Annexure 1

Scope, assumptions and limitations

S. No.	Value chain	Scope	Assumptions			Limitations/risks
			Jobs	Market opportunity (MO)	Investment opportunity (IO)	
Energy transition						
1	Utility-scale solar deployment	The scope includes only deployment, which entails the phases of business development, design and preconstruction, construction and commissioning, and operations and maintenance.	Only deployment jobs are considered.	1. GCAM data used (Das et al. 2025). 2. Lowest current tariff assured (2025).	Covers capital expenditure costs only.	Current prices for the market opportunity, only capital expenditure for investment; job numbers do not consider a declining factor.
2	Onshore wind deployment	The scope includes only deployment, which entails the phases of business development, design and preconstruction, construction, commissioning, operations and maintenance.	Only deployment jobs are considered.	1. GCAM data used (Das et al. 2025). 2. Lowest current tariff (2025).	Covers capital expenditure costs only.	Current prices for the market opportunity, only capital expenditure for investment; job numbers do not consider a declining factor.
3	Small hydropower deployment	The scope includes only deployment, which entails the phases of business development, design and preconstruction,	Only deployment jobs are considered.	1. We reach full deployment capacity by 2047. 2. Lowest current tariff.	Covers capital expenditure costs only.	Current prices for the market opportunity, only capital expenditure for investment; job numbers do not consider a declining factor.

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			Jobs	Market opportunity (MO)	Investment opportunity (IO)	
		construction, commissioning, operations and maintenance.				
4	Biomass to power	The scope includes only deployment, which entails the phases of business development, design and preconstruction, construction, commissioning, operations and maintenance.	Includes deployment and collection jobs.	1. GCAM (Das et al. 2025). projected a higher installed capacity for biomass compared to the available biomass residue. Thus, GCAM was not used here. The technical potential (the total biomass residue) is the potential in 2047 here. 2. Market sizing: Biomass surplus residue for power generation is given last priority compared to other uses. Biomass required for co-firing and existing biomass to power plants has been excluded from the biomass surplus, ensuring only leftover biomass is used for power generation. Tariff is based on news reports.	Covers capital expenditure costs only.	Biomass seems critical at this juncture, but given some level of pollution, it may be phased out, with biomass residue being used for other purposes.
5	Floating solar photovoltaic	The scope includes only deployment, which entails the phases of business development,	Only deployment jobs are considered.	1. World Bank report used to develop 2047 projections. 2. Lowest current tariff used.	Only capital expenditure costs only.	Current prices for the market opportunity, only capital expenditure for investment; job numbers do not consider a declining factor.

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			Jobs	Market opportunity (MO)	Investment opportunity (IO)	
		design and preconstruction, construction, commissioning, operations and maintenance.				
6	Pumped storage hydropower deployment	The scope includes only deployment, which entails the phases of business development, design and preconstruction, construction, commissioning, operations and maintenance.	Only deployment jobs covered.	1. National Framework for Energy Storage used to develop 2047 projections. 2. Lowest current tariff.	Covers only capital expenditure costs.	Current prices for the market opportunity, only capital expenditure for investment; job numbers do not consider a declining factor.
7	Rooftop solar	The scope includes only deployment, which entails the phases of business development, design and preconstruction, construction, commissioning, operations and maintenance.	Only deployment jobs are considered.	1. GCAM (Das et al. 2025) numbers for the short term didn't match the actual trajectory after the introduction of Suryaghar. The trajectory was developed assuming we reach the target of 40 GW by 2026 for RTS, after which exponential forecasting is used until 2047. The numbers we got for 2047 closely matched GCAM numbers.	Costs used are as per MNRE benchmarks.	Current prices for the market opportunity, only capital expenditure for investment; job numbers do not consider a declining factor.

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			Jobs	Market opportunity (MO)	Investment opportunity (IO)	
				2. Using a 40 GW target by 2026, exponential forecasting is used to project growth till 2047. To derive the price to calculate MO, the average billing rate is used.		
8	Deployment of battery energy storage systems (BESS)	The scope includes only deployment, which entails the phases of business development, design and preconstruction, construction, commissioning, operations and maintenance.	Only deployment jobs are considered.	The market is assumed to be the target as per the policy framework for energy storage. National Framework for Energy Storage. To calculate the market opportunity for BESS, the tariff from 125 MW/ 500 MWh KSEBL, at INR 4.41 lacs/MW/month, has been calculated.	The capex costs for BESS have been adapted from Aggarwal et al, 2025 at 112 USD/kWh (Aggarwal et al, 2025, Supporting document, pg. 10).	Falling battery prices may lower tariffs over the years.
9	Offshore wind deployment	The scope includes only deployment, which entails the phases of business development, design and preconstruction, construction, commissioning, operations and maintenance.	Only deployment jobs are considered.	1. Current bidding trajectory used to develop the rate of deployment. Bidding strategy is as per MNRE's strategy paper. 2. Expected current tariff, given that there are no operational capacities as of today.	Coveres capital expenditure costs only.	Current prices for the market opportunity, only capital expenditure for investment; job numbers do not consider a declining factor.
10	Decentralised renewable	Includes 14 DRE livelihood technologies:	1. Technologies will be manufactured and deployed in	1. CAGR for each of the 14 technologies: Calculated	Capital expenditure cost of 2024.	Current prices for the market opportunity, only capital expenditure

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			Jobs	Market opportunity (MO)	Investment opportunity (IO)	
	energy (DRE) based livelihood technologies	bulk milk chillers, solar cold storages, solar dryers, solar grain-milling machines, solar looms, solar refrigerators, micro food-processing machines, vertical fodder units, solar silk-reeling machines, solar charkhas, micro solar pumps, higher HP pumps, solar sewing machines, and solar aerators. Jobs are estimated in the following activities: design of the applications, procurement and assembly of components, testing and packaging of the product, installation, maintenance and corporate functions such as administration, marketing, etc.	India. 2. Jobs created in the post-deployment/adoption activities, such as value addition through processing, etc., have not been accounted for. 3. The FTE coefficients derived during the first phase of this study (done for Odisha) have been used.	using the total market potential in the country for each technology as per the CEEW 2023 report, to arrive at ambitious projections till 2047. 2. Current deployment numbers for solar aerators and sewing machines: Proxy used (0.01276): proportion of current deployment to the total market potential of all DRE technologies in the country divided by two. We assume that the government push and market demand for aerators and sewing machines is half of that for solar pumps. 3. Market opportunity is estimated at current prices (2024)		for investment; job numbers do not consider a declining factor.
11	Wind turbine manufacturing	The wind value chain consists of several segments: 1) mining, raw materials extraction and processing, 