as well apart from the Domestic Extractions and Exports/Imports. Again, residuals comprise of Solid Wastes, Effluents and Air Emissions. As an initial step, NSO, India had attempted the compilation of the Physical Supply and Use Tables for the Solid Waste Accounts for the state of Delhi. In the current publication, (Chapter 3) Solid Waste Accounts have been taken up for some other States.

2.38 As regards the Effluent and the Air Emission Accounts, the work is yet to be initiated and can be taken up in due course of time depending on the data availability.

Solid Waste Accounts

Municipal Solid Waste



Hazardous Waste



E-Waste



Bio medical Waste



Plastic Waste



Construction & Demolition Waste



Chapter 3

Solid Waste Accounts

"There is no such thing as 'away'. When we throw anything away, it must go somewhere.

- Annie Leonard

Introduction

3.1 The effect of human activity on the environment has emerged as one of the most significant policy issues in environmental sustainability- a fact that is known to all. As the countries grow and develop in terms of the economy, enormous pressure is created on the environment in terms of the residuals. There is a growing concern about the effect of economic activity upon the environment and increasing recognition that economic growth and human welfare are dependent upon benefits obtained from the environment.

3.2 India too is rapidly marching ahead towards the 'fastest growing economy'. The unprecedented levels of urbanization in India, growing consumerism and emergence of new mega-cities, along with growth in population has resulted in massive increase in the consumption and imports. As a consequence of huge annual material consumption, there is a significant pressure on the management of all forms of residuals in the country. If these residuals are not properly treated or are disposed of irresponsibly, irreversible environmental degradation is bound to happen. This will have far reaching consequences affecting the public health and well-being which will have a negative impact on all forms of life on earth. The long-term environmental strategy of the country, based on the principles of sustainable development, may not be feasible to achieve without adequate waste management. The importance of planning in residual management is reflected in the fact that the management plans need to integrate the most appropriate option for the environment, considering economic, technical, social and environmental factors.

3.3 It is thus utmost required to take stock of different types of residuals generated, collected, treated and disposed of. With the availability of integrated statistics on the flow of residuals from the economy to the environment, the analysis of various residual management options becomes viable. This allows for the decision makers to use different instruments in order to consider more acceptable options and make decisions about the optimal solutions to satisfy the specific needs. These also form the basis for initiating the decision-making process essentially depending

on the data on the waste generation and composition (qualitative & quantitative) in a given territory within a particular period of time. Effective waste management also presents an opportunity to recover resources and create employment while mitigating the negative environmental and social impacts.

Residuals and Residual Accounts

3.4 Residuals are flows of solid, liquid and gaseous materials and energy that are discarded, discharged or emitted to the environment by establishments and households through processes of production, consumption or accumulation¹. They may be generated at any stage of a supply chain from producer to consumer for instance during the extraction of raw materials, during the processing of raw materials into intermediate and final products, during the transportation of goods, during final use by consumers or at the point of disposal at the products' end of life. Residuals may be discarded, discharged or emitted directly to the environment or captured, collected, treated, recycled or reused by economic units. These various transformation processes may lead to the generation of new products that are of economic value to the unit undertaking the transformation even if the residual, when first discarded or emitted, had no economic value to the household or establishment discarding or emitting the residuals.

3.5 There are a wide variety of different types of residuals, which are not usually accounted for as a single type of flow using mutually exclusive classes. Some of the widely accepted groupings of residuals are as given below:

- (i) Solid Waste
- (ii) Waste Water
- (iii) Emissions
- (iv) Dissipative Uses of Products
- (v) Dissipative Losses
- (vi) Natural Resource Residuals

3.6 Residual Account is an organised information on the generation of residuals and its management. In the current publication, as an initial step, compilation of only the Solid Waste Accounts following the SEEA Framework has been considered.

¹ https://seea.un.org/sites/seea.un.org/files/documents/seea_glossary_terms_languages_v2.pdf

3.7 Solid waste covers all the discarded materials that are no longer required by the owner or user. Where the unit discarding the materials receives no payment for the materials then the flow is considered a residual flow of solid waste. Where the unit discarding the materials receives a payment but the actual residual value of the material is small, for example, in case of scrap metal sold to a recycling firm, this flow is considered a product flow of solid waste. Discarded material sold as second-hand products; for example, the sale of a second-hand car or furniture is treated as flows of products and is not treated as solid waste. In the determination of whether a material is a second-hand product, consideration may be given to the extent to which the receiving unit can use the product again for the same purpose for which it was conceived. In practice, in many countries, statistics on solid waste is based on legal and administrative lists of materials determined to be solid waste. However, the SEEA framework provides a basis for the measurement of solid waste in countries where legal or administrative processes concerning waste do not exist or are limited in scope.

3.8 Solid Waste Accounts organize the information on the generation of solid waste and the management of flows of solid waste to recycling facilities, to controlled landfills or directly to the environment. These accounts help to organize and connect statistics on solid waste by types, sources, suppliers, users and final disposal. They can help to answer questions viz how much solid waste is being generated, which industries are responsible for maximum generation of the solid wastes, how is the solid waste treated etc. In addition, some solid waste flows could also act as resources which can be converted into valuable products. Knowing the type of resources being generated by different industries can enable utilization of the solid waste as resources.

3.9 It is important to have proper solid waste management practices which includes collection, treatment and disposal of solid material that is discarded because it has served its purpose or is no longer useful. Improper disposal of solid wastes can create unsanitary conditions, and these conditions in turn lead to pollution of the environment and outbreaks of vector-borne diseases i.e., diseases spread by rodents and insects.

3.10 In the EnviStats India Vol-II 2022: Environment Accounts, solid waste accounts were published for the Union Territory of Delhi for the year 2020-21 using data from the Delhi Pollution Control Committee. In the current publication, solid waste accounts have been attempted for the States/UTs of Mizoram, Tamil Nadu,

Chandigarh, Jammu and Kashmir, Gujarat, Rajasthan and Maharashtra using the available information.

Linkages with Sustainable Development Goals (SDGs)

3.11 A major pillar of sustainability is the Environment and the strategies on Environment cannot be materialized without considering the problems of inadequate waste management. Decoupling economic growth from resource use and environmental degradation is one of the objectives of the 2030 Agenda for the Sustainable Development Goals. Compilation of the Solid Waste Accounts helps to measure progress in achieving targets for the SDG goals, especially Goal 11 (Make cities and human settlements inclusive, safe, resilient and sustainable) and Goal 12 (Ensure sustainable consumption and production patterns). The following Table 3.1 indicates the Global Targets and Indicators of SDG that are directly related to the Solid Waste Accounts.

Table 3.1 SDG Global Targets and Indicators related to the Solid Waste Accounts

Targets	Global SDG Indicators
Target 11.6: By 2030, reduce the adverse per capita environmental impact of cities, which includes paying special attention to air quality and municipal and other waste management.	Indicator 11.6.1: Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities
Target 12.4: By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.	Indicator 12.4.1: Number of parties to international multilateral environmental agreements on hazardous waste, and other chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement. Indicator 12.4.2: (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment.
Target 12.5: By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.	Indicator 12.5.1: National recycling rate, tons of material recycled.

3.12 In addition, there are certain SDG indicators in National Indicator Framework of SDGs which are based on generation and treatment of wastes such as Indicators 8.4.1 (Proportion of waste recycled vs. waste generated), 11.6.1 (Percentage of waste processed) and 12.4.2 (a) (Hazardous waste generated per capita (in MT/person); and (b) Proportion of hazardous waste treated, by type of treatment)). Components of these indicators involve generation of wastes by type and their treatment by type. These can be derived from Physical Supply and Use Tables (PSUT) of Solid Waste Accounts.

Linkages with Circular Economy

3.13 The Economy-Wide Material Flow Accounts (EW-MFA) provide a physical measurement of the relationship between the economy and the environment through an aggregate overview of the material inputs and outputs of an economy, including inputs from the environment, flows of materials back to the environment, and the physical amounts of imports and exports. One important component of the MFA's Physical Supply and Use Tables is the residuals. Thus, compilation of the solid waste accounts has close connections with the economy-wide material flow accounts. A reduction in the quantities of waste and an efficient and sustainable use of this waste are key elements in the efforts towards having a circular economy. In a circular economy, resource productivity is increased and materials as well as products are kept in the economic cycle for as long as possible, which benefits the environment as well as the economy. Circular Economy seeks to transform the way wastes are managed and handled. In a circular economy, waste is regarded as a valuable resource rather than something to be discarded. Therefore, a good utilization of waste is important for advancing towards the circular economy.

3.14 Solid Waste Accounts which follows the SEEA Framework is also consistent with the System of National Accounts since both the accounting frameworks are compatible with each other. As a result, the integrated information can be used to inform integrated policies. This indicator is also closely linked to other socio-economic and environmental indicators especially those related to income-level and economic growth such as rate of growth of urban population, Gross Domestic Product (GDP) per capita, Wastewater Treatment, and Waste Treatment and disposal.

Policy Relevance

3.15 While the economies derive useful inputs from the environment, the residuals are discarded back into the environment. The continuous and the rapid pace at which the residuals are flowing out from the economy has become a matter of concern. The flow of residuals into the environment has a horrendous impact on the nature. Having integrated statistics on the flow of residuals from the economy to the environment can help to improve the management of the residuals.

3.16 Measures of the amount of waste in aggregate or of quantities of specific waste materials may be important indicators for assessing the environmental pressures or identifying the issues for taking corrective measures. The compilation of solid waste accounts allows these indicators to be placed in a broader context with economic data in both physical and monetary terms. These accounts when fed into policies which are alligned with the principles of 'circular economy' plays a significant role in transitioning from a linear 'take-make-dispose' model to a more sustainable and resource-efficient system that aims to close material loops and reduce waste.

3.17 The main purpose of the compilation of the Solid Waste Accounts is to show the trend of waste generated due to various human activities. Waste generation per capita allows the comparisons of countries with similar economies, while waste generated per unit of value added will show if there has been any decoupling of waste generation from economic growth. For each industry or sector selected, the two -time series when presented together enables utilization of the full benefit of the indicator.

3.18 Sound and efficient use of natural resources is an important part of sustainable development. Waste represents a considerable loss of resources both in the form of materials and energy. The improper treatment and disposal of the generated waste may cause environmental pollution and expose humans to harmful substances and bacteria, and thereby impacting human health. Generation of waste is intimately linked to the level of economic activity in a country. It reflects society's production and consumption patterns. Wealthier economies tend to produce more waste as compared to the others. In many developed countries, a reduction in the volume of waste generated is an indication of development towards less material-intensive production and consumption patterns, particularly as the economy moves from a heavy industry base to a more service base.

Policies related to Solid Waste in India

3.19 The six Solid Waste Management Rules and guidelines by Central Pollution Control Board (CPCB), Central Public Health and Environmental Engineering Organisation (CPHEEO), and other related agencies, prescribe utilization of waste materials in some selected sectors. Apart from the Rules regarding the different categories of Solid Waste in India, Government of India has also implemented several other significant policy decisions² related to the solid waste management. Some of the milestone decisions taken are as follows:

- (i) Section 2.1 of the Municipal Solid Waste Management Manual, 2016³ by CPHEEO, Ministry of Urban Development, prescribes a stepwise waste minimisation approach that is closely linked to the 3Rs (Reduce, Reuse, and Recycle). The Manual mentions the need for policy interventions at the national, state and local levels, and envisages a pivotal role for Urban Local Bodies (ULBs) for effective management.
- (ii) In order to incentivise waste composting, Ministry of Chemicals & Fertilizers has notified the policy on promotion of City Compost providing Market Development Assistance of Rs. 1,500 per tonne to fertilizer companies, ULBs, and compost manufacturers⁴.
- (iii) Ministry of Power has revised the Tariff Policy 2006 under the Indian Electricity Act, 2003, making it mandatory for State DISCOMS to purchase power from Waste-to-Energy plants. In addition, Central Electricity Regulatory Commission (CERC) has notified generic tariff for Waste-to-Energy at Rs. 7.04 per unit and for RDF (Refuse Derived Fuel) at Rs. 7.90 per unit.
- (iv) For providing impetus to the use of waste in roads and construction activities, the Ministry of Road Transport and Highways has notified the use of plastic waste in bituminous mixes in construction of National highways⁵.
- (v) The Central Public Works Dept. has mandated the use of recycled portions of C&D Waste in construction activities, if the same is available within 100 kms of the construction site.

² <https://www.niti.gov.in/sites/default/files/2021-11/Promoting-Behaviour-Change-for-StrengtheningWasteSegregationatSource-PolicyGuidelines.pdf>

³ https://cpcb.nic.in/uploads/MSW/SWM_2016.pdf

⁴ <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1654529>

⁵ <https://morth.nic.in/sites/default/files/File1850.pdf>

- (vi) Swachh Bharat Abhiyan (Clean India Mission) launched in 2014 is a national cleanliness campaign aimed at achieving universal sanitation and effective solid waste management across India. The mission emphasizes behavioural change, construction of household toilets, public awareness campaigns, and the promotion of proper solid waste management practices at the community level.
- (vii) The various green building norms provide for re-utilisation of C&D waste. MoHUA has issued a notification to local authorities to incentivize and provide 1% to 5% extra ground coverage and Floor Area Ratio (FAR) for projects of more than 3,000 sqm plot size on basis of GRIHA evaluation. Similarly, MoEFCC has provided for out-of-turn appraisal for environmental clearances of building and construction projects on the basis of GRIHA/IGBC/LEED evaluation.
- (viii) Recently, Government of India has taken another step towards the fulfilment of its commitment to the protection of environment by banning single-use plastics⁶ in India with effect from July 2022. The policy aims to reduce the plastic waste generation and promote the use of alternative eco-friendly materials.
- (ix) The Ministry of Road Transport and Highways has come out with National Auto Scrapage Policy in March 2021. It aims to achieve multiple goals like reduction in air pollution, the fulfilment of India's climate commitments, improving road and vehicle safety, better fuel efficiency, and boosting the availability of low-cost raw materials for auto, steel and electronics industries. The government expects recycling of metals like steel, copper and aluminium from the scrapped vehicles to help reduce their imports.
- (x) The Ministry of Environment Forest & Climate Change (MoEF&CC) unveiled the Plastic Waste Management (Amendment) Rules, 2021⁷ that propose to ban select categories of single-use plastic items. The proposed prohibition on their manufacture, use, sale, import, and handling is in keeping with the objective of phasing out single-use plastic by 2022. Further, a guideline document for "Uniform Framework for Extended Producers Responsibility (Under Plastic Waste Management Rules, 2016⁸)"

⁶ <https://pib.gov.in/PressReleasePage.aspx?PRID=1882855>

⁷ <https://cpcb.nic.in/uploads/plasticwaste/Notification-12-08-2021.pdf>

⁸ <https://cpcb.nic.in/uploads/plasticwaste/PWM-Amendment-Rules-2022.pdf>

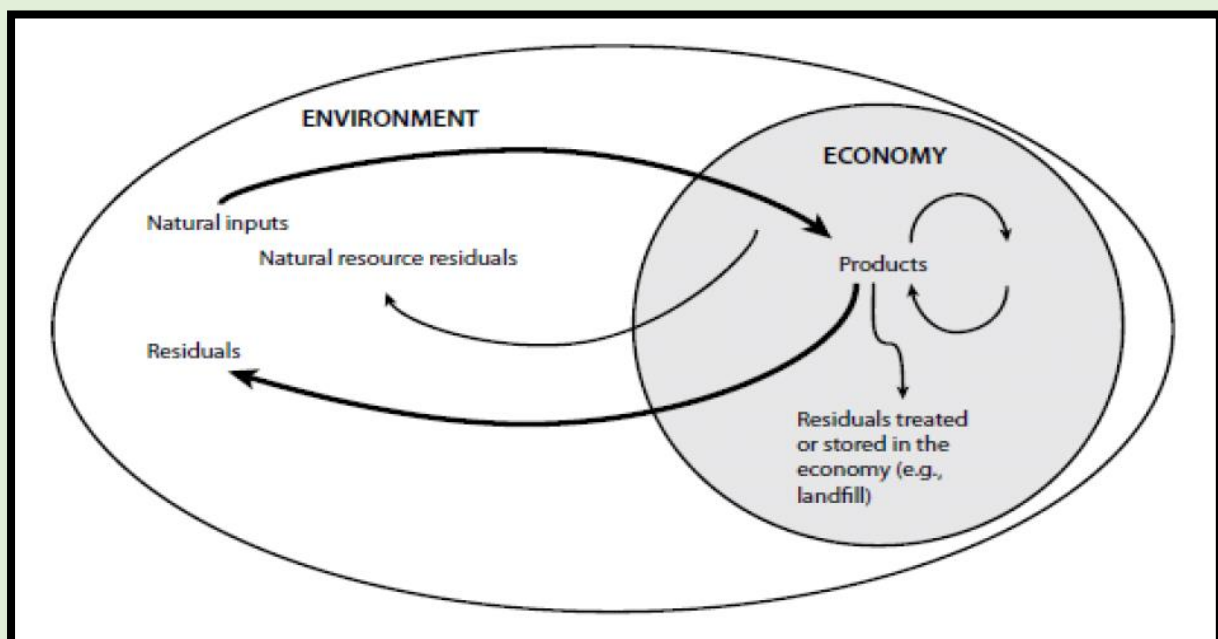
was also formulated by the ministry. The “Extended Producer Responsibility” may be defined as a policy principle to promote total life cycle environmental improvements of product systems by extending the responsibilities of the manufacturer of the product to various phases of the entire life cycle of the product, especially the take-back, recycling and final disposal of the product.

3.20 Apart from these, different Ministries and different state departments have been taking various initiatives towards the direction of minimising the solid wastes.

Solid Waste Accounts SEEA-Framework

3.21 Our economies are embedded within the environment. The economy derives useful inputs from the Environment in terms of natural inputs which includes mineral resources, timber resources, aquatic resources and water resources. These inputs are converted into useful products (goods/services) within the economy with the help of the institutional sectors for instance industries, households and government. This results in flow of residuals to the environment. Thus, there is a clear and strong linkage between the environment and the economy and the SEEA helps to better understand this linkage. Figure 3.1 given below helps to pin-point the relationships between inputs, products and residuals within the environment.

Figure 3.1: Physical flows of natural inputs, products and residuals



Source: SEEA-CF

3.22 The SEEA-Central Framework organizes and integrates the information on the various stocks and flows of the economy and the environment in a series of tables and accounts: (a) supply and use tables in physical and monetary terms showing flows of natural inputs, products and residuals; (b) asset accounts for individual environmental assets in physical and monetary terms showing the stock of environmental assets at the beginning and the end of each accounting period and the changes in the stock; (c) a sequence of economic accounts highlighting depletion-adjusted economic aggregates; and (d) functional accounts recording transactions and other information about economic activities undertaken for environmental purposes. The analysis of these data can also be extended by linking the tables and accounts to relevant employment, demographic and social information.

3.23 “Physical Flow Accounts” of System of Environmental Economic Accounting (SEEA) explains in detail the recording of different physical flows—Natural inputs, Products and Residuals and are placed within the structure of a physical supply and use table (PSUT). The flows from the environment to the economy are recorded as natural inputs (e.g., flows of minerals, timber, fish and water); flows within the economy are recorded as product flows (including additions to the stock of fixed assets) and flows from the economy to the environment are recorded as residuals.

3.24 In Physical supply and use tables (PSUT), physical flows are recorded by compiling supply and use tables in physical units of measurement. These PSUTs are used to assess how an economy supplies and uses energy, water and materials and also helps to examine changes in production and consumption patterns over time. In combination with data from monetary supply and use tables, changes in intensity in the use of natural inputs and the release of residuals can also be examined through the PSUTs.

3.25 The basic form of Physical supply and use table for solid waste accounts is given in **Figure 3.2** and **Figure 3.3**. In the current publication, an attempt has been made to compile the Physical Supply and Use Tables of the Solid Waste Accounts for selected states of India sourcing data primarily from the Central and State Pollution Control Boards/Committees.

Figure – 3.2: Basic Form of Supply Table for Solid Waste

Physical Supply Table for Solid Waste										
	Generation of Solid Waste							Rest of the world	Flows From the environment	Total supply
	Waste collection,treatment and disposal industry							Imports of Solid Waste	Recovered Residuals	
	Landfill	Incineration		Recycling and reuse	Other treatment	other industries	Households			
		Total	Of which: incineration to generate energy							
Generation of Solid Waste Residuals										
Waste 1										
Waste 2										
Waste 3										
.....										
.....										
Other Waste										
Generation of Solid Waste Products										
Waste 1										
Waste 2										
Waste 3										
.....										
.....										
Other Waste										

Dark Grey cells are null be definition

Source: SEEA-CF

Figure 3.3: Basic form of Use Table for Solid Waste Accounts

Physical Use Table for Solid Waste										
	Intermediate Consumption, collection of residuals						Final Consumption	Rest of the world	Flows to the Environment	Total supply
	Waste collection,treatment and disposal industry						Households	Exports of Solid Waste		
	Landfill	Incineration		Recycling and reuse	Other treatment	other industries				
		Total	Of which: incineration to generate energy							
Collection and disposal of solid waste residuals										
Waste 1										
Waste 2										
Waste 3										
.....										
.....										
Other Waste										
Use of Solid Waste Products										
Waste 1										
Waste 2										
Waste 3										
.....										
.....										
Other Waste										

Dark Grey cells are null be definition

Source: SEEA-CF

3.26 The first part of the supply table (Figure 3.2), “Generation of solid waste residuals”, shows the generation of solid waste by industries and households. It also

shows the supply of solid waste from the rest of the world (recorded as imports) and also solid waste recovered from the environment (for example, oil recovered following an off-shore oil spill, debris collected following a natural disaster, or the excavation of soil from locations at which hazardous chemicals were used).

3.27 Similarly, the first part of the use table (Figure 3.3), “Collection and disposal of solid waste residuals”, shows the collection and disposal of solid waste by various activities within the waste collection, treatment and disposal industry and by related activities in other industries. It also shows the flow of solid waste to the rest of the world as exports and the flow of solid waste directly to the environment. The columns of the table highlight the various activities of the waste collection, treatment and disposal industry such as landfill operation, incineration of solid waste (of which incineration of solid waste to produce energy is separately identified), recycling and reuse activities, and other treatment of solid waste. More industry details can be provided depending on analytical requirements and available information. It is to be noted that the accumulation of waste in landfill sites is not presented in a distinct accumulation column as in the general PSUT. This is done so that all information on the waste collection, treatment and disposal industry can be presented as a single group.

3.28 In the second part of the supply and use table, which talks about “Generation of solid waste products” and “Use of solid waste products” respectively, the flows of solid waste that are products rather than residuals are recorded, following the distinction described above. The flows recorded here relate to cases when a solid waste product is identified at the time of disposal by the discarding unit. The flow is recorded in the second part of the supply table matched by a use of solid waste products in the second part of the use table. Sales of scrap metal would be recorded in this way. Sales of products manufactured from solid waste, or simply obtained from waste collection, should not be included. For example, paper discarded by households that is collected by a charitable organisation and subsequently sold in bulk to a paper recycling firm, is only recorded in the solid waste account in respect of the initial flow of solid waste from households to the charitable organisation.

Classifications of Solid Waste Accounts in India

3.29 In India, Central Pollution Control Board (CPCB) is the nodal agency for developing standards and keeping a watch on residuals and their treatment. CPCB collects data related to all the three types of waste, i.e. solid waste, effluents and air

emissions. As far as the classification of the wastes is concerned, at present there is no comprehensive standard international classification for the Wastes. In India, Solid Wastes are classified into 6 components by Law, namely, (i) Municipal Solid Waste (ii) Hazardous Waste (iii) E-waste (iv) Bio-medical Waste (v) Plastic Waste and (vi) Construction and Demolition Waste.

A brief description of the different types of waste are provided in the subsequent paragraphs:

Municipal Solid Waste (MSW)

3.30 Municipal Solid Wastes includes solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other non-residential wastes, street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste and e-waste, battery waste, radioactive waste generated in the area under the local authorities and other entities mentioned in Rule 2 of the Solid Waste Management Rules, 2016.⁹

3.31 In accordance with the Provision 24 (4) of the Solid Waste Management Rules, 2016, the Central Pollution Control Board (CPCB) is required to prepare a Consolidated Annual Report (CAR) based on the annual report submitted by SPCBs/PCCs in compliance of Solid Waste Management Rules, 2016. As per the Annual Report on Solid Waste Management¹⁰ (2020-21), the total quantity of Solid waste generated in the country is 1,60,038.9 TPD of which 1,52,749.5 TPD of waste is collected at a collection efficiency of 95.4%. 79,956.3 TPD (50 %) of waste is treated and 29,427.2 (18.4%) TPD is landfilled. 50,655.4 TPD which is 31.7 % of the total waste generated remains un-accounted.

Hazardous Wastes

3.32 Hazardous Wastes are any waste which by reason of characteristics such as physical, chemical, biological, reactive, toxic, flammable, explosive or corrosive, causes danger or is likely to cause danger to health or environment, whether alone or in contact with other wastes or substances.

3.33 The Government of India has notified Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2016¹¹ under the Environment

⁹ https://cpcb.nic.in/uploads/MSW/SWM_2016.pdf

¹⁰ https://cpcb.nic.in/uploads/MSW/MSW_AnnualReport_2020-21.pdf

¹¹ <https://cpcb.nic.in/displaypdf.php?id=aHdtZC9IV01fUnVsZXNfMjAxNi5wZGY>

(Protection) Act, 1986 to ensure safe handling, generation, processing, treatment, packaging, storage, transportation, use processing, collection, conversion and offering for sale, destruction and disposal of hazardous wastes. The occupier handling hazardous waste and operator of the disposal facility are required to submit the annual return (about hazardous wastes generation, storage, recycling, utilization, disposal etc.) in the prescribed form to State Pollution Control Board (SPCB)/Pollution Control Committee (PCC) by 30th June of every financial year.

3.34 SPCBs/PCCs are required to prepare an annual inventory of the waste generated, recycled, utilized, disposed, etc. for the respective State/UT and submit the same to CPCB by 30th September of every financial year in accordance with the provisions stipulated under Rule 20(3) of the Hazardous Waste Management (HOWM) Rules, 2016. Thereafter, CPCB is required to prepare a consolidated report on management of hazardous and other wastes based on the annual inventory report submitted by SPCBs/PCCs and submit the same to the Ministry of Environment, Forest and Climate Change before 30th December every year, as per Rule 20(4) of the HOWM Rules, 2016.

3.35 As per the National Inventory on the Generation and Management of Hazardous and Other Wastes (2021-22)¹², in 2021-22, about 12.35 Million MT HW was generated (i.e. 26%) against the authorized capacity of about 46.89 Million MT.

E-Waste

3.36 E-wastes means electrical and electronic equipment, including solar photovoltaic modules or panels or cells, whole or in part discarded as waste, as well as rejects from manufacturing, refurbishment and repair processes.

3.37 E- Waste (Management & Handling) Rules, 2011¹³ were notified in 2011 and had come into force since 1st May, 2012. In order to ensure effective implementation of E-Waste Rules and to clearly delineate the role of producers in Extended Producer Responsibility (EPR), MoEFCC, Government of India in supersession of E-Waste (Management and Handling) Rules, 2011 has notified the E-Waste (Management) Rules, 2016¹⁴ vide G.S.R. 338(E) dated 23.03.2016 which has been effective since 01-10-2016. These rules are applicable to every manufacturer, producer, refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, refurbishing, dismantling, recycling and processing of e-waste or electrical and

¹² https://cpcb.nic.in/uploads/hwmd/Annual_Inventory2021-22.pdf

¹³ https://www.meity.gov.in/writereaddata/files/1035e_eng.pdf

¹⁴ <https://cpcb.nic.in/displaypdf.php?id=aHdtZC9HVUIERUxJTkVTX0VXQVNURV9SVUxFU18yMDE2LnBkZg==>

electronic equipment listed in Schedule I, including their components, consumables, parts and spares which make the product operational but shall not apply to: -

- i. waste batteries as covered under the Battery Waste Management Rules, 2022¹⁵;
- ii. packaging plastics as covered under the Plastic Waste Management Rules, 2016;
- iii. micro-enterprise as defined in the Micro, Small and Medium Enterprises Development Act, 2006¹⁶ (27 of 2006); and
- iv. radio-active wastes as covered under the provisions of the Atomic Energy Act, 1962¹⁷ (33 of 1962) and rules made there under.

3.38 The E-Waste (Management) Rules, 2016 mandates CPCB to prepare guidelines on implementation of E-Waste Rules, which includes specific guidelines for extended producer responsibility, channelization, collection centres, storage, transportation, environmentally sound dismantling and recycling, refurbishment, and random sampling of Electric and Electronic Equipments (EEE) for testing of RoHS parameters. In the document, all the above guidelines have been compiled except guidelines for random sampling of EEE for testing of RoHS parameters. These guidelines are given in separate sections of the document. The Central Pollution Control Board submits an annual report to the Ministry of Environment, Forest and Climate Change regarding status of implementation of the E-waste management rules with quantitative and qualitative analysis along with its recommendations, within one month of the end of the financial year. As per the National Inventory on the Generation and Management of E-waste Rules, 2016, in 2020-21, about 1.35 Million Tones E-waste has been generated and 0.35 Million Tones E-waste has been processed.

Bio-Medical Waste (BMW)

3.39 The term "biological" means any preparation made from organisms or micro-organisms or products of metabolism and biochemical reactions intended for use in the diagnosis, immunisation or treatment of human beings or animals or in research activities pertaining thereto. "Bio-medical Waste" means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of

¹⁵ <https://cpcb.nic.in/uploads/hwmd/Battery-WasteManagementRules-2022.pdf>

¹⁶ <https://www.dcsmse.gov.in/MSMED2006.pdf>

¹⁷ <https://www.aerb.gov.in/images/PDF/Atomic-Energy-Act-1962.pdf>

biological or in health camps, including the categories mentioned in Schedule I under Biomedical Waste Management Rules, 2016 (BMWM Rules, 2016).

3.40 Biomedical Waste is regulated under the Biomedical Waste Management Rules, 2016 (BMWM Rules, 2016)¹⁸ as notified under Environment (Protection) Act, 1986 by the Ministry of Environment Forest & Climate Change. These Rules were first notified in the year 1998 and then revamped in the year 2016 in order to implement these rules more effectively and to improve the collection, segregation, processing, treatment and disposal of bio-medical wastes in an environmentally sound management, thereby reducing the bio- medical waste generation and its impact on the environment.

3.41 These rules apply to all persons who generate, collect, receive, store, transport, treat, dispose of, or handle bio-medical waste in any form including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories, blood banks, ayush hospitals, clinical establishments, research or educational institutions, health camps, medical or surgical camps, vaccination camps, blood donation camps, first aid rooms of schools, forensic laboratories and research labs. The BMWM Rules, 2016 stipulates the provisions for segregation of biomedical waste as per the colour-coded system (Yellow, Red, Blue and White) prescribed under said Rules.

3.42 These Rules have a mandate of preparation of Annual Inventory of biomedical waste generation, its collection, treatment and disposal under Rule 13. Every Occupier and Common Bio-medical Waste Treatment Facility Operator is required to prepare an annual inventory for biomedical waste management. Further, SPCBs/PCCs compile and submit the Annual Report to Central Pollution Control Board for the preceding year before 31st July of every year. Central Pollution Control Board compiles, reviews and analyses the annual data submitted by SPCBs / PCCs and submits the same to MoEFCC.

3.43 As per the Annual Report of the Bio-Medical Waste Management¹⁹ for the year 2021, as reported by SPCBs/PCCs, about 764 tonnes/day of BMW were generated during the year 2021 by 3,75,256 numbers of HCFs. Out of 764 tonnes/day of BMW, 721 tonnes/day of BMW is treated and disposed of by CBWTFs and captive treatment facilities (CTFs) installed by Healthcare Facilities.

¹⁸ https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/Bio-medical_Waste_Management_Rules_2016.pdf

¹⁹ https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/AR_BMWM_2021.pdf

Plastic Waste

3.44 The “plastic” means material which contains, as an essential ingredient a high polymer such as polyethylene terephthalate, high-density polyethylene, vinyl, low density polyethylene, polypropylene, polystyrene resins, multi-materials like acrylonitrile butadiene styrene, polyphenylene oxide, polycarbonate, polybutylene terephthalate. “Plastic waste” means any plastic discarded after use or after their intended use is over;

3.45 As per rule “17(3)” of Plastic Waste Management Rule, 2016²³ (as amended) each State Pollution Control Board or Pollution Control Committee shall prepare and submit the Annual Report to the Pollution Control Board on the implementation of these rules by the 31st July of each year. Also, as per provision “17(4)” of PWM Rules, 2016 (as amended), the Central Pollution Control Board shall prepare a consolidated report on the use and management of plastic waste and forward it to the Central Government along with its recommendation by 31st August of each year.

3.46 As per the Annual Report 2020-21²⁰ on Implementation of PWM Rules 2016 (As amended), according to the details provided by 35 States/UTs, the estimated plastic waste generation during the year 2020-21 is approximately 41,26,997 TPA. Out of which, 11,09,180 TPA has been processed in recycling, road making, co-processing, RDF, pyrolysis and others, during the same year.

Construction and Demolition Waste (C&D Waste)

3.47 As per Rule 3 (c) of Construction and Demolition (C & D) Waste Management Rules, 2016²¹ as notified under Environment (Protection) Act, 1986 (29 of 1986) by the Ministry of Environment Forest & Climate Change, the "construction and demolition waste" means waste comprising of building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure. The rules shall apply to every waste resulting from construction, re-modeling, repair and demolition of any civil structure of an individual or organization or authority who generates construction and demolition waste such as building materials, debris, rubble, etc. C&D Wastes also include surplus and damaged products and materials arising in the course of construction work or used temporarily during the course of on-site activities. Under Rule 3 of Construction and

²⁰ https://cpcb.nic.in/uploads/plasticwaste/Annual_Report_2020-21_PWM.pdf

²¹ <https://cpcb.nic.in/displaypdf.php?id=d2FzdGUvQyZEX3J1bGVzXzlwMTYucGRm>

Demolition (C & D) Waste Management Rules, 2016, the following definitions have been provided:

- Sub-rule (b) "construction" means the process of erecting of building or built facility or other structure, or building of infrastructure including alteration in these entities;
- Sub-rule (d) "de-construction" means a planned selective demolition in which salvage, re-use and recycling of the demolished structure is maximized;
- Sub-rule (e) "demolition" means breaking down or tearing down buildings and other structures either manually or using mechanical force (by various equipment) or by implosion using explosives.

Solid Waste Accounts- for the selected States/UTs of India

3.48 The basic deviation from SEEA-CF in preparation of PSUT for Solid Waste Accounts is on "products". As per SEEA if any residual fetches any value while discarding an item, it will no longer be treated as 'waste' but will be treated as 'product' in the PSUT which cannot be followed in the Indian case as data on many items like batteries, e-waste, plastic waste etc. has been given by the recycler who obtains these items by making nominal payments or at free of cost and no such segregated data is available.

3.49 It may also be noted that the data pertaining to different types of wastes are obtained by the authorised collectors of the same and so there may be an overlapping of data pertaining to a particular type of waste. For example, the data on plastic waste generated is obtained mainly from recyclers, which they might have received from ragpickers or segregators who did it from Municipal Solid Waste. Since no such segregated information is available, the data is placed as itself under the assumption that the volume of such waste may be negligible.

3.50 In the current publication, the solid waste accounts in terms of Physical Supply and Use Table (PSUT) have been attempted for the States/UTs of Chandigarh, Jammu and Kashmir, Mizoram, Gujarat, Rajasthan, Maharashtra and Tamil Nadu based on the information received from the respective State/UT Pollution Control Board/Committee and Central Pollution Control Board. Since the data on construction & demolition waste does not represent the C&D waste generated by the entire State, therefore C&D waste has not been considered while preparing the PSUT for the solid waste. The collection of solid waste generated in

the States/UTs is done by Urban Local Bodies/Municipalities/Cantonment Boards which does not include the solid waste generated in the rural areas of States/UTs.

3.51 In general, the following approach has been adopted while compiling the PSUT for the Solid Waste:

- (i) MSW: Total MSW generated has been taken from the CPCB Report and the same has been distributed in the ratio of the information provided by the respective States. On the use side of MSW, the total waste dumped or landfilled has been taken from the CPCB Report and the remaining has been computed as per the information provided by the State. The difference of generated and collected has been adjusted against the 'To the Environment' column.
- (ii) BMW: Total BMW generated has been taken from the CPCB Report. On the use side, the total waste treated is distributed in the proportion of the information provided by the State. The difference of waste generated and collected has been adjusted against the 'To the Environment' column.
- (iii) Hazardous waste information has been taken from CPCB Report.
- (iv) E-Waste information has been provided by the State
- (v) The information on the plastic waste generated has been taken from the CPCB Report and the use side information has been compiled utilizing the data received from the State. The difference of Plastic waste generated and collected has been adjusted against the 'To the Environment' column.

Chandigarh

3.52 In Chandigarh, 1 ULB is responsible for the implementation of the SWM Rules, 2016. The Municipal Corporation of Chandigarh (MCC) has facilitated door to door collection system in 24 out of 26 wards. The MCC has deputed 489 GPS installed compartmentalized vehicles (for dry, wet and domestic hazardous waste) for door-to-door collection and transportation of segregated waste from the city. The work of bio remediation for legacy waste has also started in Chandigarh and no fresh waste is being dumped at the legacy waste site. In addition, all the bulk waste generators are practising on-site composting of their wet waste.

3.53 As regards the Plastic Waste, Municipality staff collects solid waste from door to door and the segregated plastic waste is sent to Refused Derived Fuel (RDF) processing plant for final disposal. At present there are no registered and unregistered plastic manufacturing units in the UT, however, there are around 7 registered recycling units in the UT.

3.54 The Physical Supply and Use Table for the Solid Waste for the Union Territory of Chandigarh has been compiled using the data from the Chandigarh Pollution Control Committee and Central Pollution Control Board for the years 2018-19, 2019-20 and 2020-21 and is presented in the **Annexures 3.1 and 3.2**. The PSUT of solid waste accounts shows that the maximum solid waste generated in Chandigarh is Municipal solid waste followed by E-waste in all the 3 years under study. Against this, majority of the solid waste has been disposed of and treated in sanitary landfills. Remaining has been disposed of through recycling, waste to energy and composting in all the years. In 2020-21, around 82% of the solid waste has been generated by the households (municipal waste) followed by 11% by hotels/shops/restaurants (municipal waste) and the remaining 7% by industries (e-waste, hazardous and BMW). Similarly, in disposal and treatment of solid waste, around 80% of the solid wastes is disposed-off at sanitary landfills and a small proportion is treated in composting, waste to energy and recycling.

Gujarat

3.55 The Physical Supply and Use Table for the Solid Waste for the State of Gujarat has been compiled using the data from the Gujarat Pollution Control Board and Central Pollution Control Board for the years 2018-19, 2019-20 and 2020-21 and is presented in the **Annexures 3.3 and 3.4**. Gujarat Pollution Control Board²² plays its role not merely as a regulator but also as a facilitator. The Board adopted a novel approach of 'Environmental Clinic' & 'Open House' for efficient and better environment management in the State. In Gujarat, at present (according to 2020-21 CPCB Report) there are 164 dumpsites and the state reports 100% door to door collection of mixed MSW with 82% segregation at source.

3.56 The PSUT of solid waste accounts of Gujarat shows that the maximum solid waste generated in the state is Municipal solid waste followed by Hazardous waste and Plastics waste for the years 2018-19 and 2019-20. However, in 2020-21, the highest contributor of solid waste generation is Hazardous waste followed by Municipal solid waste and Plastic waste. Against this, the majority of solid waste has been disposed of and treated in sanitary landfills/dumpsites followed by recycling and composting. In 2020-21, around 42% of the solid waste has been supplied by the households/ hotels/shops/restaurants, followed by 40% generated through industries (BMW, Hazardous and E-waste) and the balance was the stock of previous year's untreated solid waste. Similarly, in disposal and treatment of solid waste, around

²² https://gpcb.gujarat.gov.in/uploads/AR_2021_22_ENGLISH.pdf

33% solid waste was disposed-off at sanitary landfills/dumpsites followed by 21% treated in recycling/reuse, 16% in composting and 10% through waste to energy.

Jammu and Kashmir

3.57 In the Jammu division of Jammu and Kashmir 100% collection of waste has been achieved by the 21 local bodies while partial collection is being done in the remaining local bodies. In Kashmir division, door to door collection of municipal solid waste is being undertaken in 80% of households in Srinagar city through Srinagar Municipal Corporation. In addition, the eco-fragile tourists' places like Pahalgam and Gulmarg have facilities with regard to the treatment and disposal of the solid waste generated in these areas. The segregated waste collected is processed in auto composters and magnetic disintegrators.

3.58 The Physical Supply and Use Table for the Solid Waste for the Union Territory of Jammu and Kashmir (J&K) has been compiled using the data from the J&K Pollution Control Board and Central Pollution Control Board for the years 2018-19, 2019-20 and 2020-21 and is presented in the **Annexures 3.5 and 3.6**. The PSUT of solid waste accounts shows that the majority of solid waste generated in J&K is Municipal solid waste followed by Plastic waste and hazardous waste in all the years. Against this, the majority of solid waste has been disposed and treated in sanitary landfills/dumpsites followed by recycling and composting in all the years. In 2020-21, around 81% of the solid waste has been generated by the households (municipal solid waste and plastic waste) followed by 13% by hotels/shops/restaurants (municipal solid waste) and 5% imports (hazardous waste). Similarly, in disposal and treatment of solid waste, around 75% of the solid waste was disposed-off at sanitary landfills/dumpsites followed by 12% treated in recycling and 9% in composting.

Maharashtra

3.59 In the State of Maharashtra, ULBs practice segregation of waste at source and adequate provisions are made in Solid Waste Management DPRs for achieving 100% segregation of waste at source. ULBs segregate waste into 3 categories-wet, dry and domestic hazardous waste. Dry waste collected from the city is further segregated into paper, plastic, glass, metal etc. through secondary segregation process at transfer stations or the designated material recovery facility (MRF) in the city or at solid waste treatment facility. Many ULBs²³ in the state have accumulated legacy

²³ https://mpcb.gov.in/sites/default/files/solid-waste/msw_annual_report_2021_12082022.pdf

waste at processing facility due to absence of treatment facilities in past. Biomining of legacy waste has been started and 141 sites have been either reclaimed or capped where legacy waste was accumulated.

3.60 The Physical Supply and Use Table for the Solid Waste for the State of Maharashtra has been compiled using the data from the Maharashtra Pollution Control Board and Central Pollution Control Board for the years 2018-19, 2019-20 and 2020-21 and is presented in the **Annexures 3.7 and 3.8**. The PSUT of solid waste accounts shows that the majority of solid waste generated in Maharashtra is Municipal solid waste followed by hazardous waste and plastic waste in all the years. Against this, the majority of solid waste has been disposed and treated in sanitary landfills/dumpsites and composting (including composting, vermi-composting, bio-methanation and waste to energy) in all the years. In 2020-21, around 66% of the solid waste has been generated by the households (municipal solid waste) followed by 22% through hotels/shops/restaurants (municipal solid waste) and 12% by industry (BMW, hazardous, e-waste and plastic). Similarly, in disposal and treatment of solid waste, around 58% of the solid waste has been treated in composting/vermi-composting/biomethanation/waste to energy followed by 33% disposed-off at sanitary landfills/dumpsites.

Mizoram

3.61 In Mizoram, 1 ULB is responsible for MSW management in the State. Solid Waste is being handled by Aizawl Municipal Corporation in Aizawl City and by Urban Development & Poverty Alleviation Department in 22 urban towns through PPP mode. The Physical Supply and Use Table for the Solid Waste for the State of Mizoram has been compiled using the data from the Mizoram Pollution Control Board and Central Pollution Control Board for the years 2018-19, 2019-20 and 2020-21 and is presented in the **Annexures 3.9 and 3.10**. The PSUT of solid waste accounts shows that the majority of solid waste generated in Mizoram is the municipal solid waste in all the years followed by Plastic waste in 2019-20 and 2020-21. Against this, the majority of solid waste had been disposed and treated in other mechanism (pig feed, reuse, composting, material recovery etc.) followed by dumpsites in all the years. In 2020-21, more than 98% of the solid waste generated is the municipal solid waste. Similarly, in disposal and treatment of solid waste, around 48% of the solid waste has been treated/reused through other mechanisms (pig feed, reuse, composting, material recovery etc.) followed by 28% treated in dumpsites and 2% in sanitary landfills. In addition, around 20% of municipal solid waste which has not

been collected by Mizoram Pollution Control Board is assumed to be discharged into the Environment.

Rajasthan

3.62 The Physical Supply and Use Table for the Solid Waste for the State of Rajasthan has been compiled using the data from the Rajasthan Pollution Control Board and Central Pollution Control Board for the years 2018-19, 2019-20 and 2020-21 and is presented in the **Annexures 3.11 and 3.12**. The PSUT of solid waste accounts shows that the majority of solid waste generated in Rajasthan is municipal solid waste followed by Hazardous waste in all the years. Against this, the majority of solid waste had been disposed and treated in sanitary landfills followed by recycling and waste to energy. In 2020-21, more than 51% of the solid waste has been generated by the households (municipal solid waste) followed by 18% through industries (hazardous, e-waste and BMW) and 17% by hotels/shops/restaurants (municipal solid waste). Similarly, in disposal and treatment of solid waste, more than 55% solid waste has been disposed-off at sanitary landfills followed by 16% in recycling and 15% treated in waste to energy. In addition, around 6% of municipal solid waste which has not been collected by Rajasthan Pollution Control Board is assumed to be discharged into the Environment.

Tamil Nadu

3.63 In the State of Tamil Nadu, urban local bodies at several places have organised collection of MSW by house-to-house collection, by using collection bins, compactor bins, lorries using dust bins etc. All the urban local bodies have partly started the source segregation of municipal solid wastes generated in their limits and are partly composting the biodegradable waste.

3.64 The Physical Supply and Use Table for the Solid Waste for the State of Tamil Nadu has been compiled using the data from the Tamil Nadu Pollution Control Board and Central Pollution Control Board for the years 2018-19, 2019-20 and 2020-21 and are presented in the **Annexures 3.13 and 3.14**. The PSUT of solid waste accounts shows that the majority of solid waste generated in Tamil Nadu is Municipal solid waste followed by Hazardous waste and Plastic waste in all the years. Against this, the majority of solid waste has been disposed and treated in composting followed by landfills/dumpsites in all the years. In 2020-21, around 62% of the solid waste is generated by households (municipal solid waste, plastics waste and e-waste) followed by 19% through hotels/shops/restaurants (municipal

solid waste) and 15% by industries (hazardous, plastic, e-waste and BMW). Similarly, in disposal and treatment of solid waste, around 48% of the solid waste has been treated in composting followed by 15% disposed-off in landfills/dumpsites, 9% in reuse and 6% in recycling. In addition, around 10% of municipal solid waste & plastic waste which has not been collected by Tamil Nadu Pollution Control Board is assumed to flow into the environment

3.65 Using the Physical Supply and Use Table of Solid Waste Accounts, the following Global SDG Indicators have been compiled for the years 2018-19, 2019-20 and 2020-21 and are given in **Annexures 3.15 and 3.16**. For 2020-21, the summary value of the following SDG Indicators is presented in **Tables 3.1 and 3.2**.

- **Global SDG Indicator 11.6.1:** Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated.
- **Global SDG Indicator 12.4.2:** (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment.

Table 3.1: Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated.

Year: 2020-21

S. No.	Name of States/UTs	Total Municipal Solid Waste Generated (Tonnes)	Total Municipal Solid Waste Collected (%)	Total Municipal Solid Waste Managed in Controlled Facilities (%)
1	Rajasthan	25,17,464	91.2	91.2
2	Gujarat	37,86,433	99.6	67.0
3	Maharashtra	82,60,939	99.8	72.5
4	Tamil Nadu	48,99,031	87.4	71.6
5	Chandigarh	1,87,245	100.0	100.0
6	Jammu & Kashmir	5,34,079	98.2	41.1
7	Mizoram	1,26,097	79.9	50.8

Table 3.2: (a) Hazardous waste (HW) generated per capita; and (b) proportion of hazardous waste treated, by type of treatment.

Year: 2020-21

S. No.	Name of States/UTs	Total HW Generated (Tonnes)	HW Generated Per Capita (Tonnes)	Total Hazardous Waste Treated by Type of Treatment (%)				
				Sanitary Landfill	Incineration	Recycling	Reuse	Waste to Energy
1	Rajasthan	11,32,287	1.436	16.1	0.2	11.1	18.2	47.7
2	Gujarat	39,10,007	5.634	30.5	3.6	5.0	5.6	20.5
3	Maharashtra	8,37,488	0.676	34.8	5.2	14.3	43.1	
4	Tamil Nadu	10,72,953	1.408	8.2	0.5	7.9	44.8	15.7
5	Chandigarh	1,279	0.106					
6	Jammu & Kashmir	34,406	0.257			93.4		
7	Mizoram	51	0.004	5.9		94.1		

3.66 It is evident from the Table 3.1 that almost 100% of the Municipal solid waste is collected in the States of Gujarat, Maharashtra & Union Territory of Chandigarh. Against the collected municipal solid waste in the States/UTs, the Union Territory of Chandigarh has managed 100% treatment in controlled facilities followed by Rajasthan (91.2%), Maharashtra (72.5%) and Tamil Nadu (71.6%). Table 3.2 shows that out of 7 States/UTs, the highest per capita hazardous waste generated in 2020-21 was Gujarat and the lowest in Mizoram. Further in respect of hazardous waste treated by type of treatment, more than 93% of the hazardous waste has been treated in recycling by the State of Mizoram and Union Territory of Jammu & Kashmir in 2020-21. Similarly, around 44.8% of the hazardous waste has been treated in reuse in 2020-21 by the State of Tamil Nadu followed by Maharashtra (43%). In Rajasthan, around 48% of the hazardous waste has been treated in waste to energy in 2020-21.

3.67 As per the metadata of Global SDG Indicator 12.5.1, National Recycling Rate is defined as the quantity of material recycled in the country plus quantities exported for recycling minus material imported intended for recycling out of total waste generated in the country. Recycling includes co-digestion /anaerobic digestion and composting/aerobic process but not controlled combustion (incineration) or land application. National recycling rate can be presented by type of waste including e-waste, plastic waste, municipal waste and others.

$$\text{Recycling Rate} = \frac{\left(\frac{\text{Material recycled} + \text{Material exported intended for recycling}}{\text{Material imported intended for recycling}} \right) \times 100}{\text{Total waste generated}}$$

where

Total waste generated = Waste from manufacturing (ISIC 10-33) + Waste from electricity, gas, steam and air conditioning supply (ISIC 35) + Waste from other economic activities (ISIC 38) + Municipal waste (excluding construction and mining).

3.68 Recycling Rate has not been compiled due to non-availability of data as per the International Standard Industrial Classification (ISIC).

Conclusions

3.69 Despite huge thrust on the principles of 3R (reduce, reuse, recycle) being implemented with active engagement of citizens, there still exists considerable scope to recover value from the waste. This is possible through the adoption of the circular economy approach which is central to achieving the vision of a clean India. Circular Economy solutions are embedded in the concept of generating zero waste through innovations that can utilize discarded materials to produce reusable and recyclable products.

3.70 Given the hazardous effects of the residuals, management of wastes has gained paramount importance in today's society. The tasks of solid waste management pose not only complex technical challenges but also a wide variety of administrative, economic and social problems. It is an undeniable fact that 'Better Data' will provide better information on waste generation which will lead the policy makers to take decisions on RRRR (Reduce, Reuse, Recycle and Recover).

3.71 Solid Waste Account is one of three accounts suggested by the SEEA for the residuals. The scope ahead is enormous. A time series accounts on Solid Waste will provide useful insights into the trend in 'generation & processing' of waste. This will enable further probing in estimating the generation of solid waste in different types of waste which in-turn will be helpful for the policy makers to take empirical decisions on the number and capacity of treatment plants to be set up. With the support of the Central and State Pollution Control Board, these accounts can be developed for other States as well. Also, the residual accounts can be extended for the Effluents and Air Emissions. The Material Flow Accounts (Core Accounts) together with the complete Residual Accounts will completely describe the Material Flow Accounts.

Fish Provisioning Services

Provisioning Services

Fisheries



Food



Genetic resources

Regulating Services

Redistribution of fluxes, nutrient regulation (e.g., marine nutrient derived)



Cultural Services



Gastronomic events



Education and research



Community interest in biodiversity and conservation



Leisure and competition angling



Supporting Services



Support of biological cycles (e.g., bivalve larvae)

Bioindicators



Maintenance of nursery habitats and populations



Productivity of the food-web



Chapter 4

Fish Provisioning Services

Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime.

-Maimonides

Introduction-Fisheries Sector

4.1 Fishing is the capture of aquatic organisms in marine, coastal and inland areas. The fisheries and aquaculture sectors have been increasingly recognised for their essential contribution to global food security and nutrition in the twenty-first century. According to the 'The State of World Fisheries and Aquaculture: 2022', Towards Blue Transformation¹ released by FAO, total fisheries and aquaculture production reached a record of 214 million tonnes in 2020, comprising of 178 million tonnes of aquatic animals. Expanding this role requires scaling up transformative changes in policy, management, innovation, and investment to achieve sustainable, inclusive and equitable global fisheries and aquaculture.

4.2 Aquaculture and fishing have a great potential to feed and nourish the world's growing population, but ensuring sustainability is utmost required. As per the above-mentioned FAO's report, it is estimated that 58.5 million people were employed in the primary sector. Including subsistence and secondary sector workers, and their dependents, it is estimated that about 600 million livelihoods depend at least partially on fisheries and aquaculture. Fishing – both in capture fisheries (at sea) and in aquaculture (fish farming) – if sustainably managed, has an important role to play in providing jobs and feeding the world.

4.3 Factors such as overfishing, pollution, poor management are causing a continuous decrease in the fishery resources. Under such circumstances, it is important to improve global fisheries management to restore ecosystems to a healthy and productive state and protect the long-term supply of aquatic foods. Rebuilding overfished stocks could increase fisheries production by 16.5 million tonnes² and raise the contribution of marine fisheries towards food security, nutrition, economic growth and well-being of coastal communities.

¹ <https://www.fao.org/3/cc0461en/cc0461en.pdf>

² <https://www.fao.org/3/cc0461en/online/sofia/2022/key-messages.html>

4.4 Aquatic food production is forecast to increase by a further 15 percent by 2030, mainly by intensifying and expanding sustainable aquaculture production. Blue Transformation is a vision for sustainably transforming aquatic food systems, a recognized solution for food and nutrition security and environmental and social well-being, by preserving health of aquatic ecosystems, reducing pollution, protecting biodiversity and promoting social equality. Blue Transformation aims to: (i) increase the development and adoption of sustainable aquaculture practices; (ii) integrate aquaculture into national, regional and global development strategies and food policies; (iii) expand and intensify aquaculture production to meet the growing demand for aquatic food and enhance inclusive livelihoods; and (iv) improve capacities at all levels to develop and adopt innovative technology and management practices for a more efficient and resilient aquaculture industry.

Fisheries Sector in India

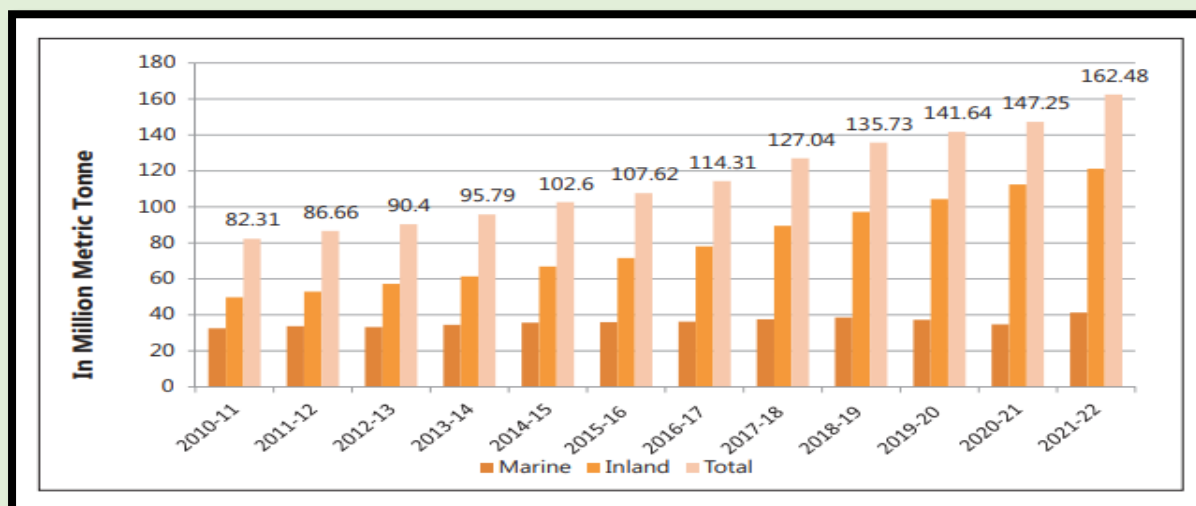
4.5 The history of fisheries in India dates back to the Harappan Civilization. However, the importance and the role of the Fisheries sector was officially recognised in India, through the enactment of the 'Indian Fisheries Act' in 1897³. This Act laid the foundation of the development of the fisheries sector in India and delineated the responsibility of the provinces, towards the development and conservation of fisheries in the country. Through this Act, the provinces were empowered to formulate Rules/Laws for the conservation of the fish and fisheries resources. As Fisheries is a State Subject, so historically investments in the sector, particularly in the fishing villages/coastal fishing villages, fishing harbours and ports have been made by the states 'for the welfare and support of the fishermen community'. However, with the growing requirements for resources, technological transfer/ advice and policy orientation the efforts of State Governments/UT Administrations are supplemented by the Government of India towards the development of the fisheries sector.

4.6 Fisheries sector have emerged as a sunrise sector and have been an important sector that provides food, nutrition, employment, income and livelihood in India. The fisheries sector plays an important role in the national economy and the sector has been one of the major contributors of foreign exchange earnings, with India being one of the leading seafood exporting nations in the world.

³ <http://nbaindia.org/uploaded/Biodiversityindia/1.%20Fisheries%20Act.pdf>

4.7 An expansion in the farmers income cannot be achieved only through the Agriculture sector. Allied agricultural activities also need to play a vital role. Fisheries sector has a great potential and that needs to be tapped. The Central Government and the State Government has been continuously coming up with several schemes to encourage fisheries activities and also to provide social security measures in the States as well as to develop fisheries as the primary source of livelihood.

Figure 4.1 Fish Production of India over the years



Source: Ministry of Fisheries, Animal Husbandry and Dairying

4.8 India is the 3rd largest fish producing country⁴ in the world and accounts for 7.96% of the global production. India is also a major producer of fish through Aquaculture and ranks second in the world after China. The fish production has increased from 5.66 MMT in 2000-01 to 8.67 MMT in 2011-12 and further to 16.25 MMT in 2021-22 and has immense potential for growth. The fisheries sector plays an important role in the national economy and according to FAO's 'The State of World Fisheries and Aquaculture 2022' report, India ranked first in Inland water capture production and ranked sixth in Marine water capture.

4.9 Fish, being an affordable and rich source of animal protein, is one of the healthiest options to mitigate hunger and nutrient deficiency. The sector has been recognized as a powerful income and employment generator as it stimulates growth of a number of subsidiary industries. Also, it is an instrument of livelihood for a large section of economically backward population of the country providing income and employment to a large chunk of population. Therefore, a sustained and focussed

⁴ https://dof.gov.in/sites/default/files/2023-04/Final_Annual_Report_2022-23_English.pdf

attention is given to the fisheries sector by the Union Government through policy and financial support to accelerate its development in a sustainable, responsible, inclusive and equitable manner. They include:

- **Pradhan Mantri Matsya Sampada Yojana (PMMSY):** The scheme aims to address critical gaps in fish production and productivity, infuse innovation and modern technology, improve post-harvest infrastructure and management, modernize and strengthen value chain and traceability, establish framework for a robust fisheries management and fishers' welfare. Emphasis has been laid towards creating awareness for harnessing of fisheries potential in a sustainable, responsible, inclusive and equitable manner. The scheme envisages to bring about Blue Revolution⁵ through sustainable and responsible development of fisheries sector in India.
- **Fisheries and Aquaculture Infrastructure Development Fund (FIDF):** In order to address the infrastructure requirement for fisheries sector, the Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying during 2018-19 has created dedicated a fund namely FIDF with a total funds size of Rs 7522.48 crore⁶. FIDF provides concessional finance / loan to the Eligible Entities (EEs), including State Governments/UT Administrations and State entities for development of identified fisheries infrastructure facilities.
- **Kisan Credit Card (KCC):** The Government of India announced Rs.2 lakh crore concessional credit boost to 2.5 crore farmers including fishers and fish farmers under Kisan Credit Card (KCC) Scheme as a part of Atmanirbhar Bharat Package. KCC aims to help animal husbandry and fisheries farmers for meeting their working capital requirements.

Ecosystem Services

4.10 The Ecosystem Services are central in the ecosystem accounting framework since they provide the link between ecosystem assets on the one hand, and the benefits used and enjoyed by people on the other hand. A fundamental aspect of ecosystem accounting is recognising the fact that a single ecosystem will generate a range of ecosystem services thus contributing to the generation of a number of benefits. For accounting purposes, it is most useful to consider ecosystem services in

⁵ https://dof.gov.in/sites/default/files/2020-07/PressReleasebyPIBonPMMSY_0.pdf

⁶ <https://dof.gov.in/index.php/related-links/fidf>

the context of a chain of flows that connect ecosystems with well-being. Starting at the individual and societal well-being, the chained approach recognises that well-being is influenced by the receipts of benefits. In the context of ecosystem accounting, benefits comprise of SNA and Non-SNA benefits. (Refer to Chapter 1 para 14).

4.11 SEEA- Ecosystem Accounting classifies the Ecosystem services into three broadly agreed categories:

- (i) Provisioning Services: those ecosystem services representing the contribution to benefits that are extracted or harvested from ecosystems, for example a fish or a plant with pharmaceutical properties.
- (ii) Regulating and maintenance Services: those ecosystem services resulting from the ability of ecosystems to regulate biological processes and to influence climate, hydrological and biochemical cycles, and thereby maintain environmental conditions beneficial to individuals and society. These services often have an important spatial aspect.
- (iii) Cultural Services are generated from the physical settings, locations or situations which give rise to intellectual and symbolic benefits that people obtain from ecosystems through recreation, knowledge development, relaxation, and spiritual reflection. This may involve actual visits to an area, indirectly enjoying the ecosystem (e.g. through nature movies), or gaining satisfaction from the knowledge that an ecosystem containing important biodiversity or cultural monuments will be preserved.

4.12 In order to estimate the Fish Provisioning Services, one of the approaches suggested in the SEEA is the resource rent method. Using this method, Fish Provisioning Services for the States of Andhra Pradesh, Rajasthan and Haryana were estimated and published in the issue “EnviStats India 2022: Vol II Environment Accounts”. In the current publication, an attempt has been made to estimate the fish provisioning services for other States. Based on the information received from States, the resource rent has been calculated using the rental price approach for the States of Bihar, Kerala and Tamil Nadu. The estimates compiled in the publication are limited to tanks, ponds, lakes, reservoirs etc. that are provided for lease/rent. The information on the marine areas has not been considered due to paucity of information on the coastal boundaries and the availability of rent structure for coastal fishing. Since the subject matter of ‘Fisheries’ is listed in the State List (entry

21 under 7th Schedule of article 246⁷) of the Constitution of India, data has been from the State Fisheries Department.

Bihar

4.13 Traditionally, Bihar's economy is dominated⁸ by the rural sector. Around 88% of the population live in the rural areas. River Ganga is the main river which is joined by tributaries such as Ghagra, Gandak, Burhi, Gandak, Bagmati, Kamla-Balanm, Kosi and Mahananda. The species of major and minor carps found in the Ganges river system are extensively used for the culture in ponds, lakes, reservoirs and enclosures throughout the country. The state is endowed with adequate freshwater resources. The state's average rainfall of 1091mm is considered to be adequate; however, owing to change in climate over the years, droughts and floods are adversely affecting the agriculture, fisheries output and Gross State Domestic Product (GSDP). Capture and culture of fish are traditional activities of Bihar.

4.14 During sixties and seventies, Bihar was the biggest supplier of Indian major carp seed from its riverine resources to the entire country to meet the seed requirement of growing freshwater aquaculture sector. Unfortunately, the riverine fisheries have collapsed due to overfishing and destructive fishing, population pressure, pollution, siltation and reduction in water flow and other anthropogenic activities. The state has also extensive network of irrigation canals which retains water for considerable period and offer opportunities for aquaculture through cage and other enclosure-based aquaculture. However, this potential is still lying untapped even at national level. Besides, vast area of lands adjoining the canals often remains water logged for several months which could also be developed for aquaculture and fish seed production. Fisheries resources of the state such as reservoirs are common public property which provide productive source of livelihoods for a large number of resources to poor landless and marginal farming communities, especially traditional fishing communities. Chours, on the other hand, are largely multi-ownership-based resources which offer an additional crop of fish during the period of water availability. So far, this resource is lying unutilized.

4.15 The main culture fishery resources of Bihar lie in the ponds and tanks of variable sizes which are distributed throughout the state. Most of the ponds are seasonal while some are also perennial. These perennial ponds offer vast potential

⁷ <https://www.mea.gov.in/Images/pdf1/S7.pdf>

⁸ <http://fisheries.bihar.gov.in/Introduction.aspx>

for the development of aquaculture while seasonal ponds are highly suitable for rearing of sees-fry, fingerlings and yearlings.

4.16 As regards the water bodies, according to the 1st Census of Water Bodies (2018-19)⁹ released by M/o Jal Shakti in 2023, 45,793 water bodies have been enumerated in the State of Bihar, out of which 95.7% are in rural areas and the remaining 4.3% are in urban areas. Majority of the water bodies are ponds, followed by tanks and lakes. The key parameters of the 1st Census of Water Bodies (2018-19) in Bihar are presented in the **Table 4.1** below:

Table 4.1: Key Parameters of First Census of Water Bodies (2018-19) - Bihar

S. No.	Parameter	Unit	Value
1.	Water Bodies	Number	45,793
	Rural		43,831
	Urban		1,962
2.	Type of Water Bodies	Number	45,793
	Ponds		35,027
	Tanks		4,221
	Lakes		2,693
	Reservoirs		2,126
	Water Conservation Schemes / Percolation Tanks / Check Dams		312
	Others		1,414
3.	Distribution of Water Bodies by Water Spread Area (Ha)	Number	45,713
	Less than 0.5 hectares		24,187
	0.5 hectare to 1.0 hectare		8,964
	1 hectare to 5 hectares		11,026
	5 hectares to 10 hectares		983
	10 hectares to 50 hectares		353
	More than 50 hectares		200
4.	Water Bodies not in use due to reasons	Number	22,440
	Dried up		3,975
	Construction		5,830
	Siltation		3,560
	Destroyed beyond repair		1,742
	Salinity		489
	Due to industrial effluents		129
	Others		7,093

⁹ <https://cdnbbsr.s3waas.gov.in/s3a70dc40477bc2adceef4d2c90f47eb82/uploads/2023/05/2023051279.pdf>

4.17 In the State of Bihar, the term “Jalkar” means Tank, Pokhar, Ahar, River, Water Course Channel, ‘Chaur’, ‘Dhav’, Reservoir Lake, Ox-bow Lake etc. under Department of Animal Husbandry and Fisheries, Bihar where Makhana, Singhara and Fish is reared. The ‘Reserve Deposit Fixation Committee’ fixes the Government selling price of different types of aqua-product, after every five years evaluating the data of the market selling rate of different types of aqua-product placed by the District Fisheries Officer. On the basis of the selling price, reserve deposit amount of all Jalkars will be fixed by ‘Reserve Deposit Fixation Committee’ after 5 years, provided that the annual reserve deposit amount of any Jalkar will not be more than 15% or less than 10% of the value of its annual production. The ‘Reserve Deposit Fixation Committee’ shall have the right to fix any percentage, which is not more than 5% of the annual enhancement of Reserve Deposit Amount of the consecutive year. This is the amount which is to be deposited by the cooperative federation as rent/lease of the Jalkar.

4.18 On the basis of the district wise details of area of leased water bodies (Jalkar) and its revenue in terms of ‘Reserved Deposit’ provided by the Directorate of Fisheries, Bihar, Fish Provisioning Services for the State for the years 2017-18 to 2021-22 have been computed and is presented in the **Table 4.2** below:

Table 4.2: Year-wise Fish Provisioning Services- Bihar

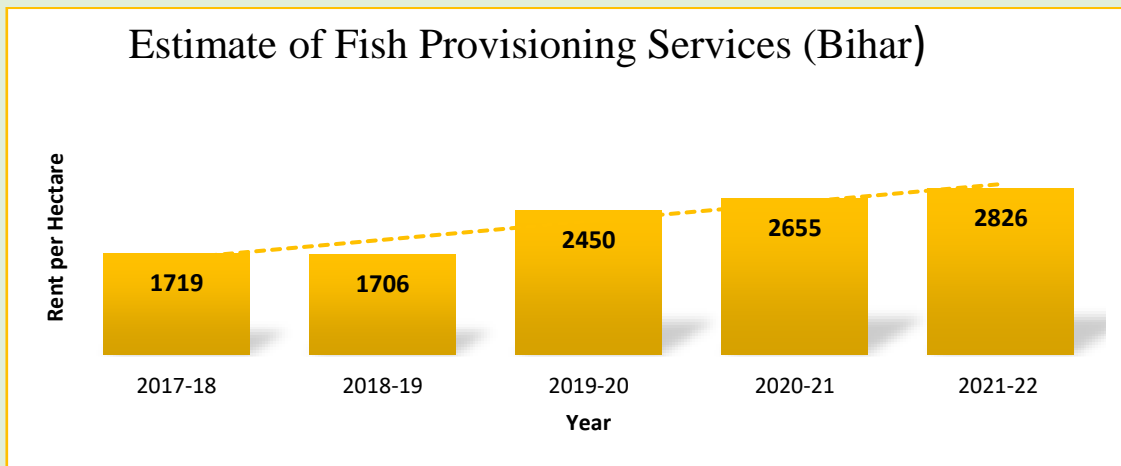
S. No.	Year	Total Resources*		Total Rent/Lease Amount	Rent per Hectare
		No. of Resources	Area (Hectare)	(Rs.)	(Rs. / Hectare)
1	2017-18	30,384	58,447	10,04,62,600	1,719
2	2018-19	31,120	60,481	10,32,00,400	1,706
3	2019-20	30,918	60,169	14,74,37,800	2,450
4	2020-21	30,879	60,469	16,05,41,956	2,655
5	2021-22	30,680	56,881	16,07,26,900	2,826

*Resources include Tanks, Ponds, Lake, Reservoirs

4.19 The year-wise estimates of Fish Provisioning Services for the years 2017-18 to 2021-22 are presented in the **Figure 4.2**. From the graph presented below, it can be seen that in general there is an upward trend in the Fish Provisioning Services for the State of Bihar despite decrease in number of water resources as well as area. The rent/ lease amount is fixed by ‘Reserve Deposit Fixation Committee’ based on selling

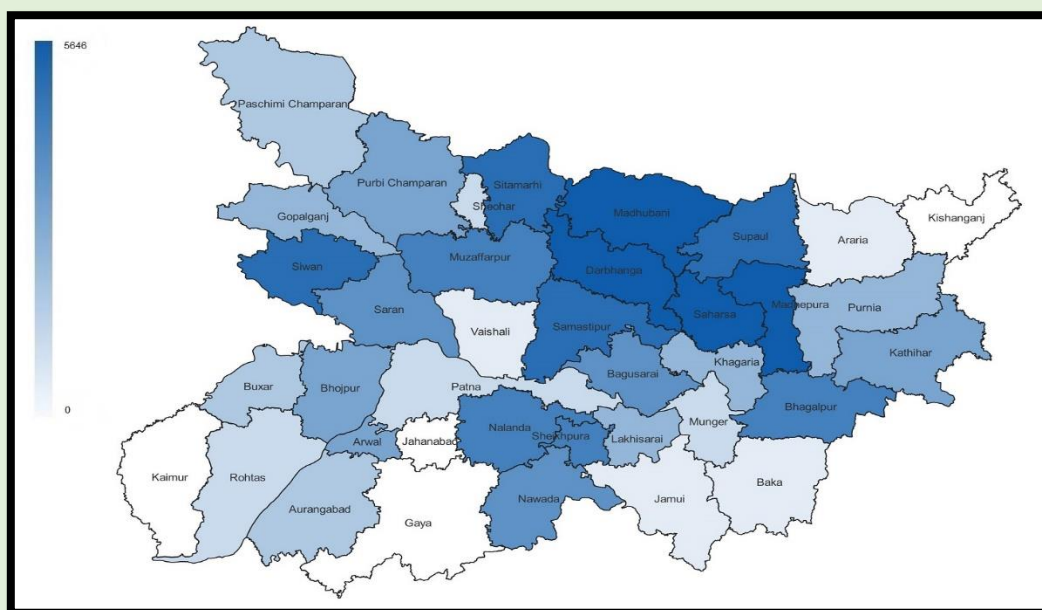
price of different aqua product. The actual rent depends upon several factors such as water availability, water quality and other condition such as presence of fence etc.

Figure 4.2 Estimates of Fish Provisioning Services (Rs./Hectare) for Bihar

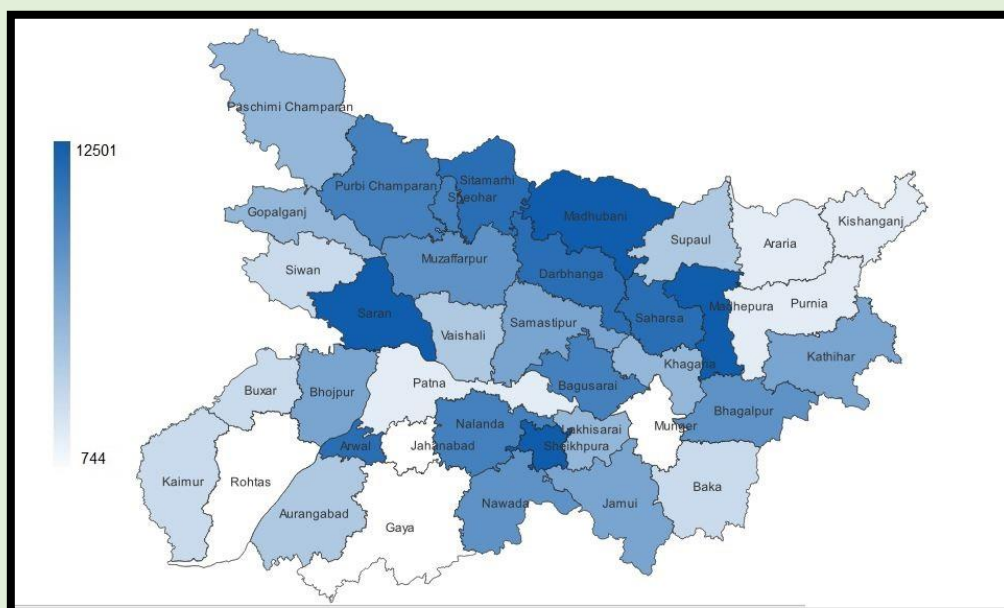


4.20 The district-wise estimates of the Fish Provisioning Services for the years 2017-18 to 2021-22 have also been computed for the State, the details (district-wise lakes, ponds, reservoirs etc. along with area) of which have been presented in the **Annexure 4.1 to 4.5**. For the year 2021-22, the district wise estimates have been presented in the **Maps 4.1 and 4.2** below:

Map: 4.1 District wise Fish Provisioning Services (Rs/Hectare) for Bihar for 2017-18



Map: 4.2 District wise Fish Provisioning Services (Rs/Hectare) for Bihar for 2021-22



Kerala

4.21 The State of Kerala is geographically placed¹⁰ in such a way that it has a 590 km long coastline, 44 rivers and innumerable number of waterbodies. These play a significant role in the ecological diversity and livelihood of the State. Many species of fish, invertebrates, plants, algae and other aquatic living organisms occupy a wide variety of habitat along the vast coastline and associated waters. The aquatic biodiversity and fish wealth of Kerala sustain more than 10 lakh fisherfolk and supports numerous additional activities including commercial fishing, aquaculture, tourism, education, recreation etc.

4.22 Currently Kerala has 222 fishing villages in the marine and 113 fishery villages in the inland sector, where fishing and relative aspects provide livelihood to a vast majority of the population. The extent of inland water resources of Kerala has high potential for expanding aquaculture.

4.23 As regards the water bodies, according to the 1st Census of Water Bodies (2018-19) released by M/o Jal Shakti in 2023, 55,734 water bodies have been enumerated in the State, out of which majority i.e. 89.2% are in rural areas and the remaining 10.8% are in urban areas with majority of the water bodies as ponds. The key parameters of 1st Census of Water Bodies (2018-19) in Kerala are presented in the **Table 4.3**.

¹⁰ <https://fisheries.kerala.gov.in/about-us>

Table 4.3: Key Parameters of First Census of Water Bodies (2018-19) - Kerala

S. No.	Parameter	Unit	Value
1.	Water Bodies	Number	55,734
	Rural		49,725
	Urban		6,009
2.	Type of Water Bodies	Number	55,734
	Ponds		51,007
	Tanks		848
	Lakes		4
	Reservoirs		63
	Water Conservation Schemes / Percolation Tanks / Check Dams		3,349
	Others		463
3.	Distribution of Water Bodies by Water Spread Area (Ha)	Number	55,725
	Less than 0.5 hectares		54,054
	0.5 hectare to 1.0 hectare		1,077
	1 hectare to 5 hectares		466
	5 hectares to 10 hectares		45
	10 hectares to 50 hectares		32
	More than 50 hectares		51
4.	Water Bodies not in use due to reasons	Number	9,184
	Dried up		642
	Construction		183
	Siltation		2,126
	Destroyed beyond repair		1,326
	Salinity		287
	Due to industrial effluents		43
	Others		4,577

4.24 In the State of Kerala in majority of the districts, the rental/lease rate are fixed for a period of 5 years or above. The rental/lease rate of the water bodies vary in each district of the State depending on the geographical nature of the districts. In addition to this, the rental rate varies within the districts also depending on the terrain. Further, the water bodies are not given for rent in all the districts. For example, there is no rent/lease method practiced in Kannur district. Also, in Kasaragod district, at present fish farmers are permitted aqua culture activities in public ponds at panchayath level, but no cash transactions are done in this connection. When private

persons contact the authorities for aqua culture practice in these ponds on lease, only written permission is demanded and no rent is charged.

4.25 Based on the district-wise rent/lease data and data on lakes, ponds, reservoirs etc. along with area data received from the Department of Fisheries, Kerala, the estimates of the Fish Provisioning Services for the years 2020-21 have been compiled. Fish Provisioning Services at the State level for the block year 2020-21 to 2025-26 is shown in the **Table 4.4** given below:

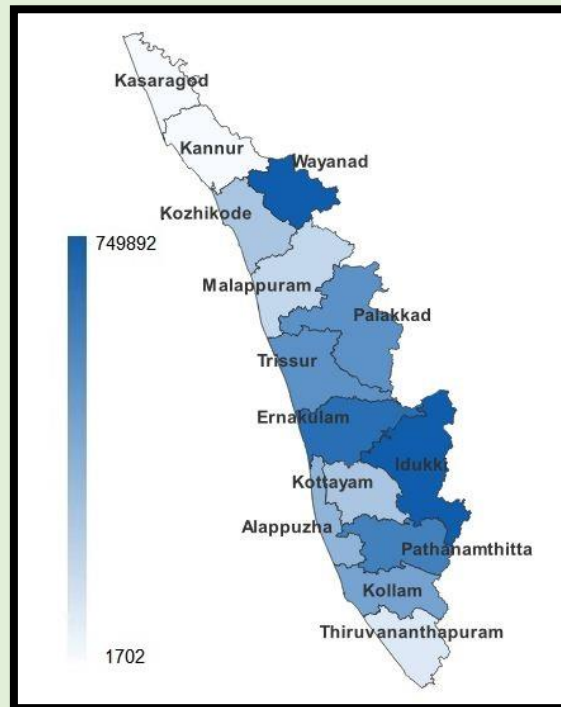
Table 4.4: District-wise Fish Provisioning Services- Kerala (From 2020-21 to 2025-26)

S. No.	District	Total Resources*		Total Rent/Lease Amount	Rent/Hectare
		No of Resources	Area (hectare)	(Rs)	(Rs/Hectare)
1	Thiruvananthapuram	1,810	2,659	45,25,000	1,702
2	Kollam	811	2,864	14,14,81,600	49,400
3	Pathanamthitta	466	2,568	25,37,18,400	98,800
4	Alappuzha	646	383	1,42,84,751	37,297
5	Kottayam	515	64	19,91,808	31,122
6	Idukki	152	9,869	7,40,06,84,148	7,49,892
7	Ernakulam	1,047	1,128	14,85,02,328	1,31,651
8	Trissur	1,503	4,607	34,13,78,700	74,100
9	Palakkad	1,039	8,005	39,94,01,470	49,894
10	Malappuram	872	62	10,87,294	17,537
11	Kozhikkode	397	2,156	7,56,19,544	35,074
12	Wayanad	118	2,960	81,15,43,200	2,74,170

*Resources include Tanks, Ponds, Lake, Reservoirs

4.26 From the Table 4.4 present above, it can be seen that Fish Provisioning Services in district Idukki is the highest whereas Thiruvananthapuram has the lowest Fish Provisioning Services. The district-wise estimates of the Fish Provisioning Services have also been depicted in the following **Map 4.3**.

Map 4.3: District wise Estimate of Fish Provisioning Services (Rs/Hectare) for Kerala (2020-21 to 2025-26)



4.27 The fluctuation in the rent amount in the State can be attributed to the water availability of reservoirs which in turn depends on the rainfall patterns in the State. Within the districts also, there is wide variation in the rent structure due to the following reasons:

- a. Rent/lease amount depends on the species farmed, or type of farming practices.
- b. Farms where extensive farming is practiced have less rent/ lease amount compared to intensive farming area.
- c. Road access, Availability of electricity, nearness to markets etc affects the rent/lease amount.
- d. Species used in farming also affects the rent or lease amount. Shrimp farms and brackish water farms fetches moderately high rent or lease amount compared to fresh water fish farms.
- e. Eastern side of the district is a Ghat area where fish farming is not as common as on the western side. Only fresh water fish farming is practiced in the eastern area and hence the rent/lease amount is less. Brackish water farming is practiced in the central and western area where rent/lease amount of the fish farms is high.
- f. In areas like Munrothuruth and Paravoor which are enriched with lot of brackish water farms due to the nearness of Ashtamudi and Paravur backwaters. Such areas possess high rent/lease amount.

- g. Possibility of Aqua tourism also plays a role in fixing the rent/lease amount in the district.

Tamil Nadu

4.28 Tamil Nadu is enriched with Marine, Brackish water and Inland fishery resources amenable for capture and culture fisheries. Substantial focus is being given on the economic and social dimensions of fishery resources by the Government of Tamil Nadu. The Indian Fisheries Act, 1897 enacted by the then Madras Presidency paved the way for the formulation of fisheries legislations across India. The Fisheries sector plays an important role in the socio-economic development of the country by providing livelihood to large number of fishers, generating employment opportunities in allied sectors and ensuring nutritional security.

4.29 Tamil Nadu possess 3.83 lakh hectares¹¹ effective inland water spread area comprising reservoirs, major and minor irrigation tanks, ponds, rivers, backwaters and other water bodies of which, 3.7 lakh hectare of water-spreads is suitable for fish culture. It comprises of major reservoirs (52,000 ha.) Big/small Irrigation tanks (98000 ha.), small lakes and Rural Fishery Demonstration tanks (158000 ha.) and Brackish water areas, swamps, estuaries (63,000 ha.). Tamil Nadu is also endowed with rich cold-water fishery resources. Apart from this, 7,400 km length of rivers and canals offer good scope for fisheries development. The Inland Fisheries policy of the state focuses in maximizing the fish production utilizing available inland water resources by adopting scientific freshwater aquaculture management and quality seed production. The inland programmes initiated are focused to bring additional water bodies for fishery development. In Tamil Nadu, the Inland Fishermen population is 1.83 lakhs and there are 270 number of Inland Fishermen Co-operative Societies with a total registered membership of 59,000 actively engaged fishermen in fishing activities in the inland water spread areas.

4.30 As regards the water bodies, according to the 1st Census of Water Bodies (2018-19)¹² released by M/o Jal Shakti in 2023, 1,06,957 water bodies have been enumerated in the state, out of which 92.9% are in rural areas and the remaining 7.1% are in urban areas. The majority of the water bodies in the State are ponds and tanks. The key parameters of 1st Census of Water Bodies (2018-19) in Tamil Nadu are presented in the **Table 4.5**.

¹¹ <https://www.fisheries.tn.gov.in/InlandFisheries>

¹² <https://cdnbbsr.s3waas.gov.in/s3a70dc40477bc2adceef4d2c90f47eb82/uploads/2023/05/2023051279.pdf>

Table 4.5: Key Parameters of First Census of Water Bodies (2018-19) – Tamil Nadu

S. No.	Parameter	Unit	Value
1.	Water Bodies	Number	1,06,957
	Rural		99,414
	Urban		7,543
2.	Type of Water Bodies	Number	1,06,957
	Ponds		38,321
	Tanks		43,837
	Lakes		13,629
	Reservoirs		111
	Water Conservation Schemes / Percolation Tanks / Check Dams		2,782
	Others		8,277
3.	Distribution of Water Bodies by Water Spread Area (Ha)	Number	1,06,292
	Less than 0.5 hectares		74,673
	0.5 hectare to 1.0 hectare		11,577
	1 hectare to 5 hectares		12,211
	5 hectares to 10 hectares		5,971
	10 hectares to 50 hectares		1,152
	More than 50 hectares		708
4.	Water Bodies not in use due to reasons	Number	31,299
	Dried up		21,449
	Construction		5,621
	Siltation		2,808
	Destroyed beyond repair		1,095
	Salinity		326
	Due to industrial effluents		-
	Others		-

4.31 The Government has always paid attention towards increasing the fish production from inland waterbodies by stocking quality fish seeds in the reservoirs. Also, the Government is encouraging leasing of tanks owned by Water Resources Department (WRD) through intensive inland fish culture scheme in five Districts such as Villupuram, Kallakurichi, Cuddalore, Madurai and Theni; promotion of fish culture in irrigation tanks through District Fish Farmers Development Agencies (DFFDAs); and by insisting the water body owning Departments to lease out the potential water bodies for fish culture. The Government has also taken special measures for stocking of fish seeds in inland water bodies through various schemes.

4.32 In Tamil Nadu, district-wise lakes, ponds, reservoirs etc. along with area

are maintained by two departments of State governments-namely Directorate of Fisheries and Public Works Department (PWD). Those districts with lakes, ponds etc. maintained in the PWD are used primarily for the agriculture and irrigation purposes. The remaining districts are maintained by the Directorate of fisheries and have been leased out for fish production. Accordingly, the estimation of Fish Production Services for those districts maintained under Directorate of Fisheries have been considered for the estimation of the FPS.

4.33 The Tamil Nadu Fisheries Development Corporations (TNFDC) has 8 reservoirs for fisheries exploitation and the TNFDC has no control over small, medium, large 'tanks/ponds/lakes' in the entire State. If the fishery exploitation was not leased out due to natural circumstances like drought i.e. insufficient water availability for fish culture or due to administrative reasons, the exploitation is carried out by the TNFDC. In addition, for the year 2016-17, due to a pending court case, the lease amount couldn't be collected for the reservoir in the Tiruvallur district.

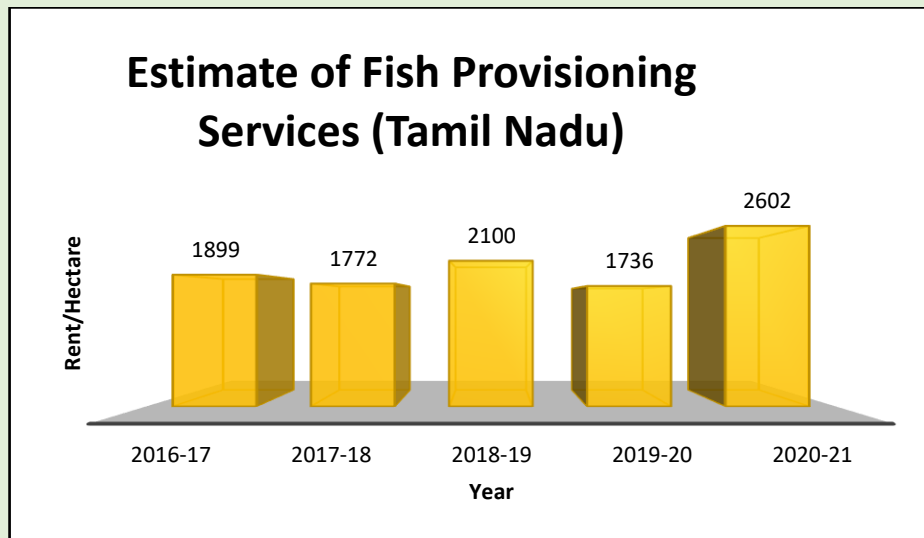
4.34 The district-wise lakes, ponds, reservoirs etc. along with area and estimates of the Fish Provisioning Services for the years 2016-17 to 2020-21 compiled using data received from Department of Fisheries and Fishermen Welfare, Tamil Nadu are provided in the **Annexure-4.6 to 4.10**. The estimates of Fish Provisioning Services for the years 2016-17 to 2020-21 are presented in the **Table 4.6** and **Figure 4.3**.

Table 4.6: Year-wise Fish Provisioning Services- Tamil Nadu

S. No.	Year	Total Resources*		Total Rent/Lease Amount	Rent per Hectare
		No of Resources	Area (Hectare)	(Rs.)	(Rs. / Hectare)
1	2016-17	59	53,088	10,08,26,798	1,899
2	2017-18	58	52,442	9,29,13,495	1,772
3	2018-19	60	55,088	11,56,78,863	2,100
4	2019-20	63	55,295	9,60,03,053	1,736
5	2020-21	61	55,151	14,34,89,564	2,602

*Resources include Reservoirs

Figure 4.3: Estimates of Fish Provisioning Services for Tamil Nadu



Challenges and Way Forward

4.35 India has rich and diverse fisheries resources ranging from deep seas to lakes, ponds, rivers and more than 10 percent of the global biodiversity in terms of fish and shellfish species. The Fisheries sector in India has immense potential to expand and this will be possible only when the waterbodies are in good and healthy conditions. It is therefore essential to have focused attention to the fisheries sector through policy intervention and financial support in order to accelerate its development in a sustainable, responsible, inclusive and equitable manner.

4.36 The estimation of the Fish Provisioning Service is an attempt to measure the value of the waterbodies where the fishes thrive. It is thus the contribution of the water bodies which helps mankind in the generation of huge amount of economic benefit as well as providing employment to people for better livelihood. The valuation of this service will open up avenues for more granular level policy framing to ensure improvement in the health of the water ecosystems which will, in turn, help to attain progress towards the achievement of sustainability.

4.37 In the current study, the Fish Provisioning Services (Rent/hectare) has been computed for those districts where the water bodies are rented/leased by the Governments. As the 1st Census of the Water Bodies provides a fair idea about the total water bodies in the State categorised in different area classes, the estimates can be further refined if all the water bodies are considered. Moreover, the total Fish

Provisioning Services of the State can be computed using the total area of the water bodies and the Rent/hectare.

4.38 The estimates in the current publication have been confined to three states for a limited number of years. There is scope for further improvement and expansion over time. With the availability of more information from other states, the estimates can be compiled on a pan-India basis.

Soil Erosion Prevention Services provided by the Forests



Chapter 5

Soil Erosion Prevention Services by the Forests

Trees listen to the breeze; & then, rustle its voice so beautifully.

-Summer Crosby & Angie Weiland-Crosby

Introduction

5.1 Forests have a deep cultural connect to civilization and its evolution in the Indian subcontinent. Since time immemorial, forests have been crucial for growth of the mind, a resource base and a sanctuary. Today, a global understanding is slowly emerging that there will be no healthy economy on an unhealthy planet¹. Environmental deterioration is contributing to climate change, biodiversity loss and the emergence of new diseases. Forests and trees can play crucial roles in addressing these crises and moving towards sustainable economies.

5.2 In India, as per India State of Forest Report 2021², the total forest cover is 7,13,789 sq. km which is 21.71% of the total geographical area of the country. The tree cover of the country is estimated as 95,748 sq. km which is 2.91% of the total geographical area. Globally,³ India has around 2% of the total world forest area. Forests provide a number of benefits to the mankind such as provide food and timber, poverty alleviation, tackle climate change, prevention of land and water degradation, preserving the biodiversity apart from providing the spiritual or the aesthetic pleasure. The major challenge forests pose is the deforestation.

5.3 Evidences suggests that halting deforestation would generate multiple other local and global benefits – such as biodiversity conservation, disaster reduction, the protection of soil and water and the maintenance of pollination services – that far exceed the cost of halting deforestation. It would also increase the adaptive capacity and resilience of people and ecosystems.

¹ <https://www.fao.org/3/cb9363en/cb9363en.pdf>

² <https://fsi.nic.in/isfr-2021/acknowledgement-executive-summary.pdf>

³ <https://fsi.nic.in/isfr-2021/chapter-1.pdf>

Soil Regulation Services Provided by the Forests

5.4 Soil erosion i.e. the process that transforms soil into sediments is one of the major and most widely spread forms of land degradation. It encompasses the destruction of the physical structure that supports the development of plant roots. Moreover, surface soil removal may result in substantial nutrient and water losses, as well as in the decrease of productivity and increase the pollution of surface waterways. Soil erosion thus impacts the sustainability of the ecosystems and the provision of ecosystem services. Soil conservation efforts address concerns with these impacts and aims to meet the increasing needs for food and raw materials.

5.5 Soil erosion by water is linked to desertification processes⁴. Its severity is prone to increase as a consequence of changes in the amount of precipitation as well as in its temporal and spatial distribution under prospective climate scenarios (IPCC 2014a). This will exert further pressure on ecosystems' water balance and thus calls for adequate soil protection and conservation practices in the framework of ecosystems management.

5.6 The degradation of soil quality due to erosion has far-reaching economic implications, as it affects land productivity, water quality, and the overall health of the ecosystem. Estimating soil loss and evaluating its economic impact is crucial for effective land management, sustainable development, and informed decision-making in the fields of forestry and agriculture. The importance of estimating soil loss is given below:

- (i) **Land Productivity:** Soil is a vital resource that supports plant growth, nutrient cycling, and water retention. Erosion reduces the topsoil layer, which contains essential nutrients and organic matter. Estimating soil loss helps to quantify the degradation of land productivity over time.
- (ii) **Water Quality:** Soil erosion can lead to sedimentation of water bodies, impairing water quality and affecting aquatic ecosystems. Estimating soil loss helps to assess the potential impact on water resources and the cost of treating water for consumption.
- (iii) **Economic Loss:** Soil erosion leads to direct economic losses through reduced crop yields, increased maintenance costs, and decreased land value. Accurate estimation of soil loss provides a basis for evaluating the monetary impact on agriculture and forestry sectors.

⁴ file:///C:/Users/SSD/Downloads/s40663-020-00247-y.pdf

- (iv) **Environmental Degradation:** Erosion can result in the loss of biodiversity, disruption of ecosystem services, and degradation of habitats. Estimating soil loss helps in understanding the broader ecological consequences.

5.7 The main factors influencing the amount of loss due to soil erosion are:

- (i) **Soil Structure-** Soils with a medium to fine texture having low level of organic matter content and possessing a weak structural development are most easily eroded. Typically, these soils have low water infiltration rates and therefore are subject to high rates of water erosion and are easily displaced by wind.
- (ii) **Status of vegetative cover-** Land areas covered by plant biomass, living or dead, are more resistant to wind and water soil erosion and experience relatively little erosion because rain drops and wind energy are dissipated by the biomass layer and the topsoil is held together by the biomass.
- (iii) **Land Topography-** The topography of a given landscape, its rainfall and/or wind exposure all combine to influence the land's susceptibility to soil erosion.

5.8 Trees are widely known to impact the ecosystem's hydrological cycle and resultant water availability and quality. As vegetation cover plays a crucial role in erosion and runoff rates, afforestation is considered among the best options for soil conservation. Water-related forest ecosystem services include the provision, filtration and regulation of water, along with stream ecosystem support and water-related hazards control, e.g., soil protection from erosion and runoff. In this context, forest management practices that involve vegetation cover modifications may have a substantial impact on the provision of water-related ecosystem services. Moreover, forest ecosystem's interactions with water and energy cycles have been highlighted as the foundations for carbon storage, water resources distribution and terrestrial temperature balancing. Forest management thus plays a vital role in meeting climate change mitigation goals.

5.9 An important ecosystem services provided by the forests/croplands is the soil erosion prevention services, thereby mitigating several of the negative impacts of soil erosion. To begin the assessment, the first step is to evaluate the erosion that would occur when vegetation is absent and therefore no ecosystem service is provided. SEEA EA suggests taking bare land as the baseline scenario depicting the absence of any ecosystem and thereby denoting the maximum potential soil loss. The soil erosion in the presence of the ecosystem is then compared with the baseline

scenario to quantify the SEP services. The choice of bare land as the baseline may be considered appropriate for natural vegetation such as forests and grasslands. The potential soil erosion in a given place and time is related to rainfall erosivity (i.e. the erosive potential of rainfall), soil erodibility (as a characteristic of the soil type) and local topography. Although external drivers can have an effect on these variables (for example, climate change), they are less prone to be changed directly by human action. The actual ecosystem service can then be determined by the difference between the soil erosion that occurs in two scenarios- in the presence of the ecosystem and in the absence of the same.

Revised Universal Soil Loss Equation (RUSLE)

5.10 The empirical soil loss model called the Revised Universal Soil Loss Equation Model (RUSLE), designed to predict long-term annual averages of soil loss, has been widely-used and applied around the world due to its relative simplicity and low data requirements compared to more complex soil erosion models. RUSLE is the most commonly used method for estimating soil erosion, and its input variables, such as rainfall erosivity, soil erodibility, slope length and steepness, cover management, and conservation practices, vary greatly over space. RUSLE offers a systematic methodology to estimate soil loss rates across diverse landscapes. The spatial erosion maps can serve as a useful reference for deriving land & forest planning and management strategies and provide the opportunity to develop a decision plan for soil erosion prevention and control in the country.

5.11 It is a multiplicative model that uses the information about the rainfall, topography, soil, land use and cover and support practices to estimate terrestrial rill/inter-rill erosion by the equation given below:

$$A = R * K * L * S * C * P$$

where

A= Mean annual soil loss (metric tons/ ha/ year)

R= Rainfall erosivity factor (megajoules millimeter hectare / hour/ year)

K=Soil erodibility factor (metric tons hectare hour hectare/ megajoules/millimeter)

L= Slope-length factor (unit-less)

S= Slope-steepness factor (unit-less)

C= Cover and management factor (unit-less)

P= Support practice factor (unit-less)

5.12 A brief description of each of the factors used in the model for the RUSLE equation is provided in the following paragraphs:

- (i) **Rainfall Erosivity (R) Factor:** This factor accounts for the erosive power of rainfall in the area. It is often calculated using rainfall intensity and distribution data. Rainfall data can be collected from local weather stations or interpolated from regional rainfall datasets.
- (ii) **Soil Erodibility (K) Factor:** Soil erodibility represents how susceptible a particular soil type is to erosion. It depends on soil properties such as texture, structure, organic matter content, and permeability. Soil data can be obtained from soil surveys or databases.
- (iii) **Slope Length and Steepness (LS) Factor:** This factor considers the combined effect of slope length and slope gradient on erosion. It is calculated based on the topography of the area. Digital elevation models (DEMs) can be used to determine slope characteristics.
- (iv) **Cover and Management (C) Factor:** The C factor accounts for the land cover and management practices in the area. It quantifies the effect of vegetation and ground cover in reducing soil erosion. Different land cover types have different C values, and the factor can be adjusted based on conservation practices in place.
- (v) **Support Practice (P) Factor:** The P factor represents the effectiveness of erosion control practices applied to the land. It accounts for the presence of terraces, contour farming, and other erosion control measures.

5.13 Geographic Information Systems (GIS) provide the spatial framework needed to implement RUSLE effectively. GIS technology allows the integration, analysis, and visualization of diverse geospatial data layers, enabling a comprehensive understanding of the spatial distribution of soil erosion risk. The capability to overlay various data sets—such as rainfall patterns, soil types, slope gradients, land cover and management practices, enables a holistic assessment that considers the intricate relationships between these factors.

5.14 National Statistical Office (NSO) of Ministry of Statistics and Programme Implementation (MoSPI) in collaboration with The Soil & Land Use Survey of India (SLUSI) under Integrated Nutrient Management (INM) division of Ministry of Agriculture and Farmers' Welfare attempted an assessment of the impacts of forest ecosystem on soil erosion protection, as presence of vegetation cover impacts soil

erosion over the long-term. The Soil & Land Use Survey of India (SLUSI) is the apex organization in the country which deals with Soil Survey and Land Resource Mapping. SLUSI is primarily engaged in conducting soil survey of different intensities in order to provide scientific database for developmental programs encompassing soil and water conservation planning, watershed development, scientific land use planning etc.

5.15 The main objective of the analysis presented in the chapter is to estimate the soil erosion prevention service of the Forest Ecosystem by exploring the scenario of Soil Erosion Prevention Service in comparison to bare lands for two districts of India- Gondia in Maharashtra and Balrampur in Chhattisgarh on a pilot basis for the year 2021. The main reason behind the selection of these districts was that in both these districts the area under the forest cover is more than 50% of the area of the districts. It has been assumed that the changes in the land use land cover have not been significant since 2015. (Last available data of NRSC that has been used for the analysis is for the year 2015-16).

5.16 In order to assess the regulating Ecosystem Services, provided by the forests to mitigate the soil loss, first the soil erosion owing to the local climate, topography and soil characteristics with no vegetation present is estimated; i.e. the erosion that would occur in the absence of the associated ecosystem services provided by the forests. Thereafter, soil loss is estimated in the presence of the forests and the difference of these is the estimate of the 'Soil Erosion Prevention Services' provided by the forests.

Data Sets Used

5.17 The data sets used in the estimation of the soil erosion prevention services by the forest are summarized in **Table 5.1** below. Most of these datasets are spatial data (raster and feature classes/shapefiles) that can only be viewed within the ArcMap or ArcCatalog interface.

Table 5.1: Summary of the sources for the input data used

Input	Dataset	Source	Resolution
Digital Elevation Model Format: raster	CARTOSAT_1 DEM (30 mts vertical resolution) downloaded BHUVAN Portal	Indian Space Research Organization (ISRO))- CARTO-DEM	~30 meters
Soil data (K value) Format: raster	Soil resource Mapping layer (1:50k scale) harmonized with 1:50k soil dataset (Entire district)	Harmonized Data of Soil and Land use Survey of India & National remote Sensing Centre (SLUSI & NRSC-ISRO)	1.5 arc-second (~.05km at equator)
Land cover data (NRSC 2015-16) Format: feature layer (same as shapefile)	Land Use Land Cover datasets NRSC 2015	NRSC-ISRO	1:50k scale
Rainfall erosivity (R- factor) Format: raster; ESRI grid	Global Rainfall Erosivity-2017	Panagos etal. (2017) https://esdac.jrc.ec.europa.eu/content/global-rainfall-erosivity	30 arc-second (~1km at equator)
Masks of the study area Format: shapefile	District Boundary Datasets	Admin layer from NIC and SOI	1:50K scale
K-factor dataset (Stewart 1975) (K-values used here are expressed in SI metric units. To convert to the SI metric unit, it was multiplied by 0.1317)		Harmonized Soil data (NRSC & SLUSI) localdataset https://mepas.pnnl.gov/mepas/formulations/source	
C-factor dataset ((November 2022) [Normalized Difference Vegetation Index (NDVI) in forest land cover]		NDVI based C-values in forest land as per vegetation cover derived from LISS -III, Resourcesat-2 Data, Nov-2020	

5.18 For the analysis, the software used on LUCI_SEEA⁵ is ArcMap 10.4 and the computation of soil loss using RUSLE has been done using two processes listed in the tool- Pre-process data and calculate soil loss (RUSLE).

Assumptions of the Study

5.19 Assessing soil loss using the Revised Universal Soil Loss Equation (RUSLE) with remote sensing and GIS involves several assumptions and considerations. Detailed key assumptions in respect of RUSLE model are given below:

- i. **Steady-State Conditions:** RUSLE assumes that the landscape is in a relatively steady-state condition, meaning that soil, land cover, and climate factors remain relatively constant over the assessment period. In the present study, the land use categories in the two scenarios assumes a fairly steady distribution of forest over the entire area of the district.
- ii. **Correlated Rainfall:** It assumes a uniform rainfall distribution across the study area, the values of which are correlated with the averages from the last few decades. Varying precipitation patterns in different places in the district have not been taken into account.
- iii. **Constant Slope:** In the present study, the DEM data from NRSC -ISRO has been used for measuring slope angles by assuming that that slope does not change much over time. It does not take into account the changes in slope due topographical changes owing to erosion or human activities.
- iv. **Homogeneous Soil Properties:** It assumes uniform soil properties across the study area although variability in soil types and properties can significantly affect erosion rates.
- v. **Conservation Practices:** In the present study, it is assumed that conservation practices (e.g., terracing, contour farming) are not in place. If such practices exist, they should be duly considered in the erosion assessment.
- vi. **Time Scale:** RUSLE typically assumes a long-term erosion rate, usually on an annual basis. Short-term weather events like storms can lead to more erosion than the long-term average suggests.
- vii. **Forest Definition:** In the current study the Forest Area has been taken from the NRSC-Land Use Land Cover data which includes all patches with canopy

⁵ <https://www.lucitools.org/using-luci/>

density of more than 10% greater than 0.5 hectares in size, which are not categorized under any other predominant land use. This differs from the definition used by the Forest Survey of India (FSI) which includes all lands having trees more than 1 hectare in the area with tree canopy density of more than 10% irrespective of ownership, legal status of the land and species composition of trees. The estimates do have a chance of improvement if the Forest cover from FSI is used for the analysis. The note detailing the conceptual differences in the definition of 'forests' across India's official data sources is provided in Annexure 5.1.

5.20 Similarly, assumptions in respect of use of remote sensing and GIS are given below:

- i. **Remote Sensing Data:** Remote sensing data, such as LISS III sensor satellite imagery from Resourcesat satellite and CARTO-DEM (30 mts.) downloaded from BHUVAN-ISRO portal have been used to gather information about land cover, land use, and vegetation. Assumptions here include the accuracy and availability of remote sensing data for the study area.
- ii. **GIS Data:** Geographic Information Systems (GIS) are used to integrate and analyze various spatial data layers, including topography, land use, and soil types. Assumptions include the quality and availability of GIS data.
- iii. **Spatial Variability:** Remote sensing and GIS help capture spatial variability within the study area, which can be crucial for accurately estimating erosion rates. However, due care has been taken while making assumptions about the spatial distribution of erosion factors.
- iv. **Scale:** The scale of remote sensing and GIS data must match the scale at which erosion is being assessed. Assumptions about scaling and the representativeness of data at different scales are important. In the present study, the availability of information in a single resolution is ensured through downscaling/upscaling of various data.
- v. **Data Accuracy:** Assumptions are made regarding the accuracy of remote sensing and GIS data, as errors or inaccuracies can propagate into erosion estimates.

5.21 Assessing soil loss using RUSLE with remote sensing and GIS involves some other assumptions, including those related to the natural environment, data accuracy, and the technology itself. Careful consideration of these assumptions

and potential sources of error have been worked out in order to generate reliable erosion estimates.

Gondia District, Maharashtra

5.22 Gondia district is located in the north-eastern part of the state of Maharashtra with topographic features including a mix of flat and undulating terrain with forested areas, agricultural lands and water bodies. The land use in Gondia district includes agricultural activities, forested areas and settlements. The district has various soil types contributing to its agricultural productivity and also potential for erosion. The district has a mix of forest types including:

- **Tropical Moist Deciduous Forests:** These forests are characterized by a variety of deciduous tree species that shed their leaves during the dry season. Teak, Sal, Tendu, and Bamboo are common species found in these forests.
- **Bamboo Forests:** Bamboo is a prominent component of many forests in Gondia district. Bamboo is used for various purposes, including construction, handicrafts, and as a source of income for local communities.
- **Mixed Forests:** The district also has mixed forests with a combination of both deciduous and evergreen species.

5.23 For the current analysis, as far as the geographic area of Gondia district is concerned, the date range November (post-monsoon) has been taken.

Results

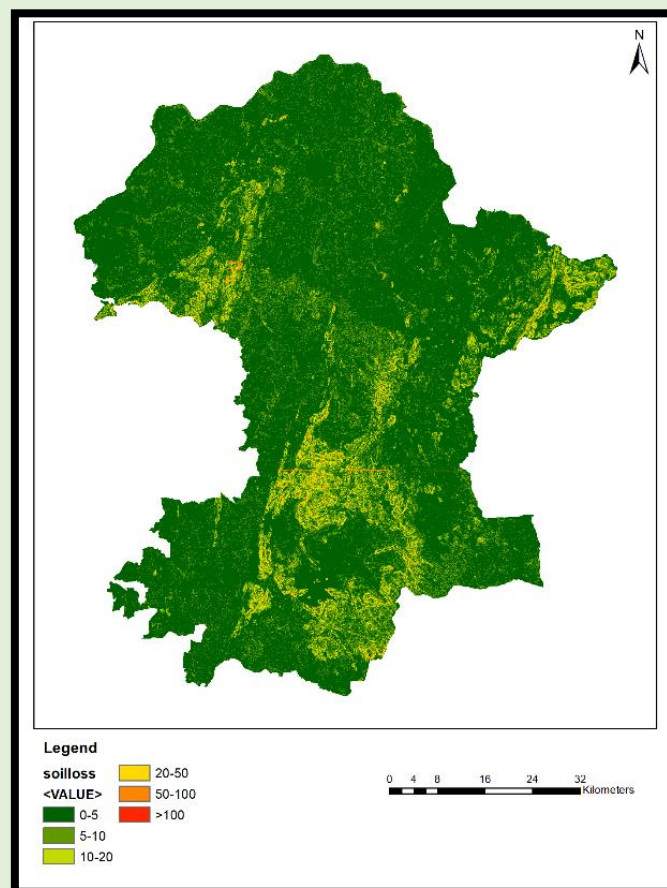
5.24 The analysis of the distribution of the soil loss in the Gondia districts indicates that a major part of the district area shows very low, low and medium soil loss (83.5%). Moderately high loss categories cover around (9.75%) land area while 6.88% area shows high to very high loss categories in the district. The distribution of area under different soil loss categories is presented in the **Table 5.2** below. The spatial distribution of the soil loss in the Gondia district of Maharashtra is shown in the **Map 5.1**. In the presence of various ecosystem cover, the estimated soil loss lies in the range varying from 0 - 113 T/Ha/year.

Table 5.2: Distribution of area under different soil loss categories (Tonnes/hectare/year)

Soil Loss Classes	Area (%)	Area hectare
0 - 5	39.74	208,541.90
5 - 10	25.27	132,670.05
10 - 20	18.36	96,333.17
20 - 50	9.75	51,203.74
50 - 100	3.65	19,200.65
>100	3.23	16,861.30
Total	100	5,24,810.84

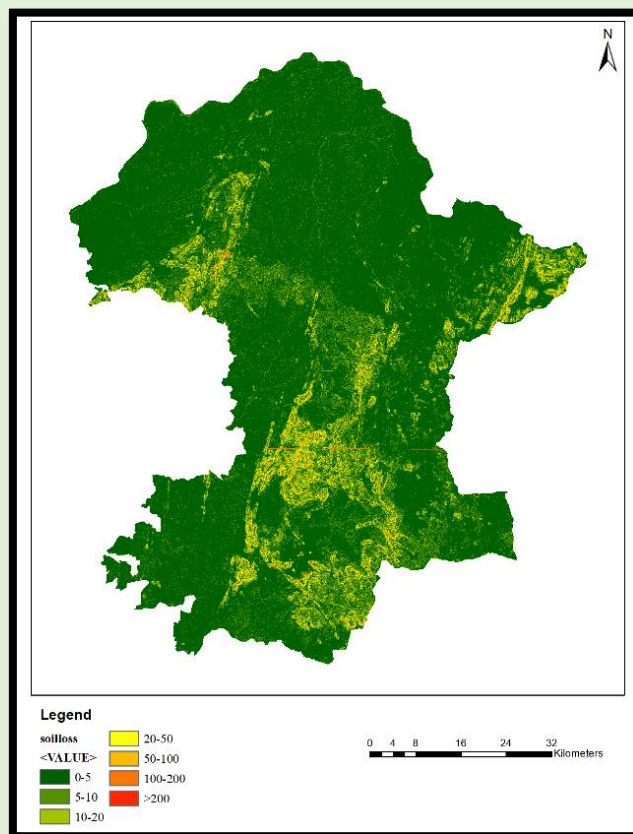
Values calculated with the support of SLUSI

Map 5.1: Distribution of Soil Loss in presence of various ecosystem in Gondia



5.25 The spatial distribution of the soil loss under the scenario of bare land (C=1) in Gondia district of Maharashtra is shown in the following **Map 5.2**. Under this scenario the estimated soil loss ranges between 0 -227 Tonnes/ Ha/Year.

Map 5.2: Distribution of Soil Loss under Bare Land Scenario in Gondia



Balrampur District, Chhattisgarh

5.26 Balrampur district is located in the Northern part of the state of Chhattisgarh in Central India with topographic features including a mix of flat and undulating terrain with forested areas, agricultural lands and water bodies. The land use in Balrampur district includes agricultural activities, forested areas and settlements. The district has various soil types contributing to its agricultural productivity and also potential for erosion. The district has a vast range of forests. These forests play a very important role in the economy of the district. There are different types of flora available in the district like Saja, Sal, Mango, Mahua, Sisham, Gamhar, Harra, Jamun, Tendu, Khair, Kusum, Imli, Bija, Aurjun, Sandan, Palas and others.

5.27 For the current analysis, as far as the geographic area of Balrampur district is concerned, the date range November (post monsoon) has been taken.

Results

5.28 The analysis of the distribution of the soil loss in the Balrampur districts indicates that a major part of the district area shows very low, low and medium soil loss (99.59%) under the presence of ecosystem cover and moderately high loss categories covers around (0.37%) land area, whereas, around 0.03% area shows high to very high loss categories in the district. The distribution of area under different soil loss categories are presented in the **Table 5.3** below. The spatial distribution of the soil loss in the Balrampur district of Chhattisgarh is shown in the **Map 5.3**.

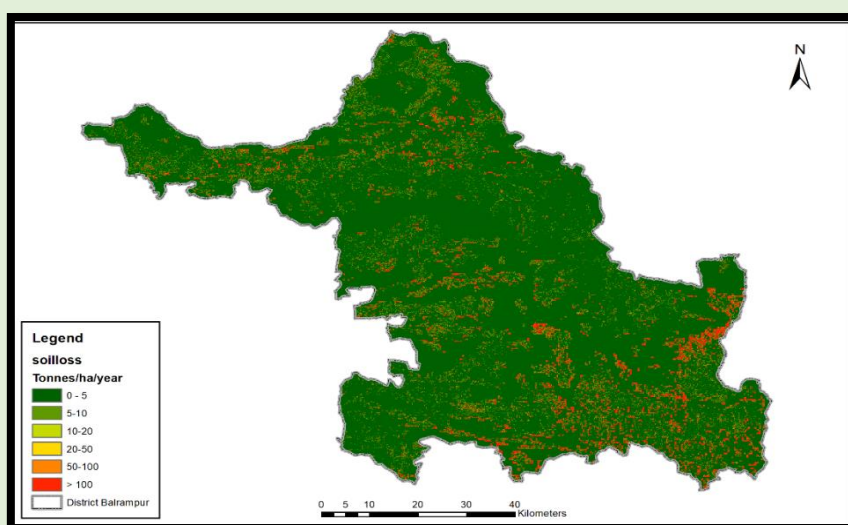
Table 5.3: Distribution of area under different soil loss categories (Tonnes/hectare/year)

Soil Loss Classes	Area (%)	Area in Hectare
0-5	95.98	6,02,336
5-10	2.58	16,249
10-20	1.02	6,409
20-50	0.38	2,378
50-100	0.028	174
100-200	0.003	16
200-300	0	0
Total	100	6,27,562

Values calculated with the support of SLUSI

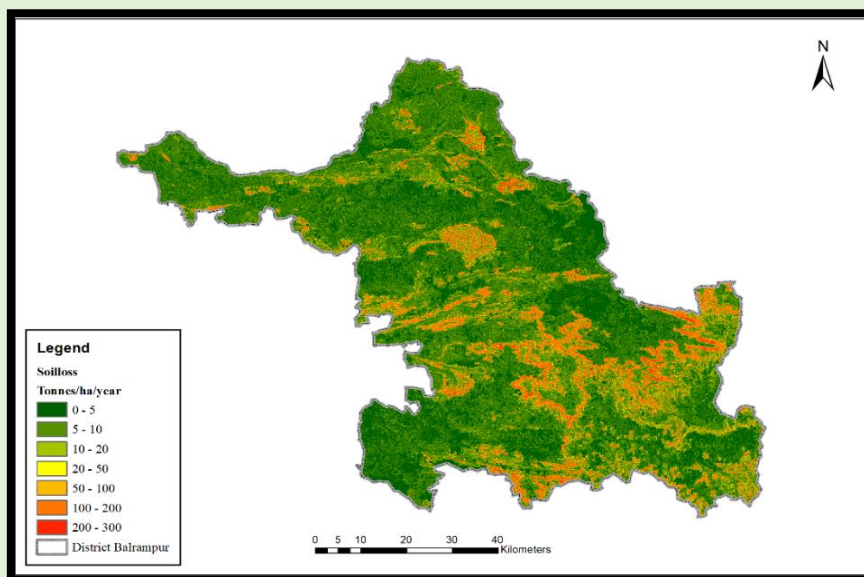
5.29 The spatial distribution of the soil loss in the Balrampur district of Chhattisgarh is shown in the **Map 5.3** as given below:

Map 5.3: Distribution of Soil Loss in presence of various ecosystem in Balrampur



5.30 The spatial distribution of the soil loss under the scenario of bare land (C=1) in the Balrampur district of Chhattisgarh is shown in the **Map 5.4** as given below:

Map 5.4: Distribution of Soil Loss under Bare Land Scenario in Balrampur



5.31 The estimates of soil loss under scenario of land use being 'bare land' and land use being 'forests' along with the soil erosion prevention services provided by the forests has been shown in the Table 5.4 below.

Table: 5.4 Estimates of Soil Erosion Prevention Services by Forests

Sr. No.	District	Soil Loss (Bare Land Scenario) (Tonnes/Ha/Year)	Soil Loss (Forests) (Tonnes/Ha/Year)	Estimates of Soil Erosion Prevention Services by Forests (Tonnes/Ha/Year)
1.	Gondia	5.79	2.89	2.9
2.	Balrampur	33.18	0.83	32.5

Values calculated with the support of SLUSI

5.32 The high SEP in Balrampur may be attributed to high potential soil loss under no vegetation cover due to steep slope in hilly areas and low soil loss due to thickly forest cover.

Limitations of the Study

5.33 The limitation of the study on soil erosion prevention services by the forest in Gondia District, Maharashtra and Balrampur District, Chhattisgarh are given below:

- i. **Validation Challenges:** It can be challenging to validate RUSLE predictions with ground- truth data, making it difficult to assess the accuracy of the model's results.
- ii. **Uncertainty:** Like all models, RUSLE has inherent uncertainties due to data errors, assumptions, and natural variability. Users should be cautious about interpreting results without considering these uncertainties.
- iii. **Hydrological Factors:** RUSLE primarily estimates sheet and rill erosion but does not explicitly consider hydrological factors. In areas with significant runoff or complex hydrology, additional modelling may be necessary.
- iv. **Vegetation Dynamics:** Changes in vegetation cover and density can affect erosion rates, and RUSLE may not capture these dynamics adequately.
- v. **Model Calibration:** Calibration of RUSLE parameters can be challenging, and the choice of parameters can impact the accuracy of the model's predictions.

5.34 In summary, while RUSLE with RS and GIS are a valuable tool for soil erosion assessment, it is not without limitations. Users should consider these while interpreting and using the results. Combining RUSLE with other erosion models, ground- based measurements, and local knowledge can help improve the accuracy of erosion assessments, especially in complex or changing environments.

Conclusion

5.35 Human activities, severe climatic events, fire, pests, diseases and other environmental disturbances may degrade forests and thereby reduce the provision of forest goods and services, biodiversity values, productivity and health. Forest degradation may also negatively affect other land uses (e.g. by causing a loss of downstream water quality and affecting groundwater recharge) and cause the emission of greenhouse gases (GHG). With the population growing at a rapid pace, more and more forest land is converted into cropland to address the dietary requirements.

5.36 It is important to understand the fact that the Forest Ecosystems provide a number of services to mankind and the soil erosion prevention services is one such service. The forest pathways can contribute to building inclusive, resilient and sustainable economies. Doing so optimally will require shifts in policies to maximize synergies among the pathways and between agriculture and forestry across agri-food systems and to encourage private-sector investments.

Domestic Extraction: Production and Value of Biomass

2011-12

S. No.	Item	Production (in Lakh Tonnes)	GVO (Rupees in Lakhs)
A	Cereals		
1	Rice	1,053	1,70,59,496
2	Wheat	949	1,18,06,819
3	Jowar	60	9,80,657
4	Bajra	103	9,93,964
5	Barley	16	1,90,139
6	Maize	218	23,53,929
7	Ragi	19	2,01,465
8	Small Millets	5	41,345
9	Other Cereals		8,124
B	Pulses		
10	Gram	77	21,78,137
11	Arhar	27	8,97,623
12	Urd	18	6,39,919
13	Moong	16	5,98,692
14	Masur	11	3,58,240
15	Other Pulses	23	5,42,448
C	Oilseeds		
16	Linseed	2	51,676
17	Sesamum	8	3,64,886
18	Groundnut	70	24,50,047
19	Rapeseed & Mustard	66	22,33,530
20	Castor	23	11,26,115
21	Coconut	149	13,29,331
22	Niger Seed	1	27,148
23	Safflower	1	30,799
24	Sunflower	5	1,43,249
25	Soyabean	122	28,30,732
26	Taramira		7,147
27	Other Oilseeds		70,787
D	Sugars		
28	Sugarcane	3,610	60,13,886
29	Gur		15,61,839
30	Palmyra		15
31	Other Sugars		29,093
E	Fibres		
32	Kapas	6	77,42,563
33	Jute	19	4,21,969
34	Sunhemp		4,009

Domestic Extraction: Production and Value of Biomass

2011-12

S. No.	Item	Production (in Lakh Tonnes)	GVO (Rupees in Lakhs)
35	Mesta	1	18,947
36	Other Fibres		6,895
F	Indigo, Dyes & Tanning Material		8,553
G	Drugs & Narcotics		
37	Tea	10	6,17,121
38	Coffee	3	6,66,175
39	Tobacco	8	7,26,960
40	Opium		11,801
41	Betel Leaves		7,48,432
42	Isabgol		59,883
43	Saffron		4,050
44	Cocoa		14,798
45	Other Drugs And Narcotics		9,98,524
H	Condiments & Spices		
46	Cardamom		1,21,996
47	Chillies	13	10,99,876
48	Black Pepper		1,48,867
49	Ginger	8	2,86,131
50	Turmeric	12	7,27,552
51	Arecanut	7	7,93,533
52	Garlic	12	3,08,838
53	Coriander	5	1,92,067
54	Fennel	1	80,404
55	Cumin	4	5,78,899
56	Ajwain		21,323
57	Methi	1	28,819
58	Tamarind	2	86,778
59	Nutmeg		42,325
60	Cloves		530
61	Cinnamon/Tejpatta		112
62	Other Condiments And Spices		1,21,938
I	Fruits & Vegetables		
63	Banana	285	24,98,581
64	Cashewnut	7	4,31,839
65	Potato	415	21,29,459
66	Sweet Potato	11	1,36,073
67	Tapioca	87	5,50,465
68	Onion	175	13,60,653
69	Mango	162	33,70,228

Domestic Extraction: Production and Value of Biomass

2011-12

S. No.	Item	Production (in Lakh Tonnes)	GVO (Rupees in Lakhs)
70	Floriculture	773	17,36,538
71	Grapes	22	3,71,050
72	Papaya	45	4,12,224
73	Apple	22	3,58,993
74	Mosambi	12	1,41,656
75	Lemon	23	4,75,442
76	Orange	31	9,04,392
77	Other Citrus Fruit	13	87,990
78	Lichi	5	2,23,739
79	Pineapple	15	2,36,328
80	Sapota	14	2,01,697
81	Cherry		7,042
82	Almonds		5,991
83	Jack Fruit	10	1,67,704
84	Sub-Tropical Fruit		405
85	Pear	3	68,252
86	Walnut	3	2,31,112
87	Guava	25	3,03,931
88	Amla/Anola	10	1,54,510
89	Ber	3	58,498
90	Passion Fruit	1	12,259
91	Peach/Plum	1	57,923
92	Pomegranate	8	2,08,501
93	Strawberry		132
94	Other Temperate Fruits		1,265
95	Nuts And Dry Fruits		226
96	Other Fruits	50	7,67,686
97	Brinjal	126	16,42,778
98	Cabbage	84	8,47,038
99	Cauliflower	73	11,77,867
100	Okra	63	10,70,028
101	Tomato	187	20,30,198
102	Drum Sticks		1,93,781
103	Green Peas	37	6,61,248
104	Beans	12	2,96,054
105	Bittergourd	9	1,34,155
106	Bottlegourd	20	1,51,226
107	Capsicum	1	22,726
108	Carrot	12	1,23,898

Domestic Extraction: Production and Value of Biomass

2011-12

S. No.	Item	Production (in Lakh Tonnes)	GVO (Rupees in Lakhs)
109	Cucumber	6	55,932
110	Muskmelon	8	65,739
111	Parmal		4,702
112	Radish	23	2,47,707
113	Pumpkin	3	25,480
114	Watermelon	17	2,61,168
115	Other Vegetables	195	20,58,147
J	Other Crops		
116	Rubber	9	17,16,422
117	Guarseed	22	22,29,639
118	Miscellaneous Food Crops		7,219
119	Miscellaneous Non-Food Crops		1,58,639
120	Fodder		32,49,446
121	Grass		17,83,720
122	Mulberry		3,713
123	Mushroom		48,678
K	By Products		
124	Straw & Stalks		60,88,723
125	Other By Products		7,96,814
L	Kitchen Garden		5,10,729
M	Forestry And Logging		
126	Industrial Wood (Forest And Trees Outside Forest)		74,25,186
127	Firewood		48,11,713
128	Non-Timber Forest Products		26,37,926
O	Fisheries		
129	Inland Fish	53	46,18,119
130	Marine Fish	34	33,92,335
Total		9,987	14,20,33,619

Source:

1. *Agriculture Statistics at a Glance, 2023, Ministry of Agriculture and Farmers Welfare*
2. *National Accounts Statistics, Ministry of Statistics and Programme Implementation*

Annexure 2.2

Domestic Extraction: Quantity and Value of Minerals

2011-12

S. No.	Minerals	Quantity (Tonnes)	Value ('000 Rupees)
1	Agate	476	238
2	Apatite	3,053	6,459
3	Asbestos	276	13,347
4	Ball Clay	16,46,516	6,93,714
5	Barytes	17,76,980	16,85,965
6	Bauxite	1,35,99,566	61,26,011
7	Calcite	54,081	20,835
8	Chalk	1,78,736	70,458
9	Chromite	29,23,435	2,42,44,987
10	Clay (Others)	14,17,684	1,28,016
11	Copper Concentrate	1,30,456	53,85,751
12	Copper Ore	34,79,189	
13	Corundum	37	130
14	Crude Mica	1,899	68,670
15	Diamond		1,98,240
16	Diaspore	23,818	35,655
17	Dolomite	59,68,554	17,37,037
18	Dunite	38,774	25,449
19	Felsite	1,117	2,590
20	Felspar	8,35,526	2,55,408
21	Fireclay	9,83,155	1,58,015
22	Flint Stone	708	172
23	Fluorite (Graded)	5,010	12,270
24	Garnet	17,17,904	9,81,625
25	Gold Ore	4,91,562	
26	Gold Primary	2	53,11,592
27	Graphite	1,53,339	69,449
28	Iron Ore	16,85,82,870	38,35,70,264
29	Kyanite	4,064	4,802
30	Laterite	28,15,275	3,95,549
31	Lead & Zinc Ore	80,41,881	
32	Lead Concentrate	1,61,854	24,54,497
33	Lime Kankar	3,11,219	59,469
34	Limeshell	33,225	40,788
35	Limestone	26,25,68,000	4,07,68,303
36	Magnesite	2,24,104	3,54,978
37	Manganese Ore	24,11,871	1,17,77,000
38	Marl	41,40,577	2,72,904

Domestic Extraction: Quantity and Value of Minerals

2011-12

S. No.	Minerals	Quantity (Tonnes)	Value ('000 Rupees)
39	Moulding Sand	30	5
40	Natural Kaolin	30,00,661	5,18,389
41	Ochre	15,76,265	2,76,937
42	Phosphorite	22,59,726	74,96,300
43	Processed Kaolin	76,134	1,33,979
44	Pyrophyllite	2,55,891	1,39,510
45	Pyroxenite	86,031	33,112
46	Quartz	7,82,575	1,73,890
47	Quartzite	2,72,141	1,39,207
48	Sand (Others)	26,25,111	1,62,965
49	Selenite	13,047	1,61,105
50	Serpentine	3,526	4,408
51	Shale	34,39,775	1,39,066
52	Silica Sand	48,67,667	7,14,062
53	Siliceous Earth	11,956	6,576
54	Sillimanite	59,206	5,22,737
55	Silver	207	1,15,61,772
56	Steatite	9,98,438	8,78,590
57	Tin Concentrate	49	26,062
58	Vermiculite	10,194	7,085
59	Waste/Scrap Mica	14,186	
60	Wollastonite	1,84,445	1,59,974
61	Zinc Concentrate	14,14,009	1,98,62,214
62	Coal	53,99,50,000	70,02,55,000
63	Lignite	4,23,32,000	5,33,76,521
64	Natural Gas	39	30,44,25,159
65	Petroleum	3,80,90,000	69,54,54,076
66	Minor Minerals	NA	69,62,50,000
Total *		1,12,70,50,104	2,97,98,09,337

* Excluding Atomic Minerals

Source:

1. Monthly Statistics of Mineral Production, Indian Bureau of Mines
2. National Accounts Statistics, Ministry of Statistics and Programme Implementation
3. Ministry of Coal

Quantity and Value of Export

2011-12

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
1	AC, Refrigeration Machinery, etc.	KGS	105	2,980
		NOS		2,263
2	Accumulators And Batteries	KGS	3	73
		NOS		835
3	Agro Chemicals	KGS	207	6,861
4	Aircraft, Spacecraft And Parts	KGS	1	4,554
		NOS		627
5	Alcoholic Beverages	LTR		1,444
6	Aluminium, Products of Aluminium	KGS	493	6,918
7	Animal Casings	KGS	1	34
8	ATM, Injecting Moulding Machinery, Etc.	KGS	129	5,272
9	Auto Components/Parts	KGS	554	13,498
		NOS		1,826
10	Auto Tyres And Tubes	KGS	13	155
		NOS		4,100
11	Ayush And Herbal Products	KGS	74	1,697
12	Bicycle And Parts	KGS	143	826
		NOS		552
13	Books, Publications And Printing	KGS	97	1,411
14	Buffalo Meat	KGS	985	13,741
15	Bulk Drugs, Drug Intermediates	KGS	254	20,039
16	Bulk Minerals And Ores	KGS	6,767	2,189
17	Carpet (Excluding Silk) Handmade	SQM		3,230
18	Cashew	KGS	108	4,390
19	Cashew Nut Shell Liquid	KGS	13	59
20	Castor Oil	KGS	493	4,572
21	Ceramics And Allied Products	KGS	207	945
		THN		1
		TON	839	967
22	Cereal Preparations	KGS	300	1,889
23	Cement, Clinker And Asbestos Cement	KGS	3,447	1,159
24	Coal, Coke And Briquettes, Etc.	TON	2,646	1,743
25	Cocoa Products	KGS	17	176
26	Coffee	KGS	277	4,535
27	Coir And Coir Manufactures	SQM		519
		KGS	339	496
		NOS		0.252
28	Computer Hardware, Peripherals	KGS	3	829
		NOS		1,643
29	Consumer Electronics	KGS	3	752
		NOS		3,200
30	Copper And Products Made of Copper	KGS	340	13,934

Quantity and Value of Export

2011-12

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
31	Cosmetics And Toiletries	KGS	446	5,824
32	Cotton Fabrics, Madeups, Etc.	KGS	369	8,473
		NOS		5,479
		SQM		6,898
33	Cotton Raw Including Waste	KGS	2,007	21,624
34	Cotton Yarn	KGS	749	14,262
35	Cranes, Lifts And Winches	KGS	11	394
		NOS		666
36	Dairy Products	KGS	52	647
37	Drug Formulations, Biologicals	KGS	455	38,150
38	Dye Intermediates	KGS	161	768
39	Dyes	KGS	273	6,640
40	Electric Machinery And Equipment	GIF		0.002
		KGS	188	8,704
		NOS		7,589
41	Electrodes	KGS	13	181
42	Electronics Components	KGS	133	5,643
		NOS		1,663
43	Electronics Instruments	KGS	23	2,112
		NOS		5,835
44	Essential Oils	KGS	4	292
45	Fertilizers Crude	KGS	17	24
46	Fertilizers Manufactured	KGS	127	373
47	Finished Leather	KGS	58	4,911
48	Floor Covering of Jute	SQM		142
49	Floriculture Products	KGS	14	214
50	Footwear of Leather	PRS		8,182
51	Footwear of Rubber/Canvas, Etc.	KGS	1	48
		PRS		334
52	Fresh Fruits	KGS	372	1,593
53	Fresh Vegetables	KGS	1,919	2,638
54	Fruits / Vegetable Seeds	KGS	15	288
55	Glass And Glassware	KGS	311	2,368
		NOS		75
		SQM		220
56	Gold	KGS		22,922
57	Gold And Other Precious Metal Jewellery	KGS		62,783
58	Granite, Natural Stone And Products	KGS	7,045	7,996
59	Graphite, Explosives And Accessories	KGS	41	464
60	Guergam Meal	KGS	521	14,484
61	Handicrafts (Excluding Handmade Carpets)	KGS	175	4,523
		NOS		755
		SQM		0.316

Quantity and Value of Export

2011-12

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
62	Handloom Products	KGS	73	1,492
		NOS		673
		PRS		3
		SQM		438
63	Hand Tool, Cutting Tool of Metals	KGS	175	3,610
64	Human Hair, Products Thereof	KGS	4	2,015
65	Internal combustion Engines And Parts	KGS	102	4,160
		NOS		5,847
66	Industrial Machinery For Dairy, Etc.	KGS	164	5,333
		NOS		9,132
67	Inorganic Chemicals	KGS	1,372	5,892
68	Iron And Steel	KGS	8,013	39,759
69	Iron Ore	TON	287	170
70	Jute Hessian	KGS	71	387
		SQM		559
71	Jute Yarn	KGS	55	282
72	Jute, Raw	KGS	28	81
73	Lead And Products Made of Lead	KGS	70	907
74	Leather Footwear Components	KGS	9	1,303
75	Leather Garments	KGS	8	2,743
76	Leather Goods	KGS	41	1,615
		NOS		3,607
77	Machine Tools	KGS	12	826
		NOS		887
78	Manmade Staple Fibre	KGS	224	1,937
79	Manmade Yarn, Fabrics, Madeups	KGS	959	13,159
		NOS		379
		SQM		10,729
80	Marine Products	KGS	292	3,573
81	Medical And Scientific Instruments	KGS	8	1,448
		NOS		2,483
82	Mica	KGS	130	238
83	Milled Products	KGS	141	290
84	Miscellaneous Processed Items	KGS	266	1,376
		LTR		9
85	Mollases	KGS	384	204
86	Motor Vehicle/Cars	NOS		22,946
87	Moulded And Extruded Goods	KGS	64	1,185
88	Natural Silk Yarn, Fabrics, Madeup	KGS		51
		NOS		30
		SQM		871
89	Natural Rubber	KGS	27	444
90	Newsprint	KGS	10	33
91	Nickel, Product Made of Nickel	KGS	5	589

Quantity and Value of Export

2011-12

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
92	Niger Seeds	KGS	28	117
93	Nuclear Reactor, Industrial Boiler, Parts	KGS	55	1,503
		NOS		380
94	office Equipments	NOS		173
95	Oil Meals	KGS	7,405	11,796
96	Optical Items (Including Lens, Etc.)	KGS	7	699
		NOS		605
97	Organic Chemicals	KGS	2,375	21,529
98	Other Non Ferrous Metal And Products	KGS	179	1,834
99	Other Textile Yarn, Fabric Madeup Articles	KGS	30	849
		SQM		634
100	Other Cereals	KGS	24	97
101	Other Commodities	KGS	1,502	8,569
		NOS		3,130
		SQM		124
		TKW		435
		TON	29	77
102	Other Construction Machinery	KGS	54	2,005
		NOS		2,313
103	Other Crude Minerals	KGS	2,436	1,005
104	Other Jute Manufactures	KGS	86	510
		NOS		164
		SQM		52
105	Other Meat	KGS		4
106	Other Miscellaneous Engineering Items	KGS	159	4,004
		NOS		2,322
107	Other Miscellaneous Chemicals	KGS	158	1,155
108	Other Oil Seeds	KGS	21	83
109	Other Precious And Base Metals	KGS	1	3,187
110	Other Wood And Wood Products	CUM		10
		KGS	0.00003	0.001
		TON		0.009
111	Other Rubber Products Except Footwear	KGS	271	3,653
		NOS		640
		PRS		193
112	Paint, Varnish And Allied Products	KGS	273	2,847
113	Paper, Paper Board And Products	KGS	743	4,115
		NOS		4
114	Pearl, Precious, Semiprecious Stones	CRT		1,35,273
		KGS		10
115	Petroleum Products	TON	10,074	47,385
		KGS	90	590

Quantity and Value of Export

2011-12

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
116	Plywood And Allied Products	KGS	41	389
		CUM		194
		NOS		1,643
117	Poultry Products	KGS	16	218
		NOS		1
118	Prime Mica And Mica Products	KGS	1	101
119	Processed Fruits And Juices	KGS	511	2,175
120	Processed Meat	KGS	1	10
121	Processed Minerals	KGS	5,264	4,338
122	Processed Vegetables	KGS	175	1,043
123	Products of Iron And Steel	KGS	3,832	33,799
		NOS		32
124	Project Goods	KGS	12	396
125	Pulp And Waste Paper	KGS	1	9
126	Pulses	KGS	2	10
127	Pumps of All Types	KGS	20	949
		NOS		1,747
128	Railway Transport Equipments, Parts	KGS	7	260
		NOS		250
129	Raw Hides And Skins	KGS	2	15
		NOS		0.374
130	Residual Chemical And Allied Products	KGS	668	9,823
		MTR		115
		SQM		5
131	Rice -Basmati	KGS	3,169	15,450
132	Rice (Other Than Basmati)	KGS	3,992	8,659
133	Ready Made Garment Cotton Including Accessories	NOS		27,986
		KGS	103	3,001
		PRS		190
134	Ready Made Garment Manmade Fibres	NOS		10,328
		KGS	7	245
		PRS		47
135	Ready Made Garment of Other Textile Material	NOS		5,106
		KGS	19	531
		PRS		145
136	Ready Made Garment Silk	KGS		17
		NOS		1,191
137	Ready Made Garment Wool	KGS		2
		NOS		1,128
		PRS		0.120
138	Saddlery And Harness	KGS	11	515
139	Sesame Seeds	KGS	388	2,642
140	Sheep/Goat Meat	KGS	11	253
141	Shellac	KGS	4	257

Quantity and Value of Export

2011-12

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
142	Ship, Boat And Floating Structure	NOS		37,548
143	Silk Carpet	SQM		20
144	Silk Waste	KGS	2	47
145	Silk, Raw	KGS	0.00001	0.000
146	Silver	KGS		106
147	Spices	KGS	400	8,203
148	Sports Goods	KGS	12	257
		NOS		728
149	Stationery/office, School Supply	KGS	8	132
		NOS		213
150	Sugar	KGS	1,728	5,621
151	Sulphur, Unroasted Iron Pyrite	KGS	189	190
152	Surgicals	NOS		736
		KGS	21	692
153	Tea	KGS	272	4,079
154	Telecom Instruments	NOS		15,202
		KGS	13	3,793
155	Tin And Products Made of Tin	KGS		28
156	Tobacco Manufactured	KGS	22	633
		THN		369
157	Tobacco Unmanufactured	KGS	197	2,899
158	Two And Three Wheelers	NOS		6,309
159	Vegetable Oils	KGS	32	277
160	Wollen Yarn, Fabrics, Madeups, etc.	KGS	19	902
		NOS		49
		SQM		209
161	Wool, Raw	KGS		6
162	Zinc And Products Made of Zinc	KGS	295	3,627
163	Other	CRT		555
		CUM		6
		KG		17
		KGS	10,304	53,667
		LTR		44
		MTR		2
		NOS		27,688
		SQM		2,350
		THN		24
		TON	97,713	2,43,129
Total			2,02,839	13,87,456

Source: Directorate General of Commercial Intelligence and Statistics (DGCI&S), Ministry of Commerce, Government of India

Quantity and Value of Import

2011-12

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
1	Air Conditioner, Refrigeration Machinery, Etc.	KGS	84	7,481
		NOS		8,528
2	Accumulators And Batteries	KGS	18	462
		NOS		2,552
3	Agro Chemicals	KGS	58	3,346
4	Aircraft, Spacecraft And Parts	KGS	2	5,184
		NOS		14,619
5	Alcoholic Beverages	LTR		1,203
6	Aluminium, Products of Aluminm	KGS	1,112	14,306
7	ATM, Inejcting Moulding Machinery, Etc.	KGS	48	4,947
8	Auto Components/Parts	KGS	286	16,158
		NOS		1,080
9	Auto Tyres And Tubes	KGS	1	23
		NOS		1,863
10	Ayush And Herbal Products	KGS	9	185
11	Bicycle And Parts	KGS	20	936
		NOS		915
12	Books, Publications And Prntng	KGS	26	2,920
13	Bulk Drugs, Drug Intermediates	KGS	198	13,082
14	Bulk Minerals And Ores	KGS	13,058	32,087
15	Carpet (Excluding Silk) Handmade	SQM		278
16	Cashew	KGS	812	5,381
17	Cashew Nut Shell Liquid	KGS	0.1950	0.343
18	Castor Oil	KGS		1
19	Ceramics And Allied Products	KGS	78	1,725
		TON	718	1,847
20	Cereal Preparations	KGS	46	316
21	Cement, Clinker And Asbestos Cement	KGS	1,020	428
22	Coal,Coke And Briquittes Etc	TON	1,05,217	83,596
23	Cocoa Products	KGS	51	934
24	Coffee	KGS	46	470
25	Coir And Coir Manufactures	KGS	1	9
		NOS		1
		SQM		58
26	Computer Hardware, Peripherals	KGS	31	8,610
		NOS		21,467
27	Consumer Electronics	KGS	56	5,244
		NOS		11,017
28	Copper And Products Made of Copper	KGS	363	13,418
29	Cosmetics And Toiletries	KGS	406	4,321
30	Cotton Fabrics, Madeups Etc.	KGS	299	749
		NOS		396
		SQM		1,215
31	Cotton Raw Incl. Waste	KGS	77	1,059
32	Cotton Yarn	KGS	5	137
33	Cranes, Lifts And Winches	KGS	12	1,316
		NOS		7,014
34	Dairy Products	KGS	72	1,218
35	Drug Formulations, Biologicals	KGS	2	6,777
36	Dye Intermediates	KGS	1,239	2,457
37	Dyes	KGS	40	1,315

Quantity and Value of Import

2011-12

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
38	Electric Machinery And Equipment	KGS	212	20,545
		NOS		14,385
39	Electrodes	KGS	21	506
40	Electronics Components	KGS	91	11,837
		NOS		20,965
41	Electronics Instruments	KGS	49	4,940
		NOS		21,431
42	Essential Oils	KGS	3	390
43	Fertilizers Crude	KGS	9,745	8,382
44	Fertilizers Manufactured	KGS	17,984	44,639
45	Finished Leather	KGS	44	2,148
46	Floor Covering of Jute	SQM		1
47	Floriculture Products	KGS	3	64
48	Footwear of Leather	PRS		787
49	Footwear of Rubber/Canvas Etc.	KGS	7	184
		PRS		364
50	Fresh Fruits	KGS	620	3,945
51	Fresh Vegetables	KGS	5	6
52	Fruits / Vegetable Seeds	KGS	13	380
53	Glass And Glassware	KGS	343	2,957
		NOS		50
		SQM		554
54	Gold	KGS	1	2,69,902
55	Gold And Other Precious Metal Jewellery	KGS		4,290
56	Granite, Natural Stone And Product	KGS	1,847	1,838
57	Graphite, Explosives And Accessories	KGS	106	1,047
58	Guergam Meal	KGS		1
59	Handicrafts (Excluding Handmade Carpets)	KGS	49	1,010
		NOS		1,174
		SQM		3
60	Handloom Products	KGS		1
		NOS		7
		SQM		28
61	Hand Tool, Cutting Tool of Metals	KGS	60	3,957
62	Human Hair, Products Thereof	KGS		166
63	Internal combustion Engines And Parts	KGS	47	4,950
		NOS		7,627
64	Industrail Machinery For Dairy, Etc.	KGS	120	13,899
		NOS		37,514
65	Inorganic Chemicals	KGS	8,512	24,774
66	Iron And Steel	KGS	16,664	65,749
67	Iron Ore	TON	800	562
68	Jute Hessian	KGS	88	122
		SQM		55
69	Jute Yarn	KGS	50	199
70	Jute, Raw	KGS	181	449
71	Lead And Products Made of Lead	KGS	241	2,710
72	Leather Footwear Component	KGS	1	41
73	Leather Garments	KGS		12
74	Leather Goods	KGS	3	140
		NOS		133

Quantity and Value of Import

2011-12

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
75	Machine Tools	KGS	16	2,540
		NOS		12,043
76	Manmade Staple Fibre	KGS	96	919
77	Manmade Yarn, Fabrics, Madeups	KGS	236	4,503
		NOS		205
		SQM		2,662
78	Marine Products	KGS	10	126
79	Medical And Scientific Instruments	KGS	17	5,460
		NOS		10,501
80	Mica	KGS	1	3
81	Milled Products	KGS	3	10
82	Miscellaneous Processed Items	KGS	115	711
		LTR		46
83	Mollases	KGS	12	4
84	Motor Vehicle/Cars	NOS		2,846
85	Moulded And Extruded Goods	KGS	32	860
86	Natural Silk Yarn, Fabrics, Madeup	KGS	1	106
		NOS		1
		SQM		413
87	Natural Rubber	KGS	214	4,248
88	Newsprint	KGS	1,432	4,938
89	Nickel, Product Made of Nickel	KGS	35	3,912
90	Niger Seeds	KGS	0.1172	0.387
91	Nuclear Reactor, Industrial Boiler, Parts	KGS	42	2,846
		NOS		700
92	Office Equipments	NOS		124
93	Oil Meals	KGS	86	99
94	Optical Items (Including Lens, Etc.)	KGS	4	448
		NOS		805
95	Organic Chemicals	KGS	5,855	41,579
96	Other Non Ferrous Metal And Products	KGS	100	3,527
97	Other Textile Yarn, Fabric Madeup Articles	KGS	105	2,391
		SQM		458
98	Other Cereals	KGS	2	4
99	Other Commodities	KGS	890	5,666
		NOS		8,398
		SQM		2
		TON	1	2
100	Other Construction Machinery	KGS	37	4,537
		NOS		6,728
101	Other Crude Minerals	KGS	665	1,807
102	Other Jute Manufactures	KGS	46	288
		NOS		1
		SQM		53
103	Other Meat	KGS	1	12

Quantity and Value of Import

2011-12

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
104	Other Miscellaneous Engineering Items	KGS	122	7,344
		NOS		6,165
105	Other Miscellaenious Chemicals	KGS	67	1,336
106	Other Oil Seeds	KGS	41	88
107	Other Precious And Base Metals	KGS		1,198
108	Other Wood And Wood Products	CUM		4,631
		KGS	1	4
		TON	0.0220	0.203
109	Other Rubber Products Except Footwear	KGS	589	11,662
		NOS		21
		PRS		162
110	Paint, Varnish And Allied Products	KGS	326	6,315
111	Paper, Paper Board And Product	KGS	3,184	9,413
		NOS		93
112	Pearl, Precious, Semiprecious Stones	CRT		1,32,536
		KGS		54
113	Petroleum Products	KGS	19,157	57,037
		TON	365	1,614
114	Petroleum: Crude	TON	1,65,712	6,43,689
115	Plywood And Allied Products	CUM		979
		KGS	534	1,857
		NOS		1,206
116	Poultry Products	KGS		1
		NOS		8
117	Prime Mica And Mica Products	KGS	32	988
118	Processed Fruits And Juices	KGS	24	271
119	Processed Meat	KGS	1	10
120	Processed Minerals	KGS	5,932	3,198
121	Processed Vegetables	KGS	20	119
122	Products of Iron And Steel	KGS	1,417	21,633
		NOS		74
123	Project Goods	KGS	1,134	42,221
124	Pulp And Waste Paper	KGS	916	3,452
125	Pulses	KGS	783	2,596
126	Pumps of All Types	KGS	13	1,589
		NOS		3,614
127	Railway Transport Equipments, Parts	KGS	15	1,204
		NOS		288
128	Raw Hides And Skins	KGS	18	284
		NOS		157
129	Residual Chemical And Allied Products	KGS	941	16,787
		MTR		25
		SQM		214
130	Rice -Basmati	KGS		2
131	Rice(Other Than Basmati)	KGS	1	3
132	Ready Made Garments Cotton Including Accessories	KGS	1	20
		NOS		318
		PRS		31
133	Ready Made Garments Manmade Fibres	KGS		7
		NOS		249
		PRS		4

Quantity and Value of Import

2011-12

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
134	Ready Made Garments of Other Textile Material	KGS	2	52
		NOS		205
		PRS		80
135	Ready Made Garments Silk	KGS	0.0019	0.059
		NOS		13
136	Ready Made Garments Wool	KGS	0.0002	0.015
		NOS		75
		PRS		0.163
137	Saddlery And Harness	KGS		1
138	Sesame Seeds	KGS	1	4
139	Sheep/Goat Meat	KGS	0.0046	0.215
140	Shellac	KGS	1	22
141	Ship, Boat And Floating Structure	NOS		21,574
142	Silk Carpet	SQM		2
143	Silk Waste	KGS		9
144	Silk,Raw	KGS	6	1,112
145	Silver	KGS	1	3,755
146	Spices	KGS	91	1,437
147	Sports Goods	KGS	11	385
		NOS		538
148	Stationery/office, School Supply	KGS	7	205
		NOS		71
149	Sugar	KGS	1	12
150	Sulpher, Unroasted Iron Pyrite	KGS	2,040	2,286
151	Surgicals	KGS	10	622
		NOS		1,934
152	Tea	KGS	22	219
153	Telecom Instruments	KGS	54	12,869
		NOS		38,511
154	Tin And Products Made of Tin	KGS	8	867
155	Tobacco Manufactured	KGS	1	21
		THN		91
156	Tobacco Unmanufactured	KGS	2	69
157	Two And Three Wheelers	NOS		86
158	Vegetable Oils	KGS	8,442	46,334
159	Wollen Yarn,Fabrics,Madeupsetc	KGS	37	160
		NOS		0.266
		SQM		162
160	Wool, Raw	KGS	76	1,877
161	Zinc And Products Made of Zinc	KGS	131	1,370
162	Other	CRT		762
		CUM		5,006
		KG	0.0005	0.082
		KGS	7,178	57,776
		LTR		265
		MTR		111
		NOS		10,307
		SQM		1,334
TON	7,154	32,453		
Total			4,20,091	22,85,823

Source: Directorate General of Commercial Intelligence and Statistics (DGCI&S), Ministry of Commerce, Government of India

Production and Value of Biomass

2015-16

S. No.	Item	Production (in Lakh Tonnes)	GVO (INR in Lakhs)
A	Cereals		
1	Rice	1,044	2,28,18,135
2	Wheat	923	1,45,93,872
3	Jowar	42	7,81,158
4	Bajra	81	11,29,701
5	Barley	14	2,09,931
6	Maize	226	32,91,986
7	Ragi	18	3,03,961
8	Small Millets	4	42,470
9	Other Cereals		25,819
B	Pulses		
10	Gram	71	33,63,257
11	Arhar	26	19,79,853
12	Urd	20	15,55,259
13	Moong	16	10,56,661
14	Masur	10	6,13,580
15	Other Pulses	22	9,10,087
C	Oilseeds		
16	Linseed	1	48,986
17	Sesamum	9	5,18,054
18	Groundnut	67	30,18,228
19	Rapeseed & Mustard	68	26,05,650
20	Castor	18	5,83,538
21	Coconut	153	20,28,689
22	Niger Seed	1	31,669
23	Safflower	1	14,076
24	Sunflower	3	98,843
25	Soyabean	86	31,30,457
26	Taramira		3,520
27	Other Oilseeds		2,59,378
D	Sugars		
28	Sugarcane	3,484	74,65,952
29	Gur		21,20,430
30	Palmyra		12
31	Other Sugars		27,438
E	Fibres		
32	Kapas	5	63,17,277
33	Jute	18	7,26,901
34	Sunhemp		4,519

Production and Value of Biomass

2015-16

S. No.	Item	Production (in Lakh Tonnes)	GVO (INR in Lakhs)
35	Mesta	1	28,744
36	Other Fibres		7,027
F	Indigo, Dyes & Tanning Material		8,042
G	Drugs & Narcotics		
37	Tea	12	11,17,515
38	Coffee	3	7,37,024
39	Tobacco	8	10,68,580
40	Opium		457
41	Betel Leaves		11,27,617
42	Isabgol		1,40,245
43	Saffron		5,191
44	Cocoa		51,110
45	Other Drugs And Narcotics		16,92,294
H	Condiments & Spices		
46	Cardamom		1,84,971
47	Chillies	45	17,31,568
48	Black Pepper	1	4,20,176
49	Ginger	11	8,20,178
50	Turmeric	9	7,79,056
51	Arecanut	7	16,55,851
52	Garlic	16	8,40,421
53	Coriander	6	4,13,242
54	Fennel	1	96,247
55	Cumin	5	6,96,972
56	Ajwain		16,906
57	Methi	2	1,22,378
58	Tamarind	2	1,39,443
59	Nutmeg		33,485
60	Cloves		647
61	Cinnamon/Tejpatta		181
62	Other Condiments And Spices		2,72,815
I	Fruits & Vegetables		
63	Banana	291	42,57,003
64	Cashewnut	7	7,13,314
65	Potato	434	39,20,407
66	Sweet Potato	15	1,94,988
67	Tapioca	43	6,98,395
68	Onion	209	28,35,204
69	Mango	186	57,62,648

Production and Value of Biomass

2015-16

S. No.	Item	Production (in Lakh Tonnes)	GVO (INR in Lakhs)
70	Floriculture	32	23,92,019
71	Grapes	26	5,93,399
72	Papaya	57	7,94,923
73	Apple	25	6,94,073
74	Mosambi	35	2,09,088
75	Lemon	24	7,73,639
76	Orange	41	15,43,641
77	Other Citrus Fruit	16	1,66,950
78	Lichi	6	2,83,547
79	Pineapple	19	3,70,830
80	Sapota	13	2,49,337
81	Cherry		10,239
82	Almonds		12,744
83	Jack Fruit	17	3,77,312
84	Pear	3	81,886
85	Walnut	2	2,99,875
86	Guava	40	7,45,387
87	Amla/Anola	10	1,80,922
88	Ber	4	68,743
89	Passion Fruit	1	14,110
90	Peach/Plum	1	49,991
91	Pomegranate	23	9,44,092
92	Strawberry		1,684
93	Nuts And Dry Fruits		212
94	Other Fruits	24	8,90,388
95	Brinjal	125	22,14,740
96	Cabbage	88	12,27,779
97	Cauliflower	81	15,89,863
98	Okra	58	12,36,799
99	Tomato	187	31,85,867
100	Drum Sticks		4,80,923
101	Green Peas	48	12,03,743
102	Beans	23	6,84,535
103	Bittergourd	10	2,21,304
104	Bottlegourd	25	2,09,288
105	Capsicum	3	50,978
106	Carrot	13	1,65,645
107	Cucumber	12	1,23,573
108	Muskmelon	9	1,29,898

Production and Value of Biomass

2015-16

S. No.	Item	Production (in Lakh Tonnes)	GVO (INR in Lakhs)
109	Parmal	3	49,296
110	Radish	28	3,40,254
111	Pumpkin	15	1,80,908
112	Watermelon	23	4,38,670
113	Other Vegetables	227	42,75,462
J	Other Crops		
114	Rubber	6	5,58,223
115	Guarseed	28	16,96,625
116	Miscellaneous Food Crops		3,200
117	Miscellaneous Non-Food Crops		1,26,740
118	Fodder		47,06,425
119	Grass		25,13,799
120	Mulberry		4,767
121	Mushroom	4	3,45,610
K	By Products		
122	Straw & Stalks		80,06,910
123	Other By Products		9,20,843
L	Kitchen Garden		8,12,254
M	Forestry And Logging		
124	Industrial Wood (Forest And Trees Outside Forest)		1,20,73,851
125	Firewood		60,98,376
126	Non-Timber Forest Products		38,69,909
O	Fisheries		
127	Inland Fish	72	85,67,379
128	Marine Fish	36	70,01,621
Total		9,291	20,13,34,780

Source:

1. Agriculture Statistics at a Glance, 2023, Ministry of Agriculture and Farmers Welfare
2. National Accounts Statistics, Ministry of Statistics and Programme Implementation

Quantity and Value of Minerals

2015-16

S. No.	Minerals	Quantity (Tonnes)	Value ('000 Rupees)
1	Apatite	110	387
2	Bauxite	2,81,23,789	1,54,37,693
3	Chromite	29,15,584	2,12,14,490
4	Copper Concentrate	1,51,837	65,48,319
5	Copper Ore	39,07,823	
6	Diamond		6,21,441
7	Flint Stone	253	76
8	Fluorite (Graded)	2,333	12,965
9	Garnet	82,001	6,48,125
10	Gold Ore	5,62,956	
11	Gold Primary	1	32,14,623
12	Graphite	1,35,528	1,06,486
13	Iron Ore	15,81,07,400	22,32,06,635
14	Kyanite	2,901	14,180
15	Laterite	250	25
16	Lead & Zinc Ore	1,04,53,038	
17	Lead Concentrate	2,61,857	78,85,122
18	Limeshell	10,353	28,613
19	Limestone	30,70,00,530	6,86,73,970
20	Magnesite	3,27,663	8,27,072
21	Manganese Ore	21,66,947	85,45,511
22	Marl	23,89,707	3,19,957
23	Moulding Sand	26,042	6,117
24	Phosphorite	15,71,863	37,63,823
25	Selenite	3,103	6,206
26	Siliceous Earth	47,386	20,735
27	Sillimanite	69,942	5,09,315
28	Silver	426	1,52,12,374
29	Tin Concentrate	14	9,231
30	Vermiculite	23,279	10,556
31	Wollastonite	1,75,348	1,50,313
32	Zinc Concentrate	14,73,811	3,49,43,087
33	Coal	63,92,30,000	88,38,22,140
34	Lignite	4,38,42,000	7,49,94,758
35	Natural Gas	27	26,67,03,357
36	Petroleum	3,69,50,000	67,15,94,812
37	Minor Minerals	NA	84,92,50,000
Total *		1,24,00,16,102	3,15,83,02,510

* Excluding Atomic Minerals

Source:

1. Monthly Statistics of Mineral Production, Indian Bureau of Mines
2. National Accounts Statistics, Ministry of Statistics and Programme Implementation
3. Ministry of Coal

Quantity and Value of Export

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
1	Air Conditioner, Refrigeration Machinery, Etc.	KGS	90	3,251
		NOS		3,673
2	Accumulators And Batteries	KGS	2	70
		NOS		1,262
3	Agro Chemicals	KGS	308	12,902
4	Aircraft, Spacecraft And Parts	KGS	3	10,192
		NOS		15,511
5	Alcoholic Beverages	LTR		1,949
6	Aluminium, Products of Aluminium	KGS	1,159	17,285
7	Animal Casings	KGS	0.206	17
8	ATM, Injecting Moulding Machinery, Etc.	KGS	132	8,273
9	Auto Components/Parts	KGS	674	24,367
		NOS		3,250
10	Auto Tyres And Tubes	NOS		3,995
11	Ayush And Herbal Products	KGS	96	2,385
12	Bicycle And Parts	KGS	90	1,145
		NOS		811
13	Books, Publications And Printing	KGS	69	1,870
14	Buffalo Meat	KGS	1,314	26,684
15	Bulk Drugs, Drug Intermediates	KGS	341	19,678
16	Bulk Minerals And Ores	KGS	19,780	3,606
17	Carpet (Excluding Silk) Handmade	SQM		7,425
18	Cashew	KGS	103	5,028
19	Cashew Nut Shell Liquid	KGS	12	58
20	Castor Oil	KGS	587	4,616
21	Ceramics And Allied Products	KGS	172	1,423
		THN		0.207
		TON	308	1,375
22	Cereal Preparations	KGS	317	3,358
23	Cement, Clinker And Asbestos Cement	KGS	6,401	2,201
24	Coal, Coke And Briquettes, Etc.	TON	1,724	1,050
25	Cocoa Products	KGS	33	1,268
26	Coffee	KGS	256	5,125
27	Coir And Coir Manufactures	KGS	730	1,274
		NOS		2
		SQM		441
28	Computer Hardware, Peripherals	KGS	2	824
		NOS		1,508
29	Consumer Electronics	KGS	3	1,083
		NOS		3,180
30	Copper And Products Made of Copper	KGS	425	16,581
31	Cosmetics And Toiletries	KGS	526	8,756

Quantity and Value of Export

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
32	Cotton Fabrics, Madeups, Etc.	KGS	401	12,437
		NOS		10,734
		SQM		10,225
33	Cotton Raw Including Waste	KGS	1,347	12,821
34	Cotton Yarn	KGS	1,307	23,602
35	Cranes, Lifts And Winches	KGS	21	782
		NOS		2,060
36	Dairy Products	KGS	78	1,677
37	Drug Formulations, Biologicals	KGS	373	82,012
38	Dye Intermediates	KGS	84	911
39	Dyes	KGS	361	12,255
40	Electric Machinery And Equipment	GIF		0.062
		KGS	226	12,959
		NOS		12,740
41	Electrodes	KGS	18	279
42	Electronics Components	KGS	114	9,701
		NOS		2,373
43	Electronics Instruments	KGS	18	2,807
		NOS		10,088
44	Essential Oils	KGS	5	759
45	Fertilizers Crude	KGS	25	77
46	Fertilizers Manufactured	KGS	219	564
47	Finished Leather	KGS	52	6,852
48	Floor Covering of Jute	SQM		222
49	Floriculture Products	KGS	23	483
50	Footwear of Leather	KGS	1	28
		PRS		14,035
51	Footwear of Rubber/Canvas, Etc.	KGS	2	54
		PRS		1,954
52	Fresh Fruits	KGS	610	3,834
53	Fresh Vegetables	KGS	1,979	4,615
54	Fruits / Vegetable Seeds	KGS	13	529
55	Glass And Glassware	KGS	427	4,337
		NOS		47
		SQM		332
56	Gold	KGS	0.151	36,482
57	Gold And Other Precious Metal Jewellery	KGS	1	71,858
58	Granite, Natural Stone And Products	KGS	11,947	11,984
59	Graphite, Explosives And Accessories	KGS	29	435
60	Groundnut	KGS	543	4,076
61	Guergam Meal	KGS	211	2,608
62	Handicrafts (Excluding Handmade Carpets)	KGS	182	8,784
		NOS		2,013
		SQM		3

Quantity and Value of Export

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
63	Handloom Products	KGS	8	324
		NOS		969
		PRS		10
		SQM		1,051
64	Hand Tool, Cutting Tool of Metals	KGS	115	4,193
65	Human Hair, Products Thereof	KGS	4	1,968
66	Internal combustion Engines And Parts	KGS	110	6,471
		NOS		7,344
67	Industrial Machinery For Dairy, Etc.	KGS	186	8,549
		NOS		15,637
68	Inorganic Chemicals	KGS	1,021	4,086
69	Iron And Steel	KGS	7,570	35,829
70	Iron Ore	TON	5,444	1,263
71	Jute Hessian	KGS	30	262
		SQM		562
72	Jute Yarn	KGS	17	119
73	Jute, Raw	KGS	25	114
74	Lead And Products Made of Lead	KGS	89	1,188
75	Leather Footwear Components	KGS	10	1,862
76	Leather Garments	KGS	8	3,621
77	Leather Goods	KGS	38	2,935
		NOS		6,035
78	Machine Tools	KGS	9	942
		NOS		1,578
79	Manmade Staple Fibre	KGS	227	1,749
80	Manmade Yarn, Fabrics, Madeups	KGS	1,176	16,421
		NOS		467
		SQM		13,222
81	Marine Products	KGS	914	29,264
82	Medical And Scientific Instruments	KGS	32	1,595
		NOS		4,917
83	Mica	KGS	135	344
84	Milled Products	KGS	431	1,103
85	Miscellaneous Processed Items	KGS	390	2,763
		LTR		25
86	Mollases	KGS	819	657
87	Motor Vehicle/Cars	NOS		42,445
88	Moulded And Extruded Goods	KGS	65	1,334
		NOS		296
89	Natural Silk Yarn, Fabrics, Madeup	KGS	0.302	42
		NOS		22
		SQM		485
90	Natural Rubber	KGS	6	387
91	Newsprint	KGS	5	18

Quantity and Value of Export

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
92	Nickel, Product Made of Nickel	KGS	38	3,210
93	Niger Seeds	KGS	14	123
94	Nuclear Reactor, Industrial Boiler, Parts	KGS	85	3,210
		NOS		1,255
95	office Equipments	NOS		127
96	Oil Meals	KGS	2,056	3,600
97	Optical Items (Including Lens, Etc.)	KGS	10	1,311
		NOS		929
98	Organic Chemicals	KGS	3,243	27,425
99	Other Non Ferrous Metal And Products	KGS	91	2,826
100	Other Textile Yarn, Fabric Madeup Articles	KGS	42	1,525
		SQM		674
101	Other Cereals	KGS	294	696
102	Other Commodities	KGS	1,168	10,536
		NOS		1,347
		SQM		223
		TKW		2,228
		TON	17	40
103	Other Construction Machinery	KGS	73	2,758
		NOS		4,299
104	Other Crude Minerals	KGS	2,786	709
105	Other Jute Manufactures	KGS	46	418
		NOS		323
		SQM		29
106	Other Miscellaneous Engineering Items	KGS	185	8,383
		NOS		4,658
107	Other Miscellaneous Chemicals	KGS	186	2,495
108	Other Oil Seeds	KGS	205	964
109	Other Precious And Base Metals	KGS	2	2,933
110	Other Wood And Wood Products	CUM		549
		KGS	0.049	0.125
		TON	0.053	0.178
111	Other Rubber Products Except Footwear	KGS	295	5,010
		NOS		815
		PRS		211
112	Paint, Varnish And Allied Products	KGS	519	3,893
113	Paper, Paper Board And Products	KGS	976	7,703
		NOS		7
114	Pearl, Precious, Semiprecious Stones	CRT		1,43,871
		KGS	0.001	27
115	Petroleum Products	TON	18,439	62,634
116	Petroleum Products	KGS	978	1,963
117	Plywood And Allied Products	CUM		427
		KGS	43	651
		NOS		2,699

Quantity and Value of Export

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
118	Poultry Products	KGS	19	421
		NOS		348
119	Prime Mica And Mica Products	KGS	1	112
120	Processed Fruits And Juices	KGS	532	3,767
121	Processed Meat	KGS	0.279	6
122	Processed Minerals	KGS	6,441	5,720
123	Processed Vegetables	KGS	174	1,697
124	Products of Iron And Steel	KGS	3,296	40,088
		NOS		74
125	Project Goods	KGS	4	189
126	Pulp And Waste Paper	KGS	14	73
127	Pulses	KGS	26	221
128	Pumps of All Types	KGS	22	1,628
		NOS		2,999
129	Railway Transport Equipments, Parts	KGS	6	410
		NOS		315
130	Raw Hides And Skins	KGS	0.220	1
		NOS		0.001
131	Residual Chemical And Allied Products	KGS	746	16,598
		MTR		17
		SQM		1
132	Rice -Basmati	KGS	4,046	22,719
133	Rice (Other Than Basmati)	KGS	6,465	15,483
134	Ready Made Garment Cotton Including Accessories	NOS		37,083
135	Ready Made Garment Cotton Including Accessories	KGS	71	6,091
		PRS		368
136	Ready Made Garment Manmade Fibres	KGS	13	845
		NOS		26,433
		PRS		66
137	Ready Made Garment of Other Textile Material	KGS	22	2,020
		NOS		18,418
		PRS		262
138	Ready Made Garment Silk	KGS	0.027	16
		NOS		1,560
139	Ready Made Garment Wool	KGS	0.006	1
		NOS		1,215
		PRS		0.278
140	Saddlery And Harness	KGS	14	958
141	Sesame Seeds	KGS	328	3,012
142	Sheep/Goat Meat	KGS	22	838
143	Shellac	KGS	6	203
144	Ship, Boat And Floating Structure	NOS		25,994
145	Silk Carpet	SQM		15
146	Silk Waste	KGS	2	90

Quantity and Value of Export

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
147	Silk, Raw	KGS	0.009	1
148	Silver	KGS	0.029	46
149	Spices	KGS	831	16,616
150	Sports Goods	KGS	10	463
		NOS		1,024
151	Stationery/office, School Supply	KGS	6	164
		NOS		1,431
152	Sugar	KGS	3,844	9,825
153	Sulphur, Unroasted Iron Pyrite	KGS	628	516
154	Surgicals	KGS	24	858
		NOS		1,126
155	Tea	KGS	246	4,719
156	Telecom Instruments	KGS	6	2,233
		NOS		3,416
157	Tin And Products Made of Tin	KGS	4	376
158	Tobacco Manufactured	KGS	29	1,275
		THN		804
159	Tobacco Unmanufactured	KGS	215	4,373
160	Two And Three Wheelers	NOS		11,613
161	Vegetable Oils	KGS	31	523
162	Wheat	KGS	667	1,062
163	Wollen Yarn, Fabrics, Madeups, etc.	KGS	20	960
		NOS		49
		SQM		276
164	Wool, Raw	KGS	0.106	4
165	Zinc And Products Made of Zinc	KGS	258	3,435
166	Other	CRT		1,609
		CUM		11
		KGS	3,938	34,140
		LTR		123
		NOS		30,667
		SQM		6,862
		THN		0.000
Total			1,84,944	16,82,941

Source: Directorate General of Commercial Intelligence and Statistics (DGCI&S), Ministry of Commerce, Government of India

Quantity and Value of Import

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
1	Air Conditioner, Refrigeration Machinery, Etc.	KGS	73	17,174
		NOS		9,567
2	Accumulators And Batteries	KGS	23	683
		NOS		4,805
3	Agro Chemicals	KGS	71	5,476
4	Aircraft, Spacecraft And Parts	KGS	1	11,289
		NOS		21,288
5	Alcoholic Beverages	LTR		2,737
6	Aluminium, Products of Aluminium	KGS	1,690	22,931
7	ATM, Inejcting Moulding Machinery, Etc.	KGS	45	5,050
8	Auto Components/Parts	KGS	323	26,532
		NOS		2,055
9	Auto Tyres And Tubes	NOS		2,992
10	Ayush And Herbal Products	KGS	12	354
11	Bicycle And Parts	KGS	21	370
		NOS		840
12	Books, Publications And Printing	KGS	23	2,281
13	Bulk Drugs, Drug Intermediates	KGS	260	19,135
14	Bulk Minerals And Ores	KGS	22,788	34,034
15	Carpet (Excluding Silk) Handmade	SQM		510
16	Cashew	KGS	962	8,701
17	Cashew Nut Shell Liquid	KGS	2	6
18	Castor Oil	KGS		1
19	Ceramics And Allied Products	KGS	148	2,313
		THN		0.086
		TON	344	1,908
20	Cereal Preparations	KGS	62	575
21	Cement, Clinker And Asbestos Cement	KGS	1,389	682
22	Coal, Coke And Briquettes, Etc.	TON	2,07,022	89,304
23	Cocoa Products	KGS	56	1,399
24	Coffee	KGS	66	802
25	Coir And Coir Manufactures	KGS	2	10
		NOS		0.011
		SQM		21
26	Computer Hardware, Peripherals	KGS	11	8,319
		NOS		37,792
27	Consumer Electronics	KGS	49	8,323
		NOS		17,287
28	Copper And Products Made of Copper	KGS	629	21,978
29	Cosmetics And Toiletries	KGS	536	6,093
30	Cotton Fabrics, Madeups, Etc.	KGS	388	1,172
		NOS		1,111
		SQM		999
31	Cotton Raw Including Waste	KGS	233	2,566

Quantity and Value of Import

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
32	Cotton Yarn	KGS	6	272
33	Cranes, Lifts And Winches	KGS	40	1,851
		NOS		5,670
34	Dairy Products	KGS	18	372
35	Drug Formulations, Biologicals	KGS	3	8,729
36	Dye Intermediates	KGS	1,778	3,885
37	Dyes	KGS	48	2,091
38	Electric Machinery And Equipment	KGS	143	18,888
		NOS		20,637
39	Electrodes	KGS	17	533
40	Electronics Components	KGS	90	14,333
		NOS		32,439
41	Electronics Instruments	KGS	58	7,650
		NOS		30,903
42	Essential Oils	KGS	4	881
43	Fertilizers Crude	KGS	8,049	6,628
44	Fertilizers Manufactured	KGS	20,544	45,873
45	Finished Leather	KGS	75	3,900
46	Floor Covering of Jute	SQM		8
47	Floriculture Products	KGS	5	114
48	Footwear of Leather	KGS	4	133
		PRS		1,528
49	Footwear of Rubber/Canvas Etc.	KGS	2	138
		PRS		1,122
50	Fresh Fruits	KGS	857	11,064
51	Fresh Vegetables	KGS	141	394
52	Fruits / Vegetable Seeds	KGS	14	703
53	Glass And Glassware	KGS	416	5,112
		NOS		77
		SQM		1,154
54	Gold	KGS	1	2,07,488
55	Gold And Other Precious Metal Jewellery	KGS		4,575
56	Granite, Natural Stone And Product	KGS	1,495	3,269
57	Graphite, Explosives And Accessories	KGS	39	421
58	Groundnut	KGS	0.106	0.313
59	Guergam Meal	KGS	1	12
60	Handicrafts (Excluding Handmade Carpets)	KGS	166	1,908
		NOS		2,643
		SQM		2
61	Handloom Products	KGS		1
		NOS		7
		SQM		60
62	Hand Tool, Cutting Tool of Metals	KGS	60	5,538
63	Human Hair, Products Thereof	KGS		54

Quantity and Value of Import

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
64	Internal combustion Engines And Parts	KGS	56	5,621
		NOS		7,991
65	Industrail Machinery For Dairy, Etc.	KGS	158	17,341
		NOS		45,306
66	Inorganic Chemicals	KGS	9,073	29,049
67	Iron And Steel	KGS	20,917	73,551
68	Iron Ore	TON	7,095	3,193
69	Jute Hessian	KGS	4	24
		SQM		158
70	Jute Yarn	KGS	89	510
71	Jute, Raw	KGS	88	363
72	Lead And Products Made of Lead	KGS	269	3,214
73	Leather Footwear Component	KGS	3	181
74	Leather Garments	KGS	1	53
75	Leather Goods	KGS	4	256
		NOS		288
76	Machine Tools	KGS	11	2,318
		NOS		9,455
77	Manmade Staple Fibre	KGS	183	1,818
78	Manmade Yarn, Fabrics, Madeups	KGS	313	6,639
		NOS		372
		SQM		3,341
79	Marine Products	KGS	50	637
80	Medical And Scientific Instruments	KGS	20	6,324
		NOS		15,214
81	Mica	KGS	3	6
82	Milled Products	KGS	4	21
83	Miscellaneous Processed Items	KGS	114	1,080
		LTR		59
84	Mollases	KGS	17	8
85	Motor Vehicle/Cars	NOS		1,845
86	Moulded And Extruded Goods	KGS	41	1,522
87	Natural Silk Yarn, Fabrics, Madeup	KGS		82
		NOS		2
		SQM		222
88	Natural Rubber	KGS	458	4,672
89	Newsprint	KGS	1,497	5,270
90	Nickel, Product Made of Nickel	KGS	72	5,869
91	Niger Seeds	KGS	6	44
92	Nuclear Reactor, Industrial Boiler, Parts	KGS	26	1,505
		NOS		2,169
93	office Equipments	NOS		205
94	Oil Meals	KGS	257	430

Quantity and Value of Import

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
95	Optical Items (Including Lens, Etc.)	KGS	5	667
		NOS		1,410
96	Organic Chemicals	KGS	8,801	59,146
97	Other Non Ferrous Metal And Products	KGS	162	5,320
98	Other Textile Yarn, Fabric Madeup Articles	KGS	127	4,617
		SQM		404
99	Other Cereals	KGS	24	53
100	Other Commodities	KGS	1,345	9,944
		NOS		7,199
		SQM		4
		TKW		991
		TON	17	45
101	Other Construction Machinery	KGS	72	4,593
		NOS		4,960
102	Other Crude Minerals	KGS	647	2,178
103	Other Jute Manufactures	KGS	84	484
		NOS		0.324
		SQM		78
104	Other Meat	KGS		17
105	Other Miscellaneous Engineering Items	KGS	147	10,031
		NOS		8,023
106	Other Miscellaneous Chemicals	KGS	82	2,431
107	Other Oil Seeds	KGS	63	219
108	Other Precious And Base Metals	KGS		1,430
109	Other Wood And Wood Products	CUM		3,689
		KGS	1	2
		TON	434	462
110	Other Rubber Products Except Footwear	KGS	895	10,589
		NOS		53
		PRS		376
111	Paint, Varnish And Allied Products	KGS	416	8,638
112	Paper, Paper Board And Products	KGS	4,620	15,587
		NOS		103
113	Pearl, Precious, Semiprecious Stones	CRT		1,10,718
		KGS		8,972
114	Petroleum Products	KGS	25,113	75,981
		TON	3,402	11,513
115	Petroleum: Crude	TON	2,02,314	4,29,400
116	Plywood And Allied Products	CUM		1,852
		KGS	649	2,772
		NOS		1,435
117	Poultry Products	KGS		2
		NOS		25
118	Prime Mica And Mica Products	KGS	9	1,333

Quantity and Value of Import

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
119	Processed Fruits And Juices	KGS	40	526
120	Processed Meat	KGS		3
121	Processed Minerals	KGS	7,956	4,672
122	Processed Vegetables	KGS	15	120
123	Products of Iron And Steel	KGS	1,445	24,311
		NOS		91
124	Project Goods	KGS	200	18,043
125	Pulp And Waste Paper	KGS	1,356	6,265
126	Pulses	KGS	1,939	11,252
127	Pumps of All Types	KGS	9	1,500
		NOS		3,815
128	Railway Transport Equipments, Parts	KGS	25	1,681
		NOS		1,598
129	Raw Hides And Skins	KGS	15	275
		NOS		136
130	Residual Chemical And Allied Products	KGS	1,394	26,021
		MTR		2
		SQM		526
131	Rice (Other Than Basmati)	KGS	1	6
132	Ready Made Garments Cotton Including Accessories	KGS	2	68
		NOS		685
		PRS		53
133	Ready Made Garments Manmade Fibres	KGS	2	37
		NOS		1,056
		PRS		7
134	Ready Made Garments of Other Textile Material	KGS	3	155
		NOS		485
		PRS		166
135	Ready Made Garments Silk	KGS	0.008	0.461
		NOS		18
136	Ready Made Garments Wool	KGS	0.001	0.152
		NOS		66
		PRS		0.303
137	Saddlery And Harness	KGS		2
138	Sesame Seeds	KGS	24	180
139	Sheep/Goat Meat	KGS		5
140	Shellac	KGS	1	19
141	Ship, Boat And Floating Structure	NOS		29,717
142	Silk Carpet	SQM		0.049
143	Silk Waste	KGS		37
144	Silk, Raw	KGS	4	1,006
145	Silver	KGS	1	2,012
146	Spices	KGS	197	5,400

Quantity and Value of Import

2015-16

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
147	Sports Goods	KGS	21	521
		NOS		929
148	Stationery/office, School Supply	KGS	11	305
		NOS		273
149	Sugar	KGS	1,943	4,038
150	Sulphur, Unroasted Iron Pyrite	KGS	1,436	1,422
151	Surgicals	KGS	23	858
		NOS		2,776
152	Tea	KGS	24	377
153	Telecom Instruments	KGS	79	33,127
		NOS		65,968
154	Tin And Products Made of Tin	KGS	12	1,262
155	Tobacco Manufactured	KGS	2	63
		THN		131
156	Tobacco Unmanufactured	KGS	3	137
157	Two And Three Wheelers	NOS		301
158	Vegetable Oils	KGS	15,644	68,677
159	Wheat	KGS	518	873
160	Wollen Yarn, Fabrics, Madeups, etc.	KGS	13	160
		NOS		0.277
		SQM		222
161	Wool, Raw	KGS	98	2,016
162	Zinc And Products Made of Zinc	KGS	227	3,013
163	Other	CRT		8,064
		CUM		6,657
		KGS	16,742	77,447
		LTR		871
		NOS		9,546
		SQM		1,480
		TON	4,102	14,685
Total			6,17,082	23,68,709

Source: Directorate General of Commercial Intelligence and Statistics (DGCI&S), Ministry of Commerce, Government of India

Production and Value of Biomass

2020-21

S. No.	Item	Production (in Lakh Tonnes)	GVO (INR in Lakhs)
A	Cereals		
1	Rice	1,244	3,51,20,268
2	Wheat	1,096	2,18,07,972
3	Jowar	48	11,06,018
4	Bajra	109	16,79,015
5	Barley	17	2,69,120
6	Maize	316	53,12,170
7	Ragi	20	4,94,531
8	Small Millets	4	53,464
9	Other Cereals		22,750
B	Pulses		
10	Gram	119	60,43,573
11	Arhar	43	26,13,088
12	Urd	22	15,13,546
13	Moong	31	19,97,654
14	Masur	15	8,46,049
15	Other Pulses	24	13,43,781
C	Oilseeds		
16	Linseed	1	63,163
17	Sesamum	8	7,23,352
18	Groundnut	102	53,76,361
19	Rapeseed & Mustard	102	59,26,498
20	Castor	16	7,37,741
21	Coconut	143	29,52,955
22	Niger Seed		22,662
23	Safflower		14,387
24	Sunflower	2	1,06,944
25	Soyabean	126	50,19,737
26	Taramira		32,233
27	Other Oilseeds		4,64,346
D	Sugars		
28	Sugarcane	4,054	1,01,81,795
29	Gur		19,16,987
30	Other Sugars		24,771
E	Fibres		
31	Kapas	6	93,24,789
32	Jute	16	7,49,952
33	Sunhemp		5,193
34	Mesta	1	26,469

Production and Value of Biomass

2020-21

S. No.	Item	Production (in Lakh Tonnes)	GVO (INR in Lakhs)
35	Other Fibres		8,535
F	Indigo, Dyes & Tanning Material		32,595
G	Drugs & Narcotics		
36	Tea	13	19,83,959
37	Coffee	3	8,35,533
38	Tobacco	8	10,62,545
39	Opium		5,442
40	Betel Leaves		9,89,863
41	Isabgol		2,00,485
42	Saffron		2,806
43	Cocoa		32,203
44	Other Drugs And Narcotics		14,38,514
H	Condiments & Spices		
45	Cardamom		4,26,376
46	Chillies	64	31,27,400
47	Black Pepper	1	4,88,631
48	Ginger	22	17,06,184
49	Turmeric	11	8,18,240
50	Arecanut	16	50,02,127
51	Garlic	32	30,09,214
52	Coriander	9	8,32,325
53	Fennel	1	83,385
54	Cumin	8	10,19,840
55	Ajwain		11,151
56	Methi	2	75,848
57	Tamarind	2	1,97,914
58	Nutmeg		33,215
59	Cloves		530
60	Cinnamon/Tejpatta		216
61	Other Condiments And Spices		10,88,297
I	Fruits & Vegetables		
62	Banana	331	74,92,801
63	Cashewnut	7	7,36,718
64	Potato	562	84,84,477
65	Sweet Potato	12	2,36,849
66	Tapioca	69	5,34,063
67	Onion	266	59,50,760
68	Mango	204	84,56,226
69	Floriculture	38	36,48,647

Production and Value of Biomass

2020-21

S. No.	Item	Production (in Lakh Tonnes)	GVO (INR in Lakhs)
70	Grapes	34	10,04,714
71	Papaya	55	11,46,007
72	Apple	23	7,76,075
73	Mosambi	40	2,33,653
74	Lemon	35	10,59,791
75	Orange	62	27,12,832
76	Other Citrus Fruit	5	46,877
77	Lichi	7	3,66,624
78	Pineapple	18	6,71,085
79	Sapota	8	2,34,172
80	Cherry		13,893
81	Almonds		23,533
82	Jack Fruit	19	3,86,510
83	Pear	3	96,312
84	Walnut	3	5,42,857
85	Guava	46	11,27,487
86	Amla/Anola	12	3,57,814
87	Ber	6	1,43,810
88	Passion Fruit	1	15,236
89	Peach/Plum	1	79,668
90	Pomegranate	33	16,13,839
91	Strawberry		3,797
92	Nuts And Dry Fruits		159
93	Other Fruits	27	12,64,647
94	Brinjal	129	31,19,221
95	Cabbage	96	18,95,436
96	Cauliflower	92	23,31,449
97	Okra	65	17,11,061
98	Tomato	212	48,14,913
99	Drum Sticks		4,97,198
100	Green Peas	58	17,54,728
101	Beans	26	9,32,074
102	Bittergourd	13	3,49,502
103	Bottlegourd	32	4,28,054
104	Capsicum	6	1,90,701
105	Carrot	19	3,55,215
106	Cucumber	17	2,50,337
107	Muskmelon	15	2,39,396
108	Parmal	7	2,58,413

Production and Value of Biomass

2020-21

S. No.	Item	Production (in Lakh Tonnes)	GVO (INR in Lakhs)
109	Radish	33	5,51,837
110	Pumpkin	22	3,23,684
111	Watermelon	33	5,19,058
112	Other Vegetables	216	58,36,319
J	Other Crops		
113	Rubber	7	7,88,137
114	Guarseed	13	4,94,447
115	Miscellaneous Food Crops		4,233
116	Miscellaneous Non-Food Crops		1,23,669
117	Fodder		54,57,466
118	Grass		27,00,850
119	Mulberry		6,342
120	Mushroom	2	1,55,594
K	By Products		
121	Straw & Stalks		1,03,57,410
122	Other By Products		11,95,171
L	Kitchen Garden		11,42,941
M	Forestry And Logging		
123	Industrial Wood (Forest And Trees Outside Forest)		2,40,27,409
124	Firewood		69,20,107
125	Non-Timber Forest Products		42,70,402
N	Fisheries		
126	Inland Fish	112	1,78,28,881
127	Marine Fish	35	1,17,21,561
Total		11,066	31,14,21,858

Source:

1. Agriculture Statistics at a Glance, 2023, Ministry of Agriculture and Farmers Welfare
2. National Accounts Statistics, Ministry of Statistics and Programme Implementation

Quantity and Value of Minerals

2020-21

S. No.	Minerals	Quantity (Tonnes)	Value ('000 Rupees)
1	Bauxite	2,03,80,548	1,67,93,447
2	Chromite	28,30,413	2,18,62,796
3	Copper Concentrate	1,08,718	85,33,354
4	Copper Ore	32,72,915	
5	Diamond		1,47,696
6	Fluorite (Graded)	1,052	8,018
7	Garnet	7,114	26,378
8	Gold Ore	4,37,669	
9	Gold Primary	1	54,75,470
10	Graphite	35,386	87,147
11	Iolite		73
12	Iron Ore	20,50,41,900	52,72,92,469
13	Kyanite	4,925	9,251
14	Laterite	10,160	6,096
15	Lead & Zinc Ore	1,54,55,342	
16	Lead Concentrate	3,76,923	1,88,10,483
17	Limestone	34,91,19,970	8,64,84,948
18	Magnesite	74,661	3,14,677
19	Manganese Ore	27,03,313	1,74,15,460
20	Marl	22,16,414	4,17,183
21	Moulding Sand	14,363	4,150
22	Ochre	16,390	8,933
23	Phosphorite	14,55,829	46,94,525
24	Rock Salt	486	14,156
25	Selenite	402	602
26	Siliceous Earth	23,823	14,686
27	Sillimanite	11,110	13,987
28	Silver	706	4,26,64,424
29	Tin Concentrate	17	10,413
30	Vermiculite	1,260	2,157
31	Wollastonite	1,03,902	1,22,210
32	Zinc Concentrate	15,13,996	6,31,27,101
33	Coal	71,60,83,000	1,07,66,98,790
34	Lignite	3,78,95,000	7,12,67,642
35	Natural Gas	24	1,13,04,08,082
36	Petroleum	3,04,94,000	
37	Minor Minerals	NA	1,28,96,46,813
Total*		1,38,96,91,731	4,38,23,83,617

* Excluding Atomic Minerals

Source:

1. Monthly Statistics of Mineral Production, Indian Bureau of Mines
2. National Accounts Statistics, Ministry of Statistics and Programme Implementation
3. Ministry of Coal

Quantity and Value of Export

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
1	Air Conditioner, Refrigeration Machinery, Etc.	KGS	78	3,620
		NOS		4,289
2	Accumulators And Batteries	KGS	4	133
		NOS		2,856
3	Agro Chemicals	KGS	533	26,513
4	Aircraft, Spacecraft And Parts	KGS	2	7,405
		NOS		1,211
5	Alcoholic Beverages	LTR		2,447
6	Aluminium, Products of Aluminium	KGS	2,742	42,967
7	Animal Casings	KGS	14	417
8	ATM, Injecting Moulding Machinery, Etc.	KGS	152	11,826
9	Auto Components/Parts	KGS	728	34,314
		NOS		2,277
10	Auto Tyres And Tubes	NOS		14,549
11	Ayush And Herbal Products	KGS	121	3,997
12	Bicycle And Parts	KGS	65	1,573
		NOS		1,010
13	Books, Publications And Printing	KGS	16	476
		NOS		1,339
14	Buffalo Meat	KGS	1,086	23,460
15	Bulk Drugs, Drug Intermediates	KGS	324	32,857
16	Bulk Minerals And Ores	KGS	13,180	6,606
17	Carpet (Excluding Silk) Handmade	SQM		10,846
18	Cashew	KGS	70	3,112
19	Cashew Nut Shell Liquid	KGS	4	20
20	Castor Oil	KGS	734	6,802
21	Ceramics And Allied Products	KGS	265	2,040
		SQM		12,102
		THN		39
		TON	509	2,145
22	Cereal Preparations	KGS	404	4,715
23	Cement, Clinker And Asbestos Cement	KGS	3,204	3,137
24	Coal, Coke And Briquettes, Etc.	TON	3,158	1,083
25	Cocoa Products	KGS	26	1,108
26	Coffee	KGS	245	5,340
27	Coir And Coir Manufactures	KGS	1,069	2,690
		NOS		16
		SQM		824
28	Computer Hardware, Peripherals	KGS	0	12
		NOS		2,306
29	Consumer Electronics	KGS	0	10
		NOS		5,040
30	Copper And Products Made of Copper	KGS	209	10,207
		MTR		472

Quantity and Value of Export

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
31	Cosmetics And Toiletries	KGS	668	11,986
32	Cotton Fabrics, Madeups, Etc.	KGS	436	16,949
		NOS		15,623
		SQM		11,943
33	Cotton Raw Including Waste	KGS	1,214	13,968
34	Cotton Yarn	KGS	1,010	20,643
35	Cranes, Lifts And Winches	KGS	23	1,262
		NOS		2,277
36	Dairy Products	KGS	118	2,391
37	Drug Formulations, Biologicals	KGS	318	1,41,207
38	Dye Intermediates	KGS	57	1,142
39	Dyes	KGS	473	17,355
40	Electric Machinery And Equipment	KGS	56	8,280
		MTR		5,244
		NOS		46,643
41	Electrodes	KGS	19	322
42	Electronics Components	KGS	96	9,571
		NOS		8,422
43	Electronics Instruments	KGS	15	2,184
		MTR		49
		NOS		18,362
44	Essential Oils	KGS	11	1,735
45	Fertilizers Crude	KGS	25	109
46	Fertilizers Manufactured	KGS	286	671
47	Finished Leather	KGS	26	2,797
48	Floor Covering of Jute	SQM		718
49	Floriculture Products	KGS	16	576
50	Footwear of Leather	KGS	1	70
		PRS		10,913
51	Footwear of Rubber/Canvas, Etc.	KGS	1	49
		PRS		1,384
52	Fresh Fruits	KGS	973	5,669
53	Fresh Vegetables	KGS	2,340	5,388
54	Fruits / Vegetable Seeds	KGS	17	809
55	Glass And Glassware	KGS	374	5,662
		NOS		33
		SQM		532
56	Gold	KGS	0	4,126
57	Gold And Other Precious Metal Jewellery	KGS	0	48,870
58	Granite, Natural Stone And Product	KGS	21,816	16,174
59	Graphite, Explosives And Accessories	KGS	35	781
60	Groundnut	KGS	638	5,380
61	Guergam Meal	KGS	235	1,949
62	Handicrafts (Excluding Handmade Carpets)	KGS	221	10,625
		NOS		1,979
		SQM		2

Quantity and Value of Export

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
63	Handloom Products	KGS	2	71
		NOS		654
		PRS		0.198
		SQM		920
64	Hand Tool, Cutting Tool of Metals	KGS	67	4,190
		NOS		1,096
65	Human Hair, Products Thereof	KGS	7	2,834
66	Internal combustion Engines And Parts	KGS	90	8,085
		NOS		10,336
67	Industrial Machinery For Dairy, Etc.	KGS	123	9,731
		NOS		31,088
68	Inorganic Chemicals	KGS	1,827	7,814
69	Iron And Steel	KGS	21,331	89,928
70	Iron Ore	TON	57,723	36,254
71	Jute Hessian	KGS	14	245
		SQM		559
72	Jute Yarn	KGS	12	132
73	Jute, Raw	KGS	31	191
74	Lead And Products Made of Lead	KGS	177	2,585
75	Leather Footwear Component	KGS	6	1,463
76	Leather Garments	KGS	4	2,186
77	Leather Goods	KGS	28	2,371
		NOS		4,604
78	Machine Tools	KGS	2	238
		NOS		2,990
79	Manmade Staple Fibre	KGS	378	2,766
80	Manmade Yarn, Fabrics, Madeups	KGS	1,253	18,844
		NOS		421
		SQM		8,847
81	Marine Products	KGS	1,168	44,176
82	Medical And Scientific Instruments	KGS	3	1,245
		NOS		9,430
83	Mica	KGS	143	472
84	Milled Products	KGS	397	1,536
85	Miscellaneous Processed Items	KGS	728	6,222
		LTR		181
86	Mollases	KGS	1,318	1,316
87	Motor Vehicle/Cars	NOS		37,719
88	Moulded And Extruded Goods	KGS	70	1,803
89	Natural Silk Yarn, Fabrics, Madeup	KGS	0	63
		NOS		6
		SQM		345
90	Natural Rubber	KGS	11	123
91	Newsprint	KGS	3	11
92	Nickel, Product Made of Nickel	KGS	3	417
93	Niger Seeds	KGS	20	160

Quantity and Value of Export

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
94	Nuclear Reactor, Industrial Boiler, Parts	KGS	44	2,603
		NOS		1,554
95	Office Equipments	NOS		1,117
96	Oil Meals	KGS	4,367	11,689
97	Optical Items (Including Lens, Etc.)	KGS	15	1,805
		NOS		1,232
98	Organic Chemicals	KGS	7,069	56,306
99	Other Non Ferrous Metal And Products	KGS	79	3,491
		NOS		756
100	Other Textile Yarn, Fabric Madeup Articles	KGS	60	2,436
		SQM		644
101	Other Cereals	KGS	3,076	5,198
102	Other Commodities	KGS	1,931	13,853
		MTS		3
		NOS		1,160
		SQM		338
		TKW		4,478
		TON	112	248
103	Other Construction Machinery	KGS	40	3,249
		NOS		5,994
104	Other Crude Minerals	KGS	9,235	1,342
105	Other Jute Manufactures	KGS	34	519
		NOS		531
		SQM		38
106	Other Meat	KGS	1	18
107	Other Miscellaneous Engineering Items	KGS	191	11,617
		MTR		1,502
		NOS		7,794
108	Other Miscellaneous Chemicals	KGS	294	11,103
109	Other Oil Seeds	KGS	85	456
110	Other Precious And Base Metals	KGS	4	1,693
111	Other Wood And Wood Products	CUM		35
		KGS	0.106	0.324
		TON	0.135	0.228
112	Other Rubber Products Except Footwear	KGS	361	7,617
		NOS		957
		PRS		815
113	Paint, Varnish And Allied Products	KGS	607	5,442
114	Paper, Paper Board And Products	KGS	2,593	14,739
		NOS		38
115	Pearl, Precious, Semiprecious Stones	CRT		1,33,201
		KGS	2	644
116	Petroleum Products	KGS	65,513	1,90,880
		TON	2	16
117	Plywood And Allied Products	CUM		305
		KGS	133	3,216
		NOS		4,980

Quantity and Value of Export

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
118	Poultry Products	KGS	10	256
		NOS		180
119	Prime Mica And Mica Products	KGS	1	101
		NOS		78
120	Processed Fruits And Juices	KGS	533	5,151
121	Processed Meat	KGS	1	13
122	Processed Minerals	KGS	6,450	5,877
123	Processed Vegetables	KGS	367	3,150
124	Products of Iron And Steel	KGS	2,137	36,561
		NOS		11,908
125	Project Goods	KGS	0	17
126	Pulp And Waste Paper	KGS	32	80
127	Pulses	KGS	277	1,978
128	Pumps of All Types	KGS	23	2,382
		NOS		4,148
129	Railway Transport Equipments, Parts	KGS	10	559
		NOS		712
130	Raw Hides And Skins	KGS	1	5
131	Residual Chemical And Allied Products	KGS	1,455	42,838
		MTR		0.085
		SQM		7
132	Rice -Basmati	KGS	4,630	29,848
133	Rice (Other Than Basmati)	KGS	13,149	35,557
134	Ready Made Garment Cotton Including Accessories	KGS	44	6,288
		NOS		43,687
		PRS		757
135	Ready Made Garment Manmade Fibres	KGS	3	477
		NOS		18,906
		PRS		55
136	Ready Made Garment of Other Textile Material	KGS	14	1,992
		NOS		16,707
		PRS		372
137	Ready Made Garment Silk	KGS	0	3
		NOS		670
138	Ready Made Garment Wool	KGS	0	1
		NOS		794
		PRS		0.163
139	Saddlery And Harness	KGS	11	1,374
140	Sesame Seeds	KGS	273	3,159
141	Sheep/Goat Meat	KGS	7	330
142	Shellac	KGS	8	650
143	Ship, Boat And Floating Structure	NOS		33,465
144	Silk Carpet	SQM		174
145	Silk Waste	KGS	3	151
146	Silk, Raw	KGS	0	1
147	Silver	KGS	1	3,393
148	Spices	KGS	1,622	29,650

Quantity and Value of Export

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
149	Sports Goods	KGS	13	826
		NOS		1,162
150	Stationery/office, School Supply	KGS	5	168
		NOS		1,063
151	Sugar	KGS	7,518	20,669
152	Sulphur, Unroasted Iron Pyrite	KGS	803	435
153	Surgicals	KGS	47	1,694
		NOS		1,693
154	Tea	KGS	213	5,604
155	Telecom Instruments	KGS	4	1,402
		NOS		31,280
156	Tin And Products Made of Tin	KGS	1	73
157	Tobacco Manufactured	KGS	29	2,041
		THN		616
158	Tobacco Unmanufactured	KGS	178	3,840
159	Two And Three Wheelers	NOS		15,172
160	Vegetable Oils	KGS	302	4,453
161	Wheat	KGS	2,155	4,173
162	Wollen Yarn, Fabrics, Madeups, etc.	KGS	10	662
		NOS		42
		SQM		100
163	Wool, Raw	KGS	0	1
164	Zinc And Products Made of Zinc	KGS	300	5,510
165	Other	KGS	1	18
		NOS		0.152
		SQM		7
Total			2,85,889	21,04,515

Source: Directorate General of Commercial Intelligence and Statistics (DGCI&S), Ministry of Commerce, Government of India

Quantity and Value of Import

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
1	Air Conditioner, Refrigeration Machinery, Etc.	KGS	76	10,021
		NOS		11,928
2	Accumulators And Batteries	KGS	25	1,469
		NOS		10,129
3	Agro Chemicals	KGS	157	12,418
4	Aircraft, Spacecraft And Parts	KGS		1,805
		NOS		40,853
5	Alcoholic Beverages	LTR		4,037
6	Aluminium, Products of Aluminium	KGS	2,077	30,379
7	Animal Casings	KGS	0.014	0.49
8	ATM, Injecting Moulding Machinery, Etc.	KGS	47	7,177
9	Auto Components/Parts	KGS	304	28,608
		NOS		2,084
10	Auto Tyres And Tubes	NOS		1,357
11	Ayush And Herbal Products	KGS	76	797
12	Bicycle And Parts	KGS	20	582
		NOS		753
13	Books, Publications And Printing	KGS	5	1,237
		NOS		552
14	Bulk Drugs, Drug Intermediates	KGS	390	28,529
15	Bulk Minerals And Ores	KGS	30,812	19,873
		TON	107	136
16	Carpet (Excluding Silk) Handmade	SQM		533
17	Cashew	KGS	834	7,491
18	Cashew Nut Shell Liquid	KGS	2	7
19	Castor Oil	KGS		10
20	Ceramics And Allied Products	KGS	206	3,831
		SQM		170
		THN		5
		TON	489	1,647
21	Cereal Preparations	KGS	113	1,212
22	Cement, Clinker And Asbestos Cement	KGS	2,378	1,061
23	Coal, Coke And Briquettes, Etc.	TON	2,17,727	1,20,534
24	Cocoa Products	KGS	89	2,021
25	Coffee	KGS	78	901
26	Coir And Coir Manufactures	KGS	1	4
		NOS		0.40
		SQM		12
27	Computer Hardware, Peripherals	KGS	1	106
		NOS		77,131

Quantity and Value of Import

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
28	Consumer Electronics	KGS	1	359
		NOS		33,364
29	Copper And Products Made of Copper	KGS	744	34,100
		MTR		368
30	Cosmetics And Toiletries	KGS	927	10,300
31	Cotton Fabrics, Madeups, Etc.	KGS	378	1,749
		NOS		390
		SQM		777
32	Cotton Raw Including Waste	KGS	231	2,861
33	Cotton Yarn	KGS	4	121
34	Cranes, Lifts And Winches	KGS	47	2,429
		NOS		6,298
35	Dairy Products	KGS	19	365
36	Drug Formulations, Biologicals	KGS	13	18,279
37	Dye Intermediates	KGS	2,332	5,991
38	Dyes	KGS	36	2,004
39	Electric Machinery And Equipments	KGS	63	8,244
		MTR		2,236
		NOS		41,834
40	Electrodes	KGS	21	1,016
41	Electronics Components	KGS	39	17,870
		NOS		95,057
42	Electronics Instruments	KGS	38	6,605
		MTR		294
		NOS		47,956
43	Essential Oils	KGS	6	1,210
44	Fertilizers Crude	KGS	7,803	5,691
45	Fertilizers Manufactured	KGS	23,936	50,714
46	Finished Leather	KGS	70	2,262
47	Floor Covering of Jute	SQM		5
48	Floriculture Products	KGS	4	160
49	Footwear of Leather	KGS	4	190
		PRS		1,423
50	Footwear of Rubber/Canvas, Etc.	KGS	2	182
		PRS		1,170
51	Fresh Fruits	KGS	1,212	15,765
52	Fresh Vegetables	KGS	73	226
53	Fruits / Vegetable Seeds	KGS	25	1,036

Quantity and Value of Import

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
54	Glass And Glassware	KGS	466	6,441
		NOS		27
		SQM		1,701
55	Gold	KGS	1	2,54,288
56	Gold And Other Precious Metal Jewellery	KGS		2,261
57	Granite, Natural Stone And Products	KGS	713	1,441
58	Graphite, Explosives And Accessories	KGS	68	1,088
59	Groundnut	KGS	1	8
60	Guergam Meal	KGS		11
61	Handicrafts (Excluding Handmade Carpets)	KGS	101	2,904
		NOS		1,381
		SQM		3
62	Handloom Products	KGS		1
		NOS		3
		PRS		0.29
		SQM		38
63	Hand Tool, Cutting Tool of Metals	KGS	73	6,504
		NOS		618
64	Human Hair, Products Thereof	KGS		14
65	Internal combustion Engines And Parts	KGS	68	7,614
		NOS		6,078
66	Industrial Machinery For Dairy, Etc.	KGS	155	18,541
		NOS		57,475
67	Inorganic Chemicals	KGS	10,808	33,285
68	Iron And Steel	KGS	10,857	61,288
69	Iron Ore	TON	761	835
70	Jute Hessian	KGS	1	19
		SQM		248
71	Jute Yarn	KGS	38	338
72	Jute, Raw	KGS	29	179
73	Lead And Products Made of Lead	KGS	315	4,588
74	Leather Footwear Component	KGS	2	136
75	Leather Garments	KGS		15
76	Leather Goods	KGS	3	135
		NOS		130
77	Machine Tools	KGS	11	454
		NOS		15,877
78	Manmade Staple Fibre	KGS	213	2,669

Quantity and Value of Import

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
79	Manmade Yarn, Fabrics, Madeups	KGS	617	10,671
		NOS		249
		SQM		3,641
80	Marine Products	KGS	101	1,668
81	Medical And Scientific Instruments	KGS	5	4,771
		NOS		26,548
82	Mica	KGS	1	14
83	Milled Products	KGS	3	10
84	Miscellaneous Processed Items	KGS	92	1,465
		LTR		802
85	Mollases	KGS	2	1
86	Motor Vehicle/Cars	NOS		2,649
87	Moulded And Extruded Goods	KGS	56	2,234
88	Natr'l Silk Yarn, Fabrics, Madeup	KGS		62
		NOS		0.05
		SQM		98
89	Natural Rubber	KGS	410	4,620
90	Newsprint	KGS	663	2,199
91	Nickel, Product Made of Nickel	KGS	58	5,562
92	Niger Seeds	KGS	6	41
93	Nuclear Reactor, Industrial Boiler, Parts	KGS	37	1,647
		NOS		1,357
94	Office Equipments	NOS		602
95	Oil Meals	KGS	510	1,018
96	Optical Items (Including Lens, Etc.)	KGS	2	461
		NOS		2,225
97	Organic Chemicals	KGS	11,074	82,087
98	Other Non Ferrous Metal And Products	KGS	202	5,880
		NOS		829
99	Other Textile Yarn, Fabric Madeup Articles	KGS	219	4,938
		SQM		446
100	Other Cereals	KGS	135	331
101	Other Commodities	KGS	2,454	17,781
		MTS		2
		NOS		4,185
		SQM		7
		TKW		1,859
102	Other Construction Machinery	TON	133	47
		KGS	140	6,288
		NOS		6,684

Quantity and Value of Import

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
103	Other Crude Minerals	KGS	1,239	2,387
104	Other Jute Manufactures	KGS	44	321
		NOS		0.23
		SQM		192
105	Other Meat	KGS		17
106	Other Miscellaneous Engineering Items	KGS	137	9,004
		MTR		3,933
		NOS		11,033
107	Other Miscellaneous Chemicals	KGS	217	7,544
108	Other Oil Seeds	KGS	507	2,165
109	Other Precious And Base Metals	KGS		4,365
110	Other Wood And Wood Products	CUM		5,522
		KGS	9	16
		TON	57	9
111	Other Rubber Products Except Footwear	KGS	918	13,609
		NOS		151
		PRS		1,790
112	Paint, Varnish And Allied Products	KGS	524	12,223
113	Paper, Paper Board And Products	KGS	7,818	19,939
		NOS		152
114	Pearl, Precious, Semiprecious Stones	CRT		1,31,929
		KGS	2	7,095
115	Petroleum Products	KGS	67,537	1,71,685
		TON	1,847	12
116	Petroleum: Crude	TON	1,88,180	4,39,656
117	Plywood And Allied Products	CUM		3,320
		KGS	572	3,098
		NOS		875
118	Poultry Products	KGS		2
		NOS		23
119	Prime Mica And Mica Products	KGS	2	111
		NOS		2,935
120	Processed Fruits And Juices	KGS	44	663
121	Processed Meat	KGS		5
122	Processed Minerals	KGS	11,588	9,569
123	Processed Vegetables	KGS	18	164
124	Products of Iron And Steel	KGS	1,350	24,654
		NOS		3,136
125	Project Goods	KGS	110	11,107
126	Pulp And Waste Paper	KGS	1,379	6,303

Quantity and Value of Import

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
127	Pulses	KGS	2,466	11,938
128	Pumps of All Types	KGS	11	1,917
		NOS		5,859
129	Railway Transport Equipments, Parts	KGS	43	1,662
		NOS		2,187
130	Raw Hides And Skins	KGS	13	116
131	Residual Chemical And Allied Products	KGS	2,696	60,867
		MTR		0.01
		SQM		544
132	Rice (Other Than Basmati)	KGS	5	25
133	Ready Made Garments Cotton Including Accessories	KGS	1	98
		NOS		2,371
		PRS		192
134	Ready Made Garments Manmade Fibres	KGS	1	55
		NOS		1,788
		PRS		20
135	Ready Made Garments of Other Textile Materials	KGS	3	162
		NOS		1,581
		PRS		144
136	Ready Made Garments Silk	KGS	0.001	0.15
		NOS		25
137	Ready Made Garments Wool	KGS	0.001	0.15
		NOS		87
		PRS		0.17
138	Saddlery And Harness	KGS		11
139	Sesame Seeds	KGS	103	911
140	Sheep/Goat Meat	KGS		1
141	Shellac	KGS	1	21
142	Ship, Boat And Floating Structure	NOS		30,946
143	Silk Carpet	SQM		2
144	Silk Waste	KGS		3
145	Silk, Raw	KGS	2	571
146	Silver	KGS	1	5,960
147	Spices	KGS	344	8,095
148	Sports Goods	KGS	51	1,318
		NOS		640
149	Stationery/office, School Supply	KGS	16	101
		NOS		193
150	Sugar	KGS	1,964	4,720
151	Sulphur, Unroasted Iron Pyrite	KGS	1,470	1,104

Quantity and Value of Import

2020-21

S. No.	Principal Commodity	Unit	Quantity ('000 Tonnes)	Value (Rs. in Crore)
152	Surgicals	KGS	24	1,542
		NOS		3,113
153	Tea	KGS	39	659
154	Telecom Instruments	KGS	56	47,627
		NOS		62,444
155	Tin And Products Made of Tin	KGS	10	1,459
156	Tobacco Manufactured	KGS	2	68
		THN		91
157	Tobacco Unmanufactured	KGS	7	129
158	Two And Three Wheelers	NOS		136
159	Vegetable Oils	KGS	13,540	82,123
160	Wheat	KGS	0.003	0.01
161	Wollen Yarn, Fabrics, Madeups, etc.	KGS	97	385
		NOS		1
		SQM		103
162	Wool, Raw	KGS	82	995
163	Zinc And Products made of Zinc	KGS	189	3,431
164	Other	KGS		5
		SQM		1
Total			6,42,983	28,08,174

Source: Directorate General of Commercial Intelligence and Statistics (DGCI&S), Ministry of Commerce, Government of India

Year-wise Total Physical Supply Table for Solid Waste - Chandigarh

Unit: Tonnes

S. No.	Generation of Solid Waste during the year									Total
	Waste Category	Year	Households	Industry	Hotels/ Shops/ Restaurants	Imports	From the Environment	Others*	Stock of last year waste	
1	Municipal Solid Waste	2018-19	1,64,223		22,394					1,86,617
		2019-20	1,44,540		19,710					1,64,250
		2020-21	1,64,776		22,469					1,87,245
2	Bio Medical Waste	2018-19		1,164						1,164
		2019-20		1,412						1,412
		2020-21		2,091						2,091
3	Hazardous Waste	2018-19		1,798						1,798
		2019-20		2,125		602				2,727
		2020-21		1,279						1,279
4	E Waste	2018-19		7,169						7,169
		2019-20		10,333						10,333
		2020-21		11,268						11,268

Remarks:

* Others includes other industries and recovered residuals from the Environment

(i) The plastic waste generated in the State as provided by CPCB Report is 6000 TPA, 6746 TPA and 13107 TPA for the years 2018-19, 2019-20 and 2020-21 but the use side information was not available.

Year-wise Total Physical Use Table for Solid Waste - Chandigarh

Unit: Tonnes

S. No	Disposal and Treatment of Solid Waste															Total
	Waste Category	Year	Landfill/Dumpsite		Incineration	Recycling	Reuse	Composting	Vemi-Composting	Biomethanation	Waste to Energy	Export	To the Environment	Stock of waste at the end of the year	Others*	
			Sanitary Landfill	Dumpsite												
1	Municipal Solid Waste	2018-19	1,31,867					26,462		1,825	26,463					1,86,617
		2019-20	98,692					31,866		1,825	31,867					1,64,250
		2020-21	1,62,060					11,680		1,825	11,680					1,87,245
2	Bio Medical Waste	2018-19	94		791	279										1,164
		2019-20	113		960	339										1,412
		2020-21	167		1,422	502										2,091
3	Hazardous Waste	2018-19										1,798				1,798
		2019-20				602						2,125				2,727
		2020-21										1,279				1,279
4	E-Waste	2018-19				7,169										7,169
		2019-20				10,333										10,333
		2020-21				11,268										11,268

Remarks: Others includes treatment of waste other than the treatments included above or those for which treatment mechanism is not available.

Year-wise Total Physical Supply Table for Solid Waste - Gujarat

Unit: Tonnes

S. No.	Generation of Solid Waste during the year									Total
	Waste Category	Year	Households	Industry	Hotels/ Shops/ Restaurants	Imports	From the Environment	Others*	Stock of last year	
1	Municipal Solid Waste	2018-19	29,33,505		9,77,835					39,11,340
		2019-20	29,44,181		9,81,394					39,25,575
		2020-21	28,39,825		9,46,608					37,86,433
2	Bio Medical Waste	2018-19		12,303						12,303
		2019-20		13,294						13,294
		2020-21		18,064						18,064
3	Hazardous Waste	2018-19		25,21,317				8,52,496		33,73,813
		2019-20		24,85,317				4,49,131		29,34,448
		2020-21		31,93,378				7,16,629		39,10,007
4	E Waste	2018-19		3,107						3,107
		2019-20		14,186						14,186
		2020-21		23,501						23,501
5	Plastic Waste	2018-19		3,56,873						3,56,873
		2019-20		4,08,201						4,08,201
		2020-21		3,37,694						3,37,694

Remarks:

* Others includes other industries and recovered residuals from the Environment.

(i) MSW: The total waste generated (in this case wasted collected) has been taken from the CPCB Report and the same has been distributed according to the State's ratio.

Year-wise Total Physical Use Table for Solid Waste - Gujarat

Unit: Tonnes

S. No	Waste Category	Year	Disposal and Treatment of Solid Waste												Total	
			Landfill/Dumpsite		Incineration	Recycling	Reuse	Composting	Vemi-Composting	Biomethanation	Waste to Energy	Export	To the Environment	Stock at the End of the year		Others*
			Sanitary Landfill	Dumpsite												
1	Municipal Solid Waste	2018-19	15,11,830			9,33,409		14,66,101							39,11,340	
		2019-20	13,98,315			9,85,631		15,41,629							39,25,575	
		2020-21	12,35,824			12,16,939		13,18,351					15,319		37,86,433	
2	Bio Medical Waste	2018-19			12,303										12,303	
		2019-20			13,294										13,294	
		2020-21			18,064										18,064	
3	Hazardous Waste	2018-19	11,73,063		1,52,629	1,61,782	7,94,245			4,80,163	1,62,800		4,49,131		33,73,813	
		2019-20	13,17,121		1,67,509	1,72,204	1,30,724			4,30,261			7,16,629		29,34,448	
		2020-21	11,90,707		1,40,321	1,96,750	2,20,363			8,00,024	7,71,223		5,90,619		39,10,007	
4	E-Waste	2018-19				1,554	1,553								3,107	
		2019-20				7,093	7,093								14,186	
		2020-21				11,750	11,751								23,501	
5	Plastic Waste	2018-19	2,70,320			43,276	43,277								3,56,873	
		2019-20	3,14,100			47,050	47,051								4,08,201	
		2020-21	2,72,274			32,710	32,710								3,37,694	

Remarks: Others includes treatment of waste other than the treatments included above or those for which treatment mechanism is not available.

Year-wise Physical Supply Table for Solid Waste - Jammu & Kashmir

Unit: Tonnes

S. No.	Generation of Solid Waste during the year									Total
	Waste Category	Year	Households	Industry	Hotels/ Shops/ Restaurants	Imports	From the Environment	Others*	Stock of last year solid waste	
1	Municipal Solid Waste	2018-19	5,47,470		11,173					5,58,643
		2019-20	4,71,242		83,160					5,54,402
		2020-21	4,53,967		80,112					5,34,079
2	Bio Medical Waste	2018-19		1,636						1,636
		2019-20		2,154						2,154
		2020-21		2,169						2,169
3	Hazardous Waste	2018-19		1,101		26,989			1,614	29,704
		2019-20		1,213		45,815			1,345	48,373
		2020-21		1,359		31,800			1,247	34,406
4	E Waste	2018-19		49						49
		2019-20		87						87
		2020-21		150						150
5	Plastic Waste	2018-19	34,367							34,367
		2019-20	74,826							74,826
		2020-21	51,711							51,711

* Others includes other industries and recovered residuals from the Environment.

Year-wise Physical Use Table for Solid Waste - Jammu & Kashmir

Unit: Tonnes

S. No	Disposal and Treatment of Solid Waste														Total	
	Waste Category	Year	Landfill/Dumpsite		Incineration	Recycling	Reuse	Composting	Vemi-Composting	Biomethanation	Waste to Energy	Export	To the Environment	Stock at the End of the year		Others*
			Sanitary Landfill	Dumpsite												
1	Municipal Solid Waste	2018-19	1,73,936	3,52,645				1,591	2,121				28,350			5,58,643
		2019-20	1,86,040	3,11,135				32,076	5,346				19,805			5,54,402
		2020-21	1,48,464	3,05,322	2,098	5,246		54,559	4,721	4,197			9,472			5,34,079
2	Bio Medical Waste	2018-19			1,234	328							74			1,636
		2019-20			1,722	430							2			2,154
		2020-21			1,692	477										2,169
3	Hazardous Waste	2018-19			16	23,816						4,527		1,345		29,704
		2019-20			14	45,886						1,226		1,247		48,373
		2020-21				32,119						1,016		1,271		34,406
4	E-Waste	2018-19				49										49
		2019-20				87										87
		2020-21				150										150
5	Plastic Waste	2018-19	6,873			25,776									1,718	34,367
		2019-20	14,965			56,120									3,741	74,826
		2020-21	10,342			38,783									2,586	51,711

Remarks: Others includes treatment of waste other than the treatments included above or those for which treatment mechanism is not available.

Year-wise Physical Supply Table for Solid Waste - Maharashtra

Unit: Tonnes

S. No.	Generation of Solid Waste during the year									Total
	Waste Category	Year	Households	Industry	Hotels/ Shops/ Restaurants	Imports	From the Environment	Others*	Stock of last year solid waste	
1	Municipal Solid Waste	2018-19	65,27,446		21,75,815					87,03,261
		2019-20	62,81,264		20,93,755					83,75,019
		2020-21	61,95,704		20,65,235					82,60,939
2	Bio Medical Waste	2018-19		22,783						22,783
		2019-20		22,723						22,723
		2020-21		29,983						29,983
3	Hazardous Waste	2018-19		11,02,879		9,035			15,993	11,27,907
		2019-20		9,99,566		38,756			73,376	11,11,698
		2020-21		7,71,321		49,258			16,909	8,37,488
4	E Waste	2018-19		9,475						9,475
		2019-20		2,109						2,109
		2020-21		14,546						14,546
5	Plastic Waste	2018-19		4,09,630						4,09,630
		2019-20		4,43,724						4,43,724
		2020-21		3,11,254						3,11,254

* Others includes other industries and recovered residuals from the Environment.

Year-wise Physical Use Table for Solid Waste - Maharashtra

Unit: Tonnes

S. No	Disposal and Treatment of Solid Waste														Total				
	Waste Category	Year	Landfill/Dumpsite		Incineration	Recycling	Reuse	Composting	Vemi-Composting	Biomethanation	Waste to Energy	Export	To the Environment	Stock at the End of the year		Others*			
			Sanitary Landfill	Dumpsite															
1	Municipal Solid Waste	2018-19		40,34,115									46,07,515		61,631			87,03,261	
		2019-20		24,25,720										58,53,600		95,699			83,75,019
		2020-21	4,94,706	22,53,123										54,95,477		17,633			82,60,939
2	Bio Medical Waste	2018-19			13,192		6,368								38		3,185	22,783	
		2019-20			15,678		3,636								1		3,408	22,723	
		2020-21			18,882		6,594								13		4,494	29,983	
3	Hazardous Waste	2018-19	4,24,778		48,937	1,10,443	4,70,283					90		73,376				11,27,907	
		2019-20	3,00,769		52,924	1,70,218	5,33,243				5,887	31,748		16,909				11,11,698	
		2020-21	2,91,762		43,136	1,19,948	3,60,786					1,230		20,626				8,37,488	
4	E-Waste	2018-19				8,928	211										336	9,475	
		2019-20				2,095	14											2,109	
		2020-21				14,546												14,546	
5	Plastic Waste	2018-19	21,944		4,885	23,181	29,663				1,10,941		1,35,178			83,838		4,09,630	
		2019-20	23,482		5,579	17,981	21,372				1,08,700		96,043			1,70,567		4,43,724	
		2020-21	23,237		4,918	29,485	38,913				1,24,725		59,698			30,278		3,11,254	

Remarks: Others includes treatment of waste other than the treatments included above or those for which treatment mechanism is not available.

Year-wise Physical Supply Table for Solid Waste - Mizoram

Unit: Tonnes

S. No.	Generation of Solid Waste during the year								Total
	Waste Category	Year	Households	Industry	Hotels/ Shops/ Restaurants	Imports	Stock of last year waste	Others*	
1	Municipal Solid Waste	2018-19	64,238		27,530				91,768
		2019-20	88,963		38,127				1,27,090
		2020-21	88,268		37,829				1,26,097
2	Bio Medical Waste	2018-19		303					303
		2019-20		342					342
		2020-21		315					315
3	Hazardous Waste	2018-19							
		2019-20		20					20
		2020-21		51					51
4	E Waste	2018-19		25					25
		2019-20		3					3
		2020-21		19					19
5	Plastic Waste	2018-19	11		2				13
		2019-20	6,722		1,186				7,908
		2020-21	1,287		227				1,514

Remarks

* Others includes other industries and recovered residuals from the Environment.

(i) Solid Waste : Waste are collected from all premises without zoning.

(ii) E-waste : Data obtained from bulk consumers.

(iii) Bio Medical waste : Sources are different types of health care facilities.

(iv) Hazardous Waste : Data are obtained from annual returns submitted by HW generating units in the state.

Year-wise Physical Use Table for Solid Waste - Mizoram

Unit: Tonnes

S. No	Disposal and Treatment of Solid Waste														Total		
	Waste Category	Year	Landfill/Dumpsite		Incineration	Recycling	Reuse	Composting	Vemi-Composting	Biomethanation	Waste to Energy	Export	To the Environment	Stock of Waste at the end of year		Others*	
			Sanitary Landfill	Dumpsite													
1	Municipal Solid Waste	2018-19		67,105									13,998		10,665	91,768	
		2019-20		12,629										12,844		1,01,617	1,27,090
		2020-21	2,855	36,281								343		25,386		61,232	1,26,097
2	Bio Medical Waste	2018-19					55								248	303	
		2019-20			38		174								130	342	
		2020-21			25		151								139	315	
3	Hazardous Waste	2018-19															
		2019-20	1			19										20	
		2020-21	3			48										51	
4	E-Waste	2018-19				25										25	
		2019-20				3										3	
		2020-21				19										19	
5	Plastic Waste	2018-19		13												13	
		2019-20	395		395	7,118										7,908	
		2020-21	1		6	365						1,142				1,514	

Remarks

* Others includes treatment of waste other than the treatments included above or those for which treatment mechanism is not available.

(i) Municipal Solid Waste: Pig feeds, Reuse, Composting, Recycling and Material Recovery.

(ii) Bio Medical Waste: Incineration, deep burial pit, sharp pit, cytotoxic vials, ampules sent to CBMWTFs by AMC.

(iii) Plastic Waste 2019-20: Waste quantity higher due to collection of plastic wastes from waste dumped through a cleanliness programme organised by AMC.

Year-wise Physical Supply Table for Solid Waste - Rajasthan

Unit: Tonnes

S. No.	Generation of Solid Waste during the year									Total
	Waste Category	Year	Households	Industry	Hotels/ Shops/ Restaurants	Imports	From the Environment	Others*	Stock of last year solid waste	
1	Municipal Solid Waste	2018-19	18,13,747		6,04,582					24,18,329
		2019-20	18,24,574		6,08,191					24,32,765
		2020-21	18,88,098		6,29,366					25,17,464
2	Bio Medical Waste	2018-19		8,126						8,126
		2019-20		7,550						7,550
		2020-21		6,903						6,903
3	Hazardous Waste	2018-19		5,62,464		7,80,532			27,174	13,70,170
		2019-20		5,87,554		3,46,079			18,627	9,52,260
		2020-21		6,43,861		4,69,983			18,443	11,32,287
4	E Waste	2018-19		8,478						8,478
		2019-20		17,028						17,028
		2020-21		20,817						20,817

Remarks

* Others includes other industries and recovered residuals from the Environment.

(i) The Total Plastic waste generated by the State for the year 2018-19, 2019-20 and 2020-21 are 104704.38 TPA, 51966 TPA and 66324.57 TPA respectively, but the 'use side' information is not available with the sSatate.

Year-wise Physical Use Table for Solid Waste - Rajasthan

Unit: Tonnes

S. No	Disposal and Treatment of Solid Waste														Total	
	Waste Category	Year	Landfill/Dumpsite		Incineration	Recycling	Reuse	Composting	Vemi-Composting	Biomethanation	Waste to Energy	Export	To the Environment	Stock at the End of the year		Others*
			Sanitary Landfill	Dumpsite												
1	Municipal Solid Waste	2018-19	15,28,313			2,84,766							6,05,250			24,18,329
		2019-20	18,66,121			4,34,689							1,31,955			24,32,765
		2020-21	18,54,988			4,41,814							2,20,662			25,17,464
2	Bio Medical Waste	2018-19			6,173								1,953		0	8,126
		2019-20			5,957								794		799	7,550
		2020-21			5,651										1,252	6,903
3	Hazardous Waste	2018-19	6,83,408		1,198	90,930	66,272				4,97,991	11,744		18,627		13,70,170
		2019-20	5,07,578		1,552	97,922	35,149				2,84,387	7,229		18,443		9,52,260
		2020-21	1,82,097		1,737	1,25,127	2,05,700				5,39,720	7,092		70,814		11,32,287
4	E-Waste	2018-19				6,857									1,621	8,478
		2019-20				16,295									733	17,028
		2020-21				20,817										20,817

Remarks

* Others includes treatment of waste other than the treatments included above or those for which treatment mechanism is not available.

Year-wise Physical Supply Table for Solid Waste - Tamil Nadu

Unit: Tonnes

S. No.	Generation of Solid Waste during the year									Total
	Waste Category	Year	Households	Industry	Hotels/ Shops/ Restaurants	Imports	From the Environment	Others*	Stock of last year waste	
1	Municipal Solid Waste	2018-19	38,23,740		12,74,580					50,98,320
		2019-20	38,94,915		12,98,305					51,93,220
		2020-21	36,74,273		12,24,758					48,99,031
2	Bio Medical Waste	2018-19		17,227						17,227
		2019-20		21,269						21,269
		2020-21		12,873						12,873
3	Hazardous Waste	2018-19		9,29,250		94,006			2,94,466	13,17,722
		2019-20		9,64,811		64,794			2,75,910	13,05,515
		2020-21		7,91,031		46,566			2,35,356	10,72,953
4	E Waste	2018-19								
		2019-20	8,157	2,725						10,882
		2020-21	17,973	2,981						20,954
5	Plastic Waste	2018-19	2,60,709	1,40,382						4,01,091
		2019-20	2,80,457	1,51,015						4,31,472
		2020-21	2,79,570	1,50,537						4,30,107

Remarks

* Others includes other industries and recovered residuals from the Environment.

Year-wise Physical Use Table for Solid Waste - Tamil Nadu

Unit: Tonnes

S. No	Waste Category	Year	Disposal and Treatment of Solid Waste												Total	
			Landfill/Dumpsite		Incineration	Recycling	Reuse	Composting	Vemi-Composting	Biomethanation	Waste to Energy	Export	To the Environment	Stock at the end of year		Others*
			Sanitary Landfill	Dumpsite												
1	Municipal Solid Waste	2018-19	1,52,935	19,10,775				23,53,828	65,253	2,07,459			4,08,070		50,98,320	
		2019-20	1,82,815	22,86,410				21,65,417	60,030	1,90,853			3,07,695		51,93,220	
		2020-21	67,154	7,72,725				30,85,941	84,435	2,71,702			6,17,074		48,99,031	
2	Bio Medical Waste	2018-19			10,336		4,135							2,756	17,227	
		2019-20			12,761		5,105							3,403	21,269	
		2020-21			7,724		3,089							2,060	12,873	
3	Hazardous Waste	2018-19	1,07,271		6,345	1,24,781	6,71,053				1,32,362			2,75,910	13,17,722	
		2019-20	1,05,621		8,307	1,20,434	6,78,445				1,55,978	1,374		2,35,356	13,05,515	
		2020-21	88,405		5,406	85,276	4,81,167				1,68,738	8,605		2,35,356	10,72,953	
4	E-Waste	2018-19														
		2019-20				10,883									10,883	
		2020-21				20,954									20,954	
5	Plastic Waste	2018-19	66,086			2,60,807	54,144						20,054		4,01,091	
		2019-20	94,507			2,68,575	46,032						22,358		4,31,472	
		2020-21	48,056			2,95,482	71,200						15,369		4,30,107	

Remarks

* Others includes treatment of waste other than the treatments included above or those for which treatment mechanism is not available.

Global SDG Indicator 11.6.1: Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated

S. No.	Name of States/UTs	Total Municipal Solid Waste Generated (Tonnes)	Total Municipal Solid Waste Collected (Tonnes)	Total Municipal Solid Waste Managed in Controlled Facilities (Tonnes)	Total Municipal Solid Waste Collected (%)	Total Municipal Solid Waste Managed in Controlled Facilities
2020-2021						
1	Rajasthan	25,17,464	22,96,802	22,96,802	91.2	91.2
2	Gujarat	37,86,433	37,71,114	25,35,290	99.6	67.0
3	Maharashtra	82,60,939	82,43,306	59,90,183	99.8	72.5
4	Tamil Nadu	48,99,031	42,81,957	35,09,232	87.4	71.6
5	Chandigarh	1,87,245	1,87,245	1,87,245	100.0	100.0
6	Jammu & Kashmir	5,34,079	5,24,607	2,19,285	98.2	41.1
7	Mizoram	1,26,097	1,00,711	64,087	79.9	50.8
2019-2020						
1	Rajasthan	24,32,765	23,00,810	23,00,810	94.6	94.6
2	Gujarat	39,25,575	39,25,575	25,27,260	100.0	64.4
3	Maharashtra	83,75,019	82,79,320	58,53,600	98.9	69.9
4	Tamil Nadu	51,93,220	48,85,525	25,99,115	94.1	50.0
5	Chandigarh	1,64,250	1,64,250	1,64,250	100.0	100.0
6	Jammu & Kashmir	5,54,402	5,34,597	2,23,462	96.4	40.3
7	Mizoram	1,27,090	1,14,246	1,01,617	89.9	80.0
2018-19						
1	Rajasthan	24,18,329	18,13,079	18,13,079	75.0	75.0
2	Gujarat	39,11,340	39,11,340	23,99,510	100.0	61.3
3	Maharashtra	87,03,261	86,41,630	46,07,515	99.3	52.9
4	Tamil Nadu	50,98,320	46,90,250	27,79,475	92.0	54.5
5	Chandigarh	1,86,617	1,86,617	1,86,617	100.0	100.0
6	Jammu & Kashmir	5,58,643	5,30,293	1,77,648	94.9	31.8
7	Mizoram	91,768	77,770	10,656	84.7	11.6

Global SDG Indicator 12.4.2: (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment.

S. No.	Name of States/UTs	Total Hazardous Waste Generated (Tonnes)	Mid Year Projected Population	Total Hazardous Waste Treated by Type of Treatment (Tonnes)						Hazardous Waste Generated Per Capita (Tonnes)	Total Hazardous Waste Treated by Type of Treatment (%)					
				Sanitary Landfill	Incineration	Recycling	Reuse	Waste to Energy	Total		Sanitary Landfill	Incineration	Recycling	Reuse	Waste to Energy	Total
2020-21																
1	Rajasthan	11,32,287	7,88,61,000	1,82,097	1,737	1,25,127	2,05,700	5,39,720	10,54,381	1.436	16.1	0.2	11.1	18.2	47.7	93.1
2	Gujarat	39,10,007	6,94,02,000	11,90,707	1,40,321	1,96,750	2,20,363	8,00,024	25,48,165	5.634	30.5	3.6	5.0	5.6	20.5	65.2
3	Maharashtra	8,37,488	12,39,61,000	2,91,762	43,136	1,19,948	3,60,786		8,15,632	0.676	34.8	5.2	14.3	43.1		97.4
4	Tamil Nadu	10,72,953	7,62,25,000	88,405	5,406	85,276	4,81,167	1,68,738	8,28,992	1.408	8.2	0.5	7.9	44.8	15.7	77.3
5	Chandigarh	1,279	12,02,000							0.106						
6	Jammu & Kashmir	34,406	1,33,65,000			32,119			32,119	0.257			93.4			93.4
7	Mizoram	51	12,10,000	3		48			51	0.004	5.9		94.1			100.0
2019-2020																
1	Rajasthan	9,52,260	7,78,53,000	5,07,578	1,552	97,922	35,149	2,84,387	9,26,588	1.223	53.3	0.2	10.3	3.7	29.9	97.3
2	Gujarat	29,34,448	6,84,76,000	13,17,121	1,67,509	1,72,204	1,30,724	4,30,261	22,17,819	4.285	44.9	5.7	5.9	4.5	14.7	75.6
3	Maharashtra	11,11,698	12,28,19,000	3,00,769	52,924	1,70,218	5,33,243	5,887	10,63,041	0.905	27.1	4.8	15.3	48.0	0.5	95.6
4	Tamil Nadu	13,05,515	7,59,02,000	1,05,621	8,307	1,20,434	6,78,445	1,55,978	10,68,785	1.720	8.1	0.6	9.2	52.0	11.9	81.9
5	Chandigarh	2,727	11,87,000			602			602	0.230			22.1			22.1
6	Jammu & Kashmir	48,373	1,32,63,000		14	45,886			45,900	0.365		0.0	94.9			94.9
7	Mizoram	20	11,98,000	1		19			20		5.0		95.0			100.0
2018-19																
1	Rajasthan	13,70,170	7,68,44,000	6,83,408	1,198	90,930	66,272	4,97,991	13,39,799	1.783	49.9	0.1	6.6	4.8	36.3	97.8
2	Gujarat	33,73,813	6,75,50,000	11,73,063	1,52,629	1,61,782	7,94,245	4,80,163	27,61,882	4.995	34.8	4.5	4.8	23.5	14.2	81.9
3	Maharashtra	11,27,907	12,16,77,000	4,24,778	48,937	1,10,443	4,70,283		10,54,441	0.927	37.7	4.3	9.8	41.7		93.5
4	Tamil Nadu	13,17,722	7,55,48,000	1,07,271	6,345	1,24,781	6,71,053	1,32,362	10,41,812	1.744	8.1	0.5	9.5	50.9	10.0	79.1
5	Chandigarh	1,798	11,73,000							0.153						
6	Jammu & Kashmir	29,704	1,31,61,000		16	23,816			23,832	0.226		0.1	80.2			80.2
7	Mizoram		11,86,000													

Districtwise Estimates of Fish Provisioning Services - Bihar

Year: 2017-18

S. No.	Name of District	Number	Water Area (In ha.)	Reserved Deposit (In Lakh)	Reserved Deposit (In Rs)	Rent/Hectare (Rs / Hectare)
1	Patna	1,007	2,178.76	19.26	19,26,000	883.99
2	Bhojpur	683	1,463.75	21.19	21,19,000	1,447.65
3	Buxer	465	1,046.84	10.86	10,86,000	1,037.41
4	Rohtas	1,247	2,053.00	18.56	18,56,000	904.04
5	Kaimur	962	1,595.50	0.00	0	0.00
6	Nalanda	823	2,140.86	39.72	39,71,500	1,855.10
7	Gaya	1,057	1,405.69	8.75	8,74,500	622.11
8	Jahanabad	357	794.61	5.39	5,38,700	677.94
9	Arwal	195	172.00	2.80	2,80,000	1,627.91
10	Aurangabad	473	759.61	7.74	7,74,000	1,018.94
11	Nawada	436	769.11	12.95	12,95,000	1,683.76
12	Muzaffarpur	1,566	2,830.81	52.29	52,29,000	1,847.17
13	Vaishali	690	2,286.46	17.69	17,68,900	773.64
14	Sitamarhi	1,307	1,407.23	33.85	33,84,700	2,405.22
15	E. Champaran	1,242	3,748.80	58.73	58,73,300	1,566.71
16	W. Champaran	760	2,428.28	27.44	27,43,900	1,129.98
17	Shivar	109	196.91	1.87	1,87,000	949.67
18	Saran	983	986.06	16.48	16,48,000	1,671.30
19	Siwan	1,096	726.16	19.11	19,11,000	2,631.65
20	Gopalgang	862	829.26	11.40	11,40,000	1,374.72
21	Bhagalpur	817	1,581.53	28.84	28,84,000	1,823.55
22	Baka	845	1,351.63	11.19	11,19,000	827.89
23	Munger	204	1,300.68	11.04	11,03,700	848.56
24	Lakhisarai	262	638.06	7.89	7,88,500	1,235.78
25	Sheikhpura	170	850.69	15.28	15,28,400	1,796.66
26	Jamui	158	391.07	3.21	3,21,000	820.82
27	Khagaria	207	2,566.48	32.67	32,67,000	1,272.95
28	Bagusarai	304	1,611.29	28.53	28,53,200	1,770.76
29	Saharsa	215	531.01	21.44	21,44,000	4,037.59
30	Madhepura	170	221.22	12.49	12,49,000	5,645.96
31	Supaul	203	536.07	10.98	10,98,000	2,048.24
32	Katihar	868	3,797.24	61.29	61,29,000	1,614.07
33	Purnia	554	1,587.50	18.51	18,51,000	1,165.98
34	Araria	385	807.36	6.04	6,04,300	748.49
35	Kishanganj	276	1,347.09	8.55	8,55,000	634.70
36	Dharbhanga	2,370	3,460.38	125.34	1,25,34,000	3,622.15
37	Madhubani	4,864	4,031.64	156.98	1,56,98,000	3,893.70
38	Samastipur	1,192	2,016.47	58.29	58,29,000	2,890.70
Total		30,384	58,447.11	1,004.6	10,04,62,600	1,718.86

Source: Directorate of Fisheries, Government of Bihar

* Reserved deposit of any jalkar means 10-15% of total value of its annual production (in rupees).

Districtwise Estimates of Fish Provisioning Services - Bihar

Year: 2018-19

S. No.	Name of District	Number	Water Area (In ha.)	Reserved Deposit (In Lakh)	Reserved Deposit (In Rs)	Rent/Hectare (Rs / Hectare)
1	Patna	1,007	2,178.76	19.26	19,26,000	883.99
2	Bhojpur	683	1,213.97	21.19	21,19,000	1,745.51
3	Buxer	480	1,061.50	12.42	12,42,000	1,170.04
4	Rohtas	1,247	2,053.00	18.56	18,56,000	904.04
5	Kaimur	962	1,595.50	12.91	12,91,000	809.15
6	Nalanda	823	2,194.50	40.21	40,21,000	1,832.31
7	Gaya	1,070	1,431.84	9.84	9,84,400	687.51
8	Jahanabad	357	794.60	5.39	5,38,600	677.83
9	Arwal	195	172.00	2.80	2,80,000	1,627.91
10	Aurangabad	475	893.48	7.74	7,74,000	866.28
11	Nawada	436	769.11	12.95	12,95,000	1,683.76
12	Muzaffarpur	1,965	2,830.81	52.29	52,29,000	1,847.17
13	Vaishali	690	2,286.46	17.69	17,68,900	773.64
14	Sitamarhi	1,307	1,407.23	33.85	33,84,700	2,405.22
15	E. Champaran	1,244	3,748.80	58.89	58,89,000	1,570.90
16	W. Champaran	760	2,428.28	27.44	27,43,900	1,129.98
17	Shivar	109	196.91	2.33	2,33,000	1,183.28
18	Saran	983	986.06	16.48	16,48,000	1,671.30
19	Siwan	1,096	726.16	19.11	19,11,000	2,631.65
20	Gopalgang	866	829.26	11.40	11,40,000	1,374.72
21	Bhagalpur	818	1,581.53	33.77	33,77,000	2,135.27
22	Baka	845	1,351.63	11.19	11,19,000	827.89
23	Munger	204	1,300.48	10.84	10,84,000	833.54
24	Lakhisarai	262	638.06	7.89	7,88,500	1,235.78
25	Sheikhpura	170	760.62	13.94	13,93,500	1,832.06
26	Jamui	158	391.07	3.21	3,21,000	820.82
27	Khagaria	207	2,566.48	34.30	34,30,000	1,336.46
28	Bagusarai	304	1,611.29	29.46	29,45,500	1,828.04
29	Saharsa	232	561.47	23.15	23,15,000	4,123.11
30	Madhepura	167	222.84	12.46	12,46,000	5,591.36
31	Supaul	210	563.38	12.15	12,15,000	2,156.63
32	Katihar	936	4,529.32	61.29	61,29,000	1,353.18
33	Purnia	670	2,443.00	18.51	18,51,000	757.67
34	Araria	472	1,291.70	6.05	6,05,300	468.61
35	Kishangunj	281	1,347.09	9.09	9,09,000	674.79
36	Dharbhanga	2,370	3,460.38	125.34	1,25,34,000	3,622.15
37	Madhubani	4,864	4,031.64	154.98	1,54,98,000	3,844.09
38	Samastipur	1,195	2,030.47	61.65	61,65,100	3,036.29
Total		31,120	60,480.68	1,032.0	10,32,00,400	1,706.34

Source: Directorate of Fisheries, Government of Bihar

* Reserved deposit of any jalkar means 10-15% of total value of its annual production (in rupees).

Districtwise Estimates of Fish Provisioning Services - Bihar

Year: 2019-20

S. No.	Name of District	Number	Water Area (In ha.)	Reserved Deposit (In Lakh)	Reserved Deposit (In Rs)	Rent/Hectare (Rs / Hectare)
1	Patna	1,007	2,178.76	30.70	30,70,000	1,409.06
2	Bhojpur	684	1,213.97	29.42	29,42,000	2,423.45
3	Buxer	480	1,221.62	22.08	22,08,000	1,807.44
4	Rohtas	1,247	2,053.00	24.35	24,35,000	1,186.07
5	Kaimur	973	1,505.95	28.21	28,21,000	1,873.24
6	Nalanda	823	2,349.96	58.09	58,09,000	2,471.96
7	Gaya	1,071	1,437.80	15.88	15,87,900	1,104.40
8	Jahanabad	359	784.02	7.99	7,99,000	1,019.11
9	Arwal	195	119.61	6.76	6,75,900	5,650.87
10	Aurangabad	478	893.48	17.00	17,00,000	1,902.67
11	Nawada	496	786.77	23.20	23,20,000	2,948.77
12	Muzaffarpur	1,552	1,146.07	79.09	79,09,000	6,900.97
13	Vaishali	697	2,289.71	25.41	25,41,000	1,109.75
14	Sitamarhi	1,328	1,417.15	57.38	57,38,000	4,048.97
15	E. Champaran	1,244	3,748.80	119.16	1,19,16,000	3,178.62
16	W. Champaran	760	2,428.28	44.75	44,74,900	1,842.83
17	Shivar	109	279.13	3.93	3,93,000	1,407.95
18	Saran	988	406.23	29.44	29,44,000	7,247.13
19	Siwan	1,119	726.16	19.11	19,11,000	2,631.65
20	Gopalgang	866	829.26	11.40	11,40,000	1,374.72
21	Bhagalpur	830	1,489.90	44.00	44,00,000	2,953.22
22	Baka	847	1,356.69	22.64	22,63,700	1,668.55
23	Munger	205	1,300.48	10.84	10,84,000	833.54
24	Lakhisarai	262	1,617.53	15.47	15,47,000	956.40
25	Sheikhpura	195	860.39	20.92	20,92,100	2,431.57
26	Jamui	158	391.07	6.66	6,66,100	1,703.28
27	Khagaria	207	2,876.29	63.70	63,70,000	2,214.66
28	Bagusarai	310	1,611.29	48.65	48,65,400	3,019.57
29	Saharsa	232	562.61	28.37	28,36,600	5,041.86
30	Madhepura	168	254.07	22.77	22,77,000	8,962.10
31	Supaul	211	609.97	11.67	11,67,000	1,913.21
32	Katihar	936	4,529.32	93.25	93,25,000	2,058.81
33	Purnia	694	2,506.80	18.51	18,51,000	738.39
34	Araria	472	1,291.70	8.55	8,55,200	662.07
35	Kishanganj	281	1,347.09	11.23	11,23,000	833.65
36	Dharbhanga	2,376	3,686.11	164.44	1,64,44,000	4,461.07
37	Madhubani	4,864	4,031.64	154.98	1,54,98,000	3,844.09
38	Samastipur	1,194	2,030.47	74.38	74,38,000	3,663.19
Total		30,918	60,169.15	1,474.4	14,74,37,800	2,450.39

Source: Directorate of Fisheries, Government of Bihar

* Reserved deposit of any jalkar means 10-15% of total value of its annual production (in rupees).

Districtwise Estimates of Fish Provisioning Services - Bihar

Year: 2020-21

S. No.	Name of District	Number	Water Area (In ha.)	Reserved Deposit (In Lakh)	Reserved Deposit (In Rs)	Rent/Hectare (Rs / Hectare)
1	Patna	1,007	2,178.76	30.70	30,70,000	1,409.06
2	Bhojpur	684	1,213.97	29.42	29,42,000	2,423.45
3	Buxer	480	1,221.62	22.08	22,08,000	1,807.44
4	Rohtas	1,247	2,053.00	24.35	24,35,000	1,186.07
5	Kaimur	973	1,505.95	28.22	28,22,000	1,873.90
6	Nalanda	825	2,080.34	70.86	70,85,500	3,405.93
7	Gaya	1,073	1,440.80	15.88	15,87,900	1,102.10
8	Jahanabad	364	786.31	9.58	9,58,400	1,218.86
9	Arwal	195	175.93	6.76	6,75,900	3,841.87
10	Aurangabad	481	893.00	17.00	17,00,000	1,903.70
11	Nawada	496	786.77	23.20	23,20,000	2,948.77
12	Muzaffarpur	1,552	2,824.82	79.09	79,09,000	2,799.82
13	Vaishali	697	1,287.00	25.41	25,41,000	1,974.36
14	Sitamarhi	1,328	1,417.15	57.43	57,43,000	4,052.50
15	E. Champaran	1,243	3,763.87	118.92	1,18,92,400	3,159.62
16	W. Champaran	763	2,448.00	48.57	48,56,885	1,984.02
17	Shivar	109	279.13	8.93	8,93,000	3,199.23
18	Saran	989	406.63	29.44	29,44,370	7,240.91
19	Siwan	1,111	1,816.35	26.60	26,60,498	1,464.75
20	Gopalgang	870	829.26	15.86	15,85,550	1,912.01
21	Bhagalpur	831	1,491.20	44.02	44,02,000	2,951.98
22	Baka	847	1,356.69	22.68	22,68,200	1,671.86
23	Munger	205	1,300.48	10.84	10,84,000	833.54
24	Lakhisarai	262	1,617.53	15.65	15,65,000	967.52
25	Sheikhpura	196	860.39	20.92	20,92,100	2,431.57
26	Jamui	156	264.83	6.66	6,66,100	2,515.20
27	Khagaria	207	2,876.29	63.70	63,70,000	2,214.66
28	Bagusarai	310	1,611.29	48.65	48,65,400	3,019.57
29	Saharsa	245	569.85	29.27	29,26,600	5,135.70
30	Madhepura	169	254.90	22.77	22,77,053	8,933.12
31	Supaul	211	612.26	11.77	11,77,000	1,922.39
32	Katihar	943	4,579.69	93.25	93,25,000	2,036.16
33	Purnia	694	2,506.80	23.95	23,95,000	955.40
34	Araria	472	1,291.70	9.77	9,77,000	756.37
35	Kishanganj	244	821.07	11.39	11,39,000	1,387.21
36	Dharbhanga	2,381	4,189.59	176.70	1,76,69,800	4,217.55
37	Madhubani	4,765	1,846.04	230.77	2,30,77,000	12,500.81
38	Samastipur	1,254	3,009.72	74.35	74,35,300	2,470.43
Total		30,879	60,468.98	1,605.4	16,05,41,956	2,654.95

Source: Directorate of Fisheries, Government of Bihar

* Reserved deposit of any jalkar means 10-15% of total value of its annual production (in rupees).

Districtwise Estimates of Fish Provisioning Services - Bihar

Year: 2021-22

S. No.	Name of District	Number	Water Area (In ha.)	Reserved Deposit (In Lakh)	Reserved Deposit (In Rs)	Rent/Hectare (Rs / Hectare)
1	Patna	1,008	2,158.97	30.96	30,96,325	1,434.17
2	Bhojpur	682	1,212.30	29.42	29,42,000	2,426.79
3	Buxer	480	1,221.62	22.08	22,08,000	1,807.44
4	Rohtas	1,247	2,053.00	24.35	24,35,000	1,186.07
5	Kaimur	976	1,518.68	28.81	28,81,000	1,897.04
6	Nalanda	825	2,080.34	70.855	70,85,537	3,405.95
7	Gaya	1,072	1,440.80	16.14	16,13,900	1,120.14
8	Jahanabad	365	800.03	9.41	9,41,000	1,176.21
9	Arwal	195	175.93	6.76	6,75,920	3,841.98
10	Aurangabad	481	894.76	17.18	17,18,200	1,920.29
11	Nawada	496	786.77	23.20	23,20,000	2,948.77
12	Muzaffarpur	1,552	2,824.82	79.09	79,09,000	2,799.82
13	Vaishali	697	1,287.00	25.41	25,41,000	1,974.36
14	Sitamarhi	1,328	1,417.15	57.43	57,43,000	4,052.50
15	E. Champaran	1,243	3,763.87	118.92	1,18,92,400	3,159.62
16	W. Champaran	763	2,448.00	48.57	48,56,885	1,984.02
17	Shivar	109	279.13	8.93	8,93,000	3,199.23
18	Saran	989	406.63	29.4437	29,44,370	7,240.91
19	Siwan	1,123	1,816.35	26.605	26,60,500	1,464.75
20	Gopalgang	919	836.00	16.98	16,98,000	2,031.10
21	Bhagalpur	831	1,491.20	44.02	44,02,000	2,951.98
22	Baka	847	1,356.69	22.682	22,68,200	1,671.86
23	Munger	205	1,300.48	9.67	9,67,000	743.57
24	Lakhisarai	262	647.06	15.6541	15,65,410	2,419.25
25	Sheikhpura	196	344.16	20.92	20,92,100	6,078.86
26	Jamui	156	264.83	6.66	6,66,100	2,515.20
27	Khagaria	207	2,876.29	63.70	63,70,000	2,214.66
28	Bagusarai	311	1,611.89	48.68	48,68,400	3,020.31
29	Saharsa	248	571.64	29.48	29,47,600	5,156.37
30	Madhepura	169	254.90	22.77	22,77,053	8,933.12
31	Supaul	211	612.26	11.77	11,77,000	1,922.39
32	Katihar	877	3,797.24	93.25	93,25,000	2,455.73
33	Purnia	577	1,651.20	23.95	23,95,000	1,450.46
34	Araria	389	812.31	9.86	9,86,000	1,213.82
35	Kishanganj	244	821.07	11.39	11,39,000	1,387.21
36	Dharbhanga	2,381	4,189.59	176.70	1,76,69,800	4,217.55
37	Madhubani	4,765	1,846.04	230.77	2,30,77,000	12,500.83
38	Samastipur	1,254	3,009.72	74.79	74,79,200	2,485.02
Total		30,680	56,880.72	1,607.3	16,07,26,900	2,825.68

Source: Directorate of Fisheries, Government of Bihar

* Reserved deposit of any jalkar means 10-15% of total value of its annual production (in rupees).

District wise Estimates of Fish Provisioning Services - Tamil Nadu

Year: 2016-17

Area in Hectare

S. No.	District	Small reservoir		Medium reservoir		Major reservoir		Total Resource Area		Rent/Lease Amount	Rent/Hectare
		No	Area	No	Area	No	Area	No	Area	(Rs.)	(Rs/Hectare)
1	Coimbatore	1	646					1	646	38,46,348	5,954
2	Tiruppur	2	1,298					2	1,298	60,80,413	10,551
3	Dindigul	7	1,574					7	1,574	81,51,264	5,179
4	Erode	5	1,234			1	7,720	6	8,954	2,53,26,260	2,828
5	Thiruvallur			1	3,263			1	3,263		
6	Kancheepuram	1	700					1	700	83,650	120
7	Vellore	2	144					2	144	2,12,960	1,483
8	Villupuram	3	1,926					3	1,926	23,28,524	1,209
9	Cuddalore	1	834			1	6,100	2	6,934	7,34,500	106
10	Dharmapuri	8	1,343					8	1,343	2,28,94,222	17,047
11	Krishnagiri	2	882	1	1,248			3	2,130	1,79,73,824	8,438
12	Salem	2	176			1	15,346	3	15,522	26,39,675	170
13	Trichy	2	138					2	138		
14	Madurai	1	90					1	90		
15	Theni	2	231	1	2,590			3	2,821	10,00,070	355
16	Viruthunagar	4	946					4	946	56,00,050	5,920
17	Thirunelveli	7	1,475					7	1,475	5,62,198	381
18	Kaniyakumari	2	1,669	1	1,515			3	3,184	33,92,840	1,066
	Total	52	15,306	4	8,616	3	29,166	59	53,088	10,08,26,798	1,899

Source: Department of Fisheries and Fishermen Welfare, Government of Tamil Nadu

District wise Estimates of Fish Provisioning Services - Tamil Nadu

Year: 2017-18

Area in Hectare

S.No.	District	Small reservoir		Medium reservoir		Major reservoir		Total Resource Area		Rent/Lease Amount	Rent/Hectare
		No	Area	No	Area	No	Area	No	Area	(Rs.)	(Rs/Hectare)
1	Tiruppur	2	1,298					2	1,298	66,90,640	5,155
2	Dindigul	7	1,574					7	1,574	51,17,934	3,252
3	Erode	5	1,234			1	7,720	6	8,954	2,55,59,607	2,855
4	Thiruvallur			1	3,263			1	3,263		
5	Kancheepuram	1	700					1	700	1,76,790	253
6	Vellore	2	144					2	144	2,34,256	1,631
7	Villupuram	3	1,926					3	1,926	18,89,377	981
8	Cuddalore	1	834			1	6,100	2	6,934	8,17,455	118
9	Dharmapuri	8	1,343					8	1,343	2,35,72,144	17,552
10	Krishnagiri	2	882	1	1,248			3	2,130	1,97,71,206	9,282
11	Salem	2	176			1	15,346	3	15,522	23,74,555	153
12	Trichy	2	138					2	138		
13	Madurai	1	90					1	90		
14	Theni	2	231	1	2,590			3	2,821	10,99,750	390
15	Viruthunagar	4	946					4	946	49,09,268	5,190
16	Thirunelveli	7	1,475					7	1,475	7,00,513	475
17	Kanyakumari	2	1,669	1	1,515			3	3,184		
	Total	51	14,660	4	8,616	3	29,166	58	52,442	9,29,13,495	1,772

Source: Department of Fisheries and Fishermen Welfare, Government of Tamil Nadu

District wise Estimates of Fish Provisioning Services - Tamil Nadu

Year: 2018-19

Area in Hectare

S.No.	District	Small reservoir		Medium reservoir		Major reservoir		Total Resource Area		Rent/Lease Amount	Rent/Hectare
		No	Area	No	Area	No	Area	No	Area	(Rs.)	(Rs/Hectare)
1	Coimbatore	1	646					1	646	15,94,521	2,468
2	Tiruppur	2	1,298					2	1,298	53,91,767	4,154
3	Dindigul	7	1,574					7	1,574	70,00,344	4,447
4	Erode	5	1,234			1	7,720	6	8,954	1,64,72,480	1,840
5	Thiruvallur			1	3,263			1	3,263	9,70,800	298
6	Kancheepuram	1	700					1	700	2,20,350	315
7	Vellore	2	144	1	2,000			3	2,144	59,57,682	2,779
8	Villupuram	3	1,926					3	1,926		
9	Cuddalore	1	834			1	6,100	2	6,934	71,275	10
10	Dharmapuri	8	1,343					8	1,343	2,72,04,358	20,256
11	Krishnagiri	2	882	1	1,248			3	2,130	4,00,04,100	18,781
12	Salem	2	176			1	15,346	3	15,522	24,68,305	159
13	Trichy	2	138					2	138		
14	Madurai	1	90					1	90		
15	Theni	2	231	1	2,590			3	2,821	12,10,180	429
16	Viruthunagar	4	946					4	946	50,97,800	5,389
17	Thirunelveli	7	1,475					7	1,475	1,04,464	71
18	Kaniyakumari	2	1,669	1	1,515			3	3,184	19,10,437	600
	Total	52	15,306	5	10,616	3	29,166	60	55,088	11,56,78,863	2,100

Source: Department of Fisheries and Fishermen Welfare, Government of Tamil Nadu

District wise Estimates of Fish Provisioning Services - Tamil Nadu

Year: 2019-20

Area in Hectare

S.No.	District	Small reservoir		Medium reservoir		Major reservoir		Total Resource Area		Rent/Lease Amount	Rent/Hectare
		No	Area	No	Area	No	Area	No	Area	(Rs.)	(Rs/Hectare)
1	Coimbatore	1	646					1	646	31,59,452	4,891
2	Tiruppur	2	1,298					2	1,298	67,77,819	5,222
3	Dindigul	7	1,574					7	1,574	61,07,365	3,880
4	Erode	6	1,297			1	7,720	7	9,017	1,88,80,815	2,094
5	Thiruvallur			1	3,263			1	3,263	7,93,800	243
6	Kancheepuram	1	700					1	700	2,04,000	291
7	Vellore	2	144					2	144		
8	Vellore	2	144	1	2,000			3	2,144	62,70,000	2,925
9	Villupuram	3	1,926					3	1,926		
10	Cuddalore	1	834			1	6,100	2	6,934	50,400	7
11	Dharmapuri	8	1,343					8	1,343	30,29,277	2,256
12	Krishnagiri	2	882	1	1,248			3	2,130	4,45,66,566	20,923
13	Salem	2	176			1	15,346	3	15,522	40,87,503	263
14	Trichy	2	138					2	138		
15	Madurai	1	90					1	90		
16	Theni	2	231	1	2,590			3	2,821	10,70,124	379
17	Viruthunagar	4	946					4	946		
18	Thirunelveli	7	1,475					7	1,475	1,14,932	78
19	Kaniyakumari	2	1,669	1	1,515			3	3,184	8,91,000	280
	Total	55	15,512	5	10,616	3	29,166	63	55,294	9,60,03,053	1,736

Source: Department of Fisheries and Fishermen Welfare, Government of Tamil Nadu

District wise Estimates of Fish Provisioning Services - Tamil Nadu

Year: 2020-21

Area in Hectare

S. No.	District	Small reservoir		Medium reservoir		Major reservoir		Total Resource Area		Rent/Lease Amount	Rent/Hectare
		No	Area	No	Area	No	Area	No	Area	(Rs.)	(Rs/Hectare)
1	Coimbatore	1	646					1	646	34,75,397	5,380
2	Tiruppur	2	1,298					2	1,298	75,23,637	5,796
3	Dindigul	7	1,574					7	1,574	86,04,403	5,467
4	Erode	6	1,297			1	7,720	7	9,017	2,39,26,537	2,653
5	Thiruvallur			1	3,263			1	3,263	7,89,600	242
6	Kancheepuram	1	700					1	700	91,000	130
7	Vellore	2	144	1	2,000			3	2,144	72,87,880	3,400
8	Villupuram	3	1,926					3	1,926	4,76,900	248
9	Cuddalore	1	834			1	6,100	2	6,934	8,54,525	123
10	Dharmapuri	8	1,343					8	1,343	1,95,77,000	14,577
11	Krishnagiri	2	882	1	1,248			3	2,130	4,47,74,961	21,021
12	Salem	2	176			1	15,346	3	15,522	2,25,64,878	1,454
13	Trichy	2	138					2	138		
14	Madurai	1	90					1	90		
15	Theni	2	231	1	2,590			3	2,821	13,21,136	468
16	Viruthunagar	4	946					4	946	8,17,400	864
17	Thirunelveli	7	1,475					7	1,475	4,24,210	288
18	Kanyakumari	2	1,669	1	1,515			3	3,184	9,80,100	308
	Total	53	15,369	5	10,616	3	29,166	61	55,151	14,34,89,564	2,602

Source: Department of Fisheries and Fishermen Welfare, Government of Tamil Nadu

**Note on the Conceptual Differences in the Definition of “Forests” across India’s
Official Data Sources**

1. The terms ‘Forest Cover’ and ‘Forest Area’ are the two most commonly used terms to describe the extent of the forest. Both the terms, ‘Forest Cover’ and ‘Forest Area’ denote extent of the forests with different meanings. The term ‘Forest Cover’ is used to define the expanse of forest resources in a region primarily based on the tree canopy density, while the term ‘Forest Area’ is used to denote the areas having legal standing, i.e., recorded as forests in government records or maintained as forests. In addition, there exists a variation in the definition followed by different Indian official agencies in the measurement and description of forests. These differences have been elucidated in the following paragraphs.

Forest Cover

2. Definition of ‘Forest Cover’ as followed by the Forest Survey of India (FSI)¹: It includes all lands having trees more than one hectare in area with tree canopy density of more than 10 % irrespective of ownership, legal status of the land and species composition of trees. The assessment of the ‘Forest Cover’ includes tree orchards, bamboos, palms etc. within recorded forests, on other government lands, private, community or institutional lands.

3. Forest cover is classified by FSI in terms of canopy density classes as follows:

Class	Description
Very Dense Forest	All lands with tree canopy density of 70% and above
Moderately Dense Forest	All lands with tree canopy density of 40 % and more but less than 70%
Open Forest	All lands with tree canopy density of 10% and more but less than 40%
Scrub	Forest lands with canopy density less than 10%
Non-Forest	Lands not included in any of the above classes. (includes water)

4. Definition of ‘Forest Cover’ as followed by Indian Space Research Organization (ISRO), National Remote Sensing Centre (NRSC)²: The category, Forest, in the Land

¹ <https://fsi.nic.in/isfr19/vol1/chapter2.pdf>

² <https://bhuvan-app1.nrsc.gov.in/2dresources/thematic/2LULC/lulc1112.pdf>

Use Land Cover (LULC) mapping on 1:50,000 scale project is adopted mainly from the UN-FAO definition of forests and includes all patches with canopy density of more than 10% greater than 0.5 hectares in size, which are not categorized under any other predominant land use. Thus, forests are determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 m. The 'Forest' definition does not include trees/woody vegetation under orchards/plantation crops. The definition was standardized to become amenable for delineation of forest cover class by using Remote Sensing data as part of the Land Use/Land Cover Classification system adopted. Forests are further categorized in the LULC as:

- (i) Evergreen/Semi-evergreen Forests
- (ii) Deciduous Forests
- (iii) Forest Plantation
- (iv) Scrub Forests
- (v) Littoral/ Swamp/Mangrove Forests

Forest Area

5. Definition of 'Forest' in Land Use Statistics (LUS)³: The Ministry of Agriculture and Farmer's Welfare (MoAFW) compiles and releases Land Use Statistics according to a nine- fold classification. In this dataset, 'Forest' includes all land classified either as forest under any legal enactment, or administered as forest, whether State-owned or private, and whether wooded or maintained as potential forest land. The area of crops raised in the forest and grazing lands or areas open for grazing within the forests remain included under the 'Forest Area'.

6. 'Recorded Forest Area'⁴, defined by Forest Survey of India (FSI): It is defined as "all such lands which have been notified as forest under any Government Act or Rules or recorded as 'forests' in the Government Records". Recorded forest areas largely consist of areas designated as Reserved Forest (RF) or Protected Forests (PF) under the provisions of Indian Forest Act, 1927 or its counterpart State Acts. Besides these, the recorded forest area may include all such areas, which have been recorded as forests under any State Act or local laws or any revenue records.

³ https://eands.dacnet.nic.in/LUS_2013-14/Covrpage.pdf

⁴ <https://fsi.nic.in/isfr19/vol1/chapter1.pdf>

7. In terms of globally accepted standards, the extent of forests is denoted by 'Forest Area' by the Food and Agriculture Organization (FAO)⁵. It is defined as "land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ." It does not include land that is predominantly under agricultural or urban land use.

⁵ <http://www.fao.org/3/am665e/am665e.pdf>



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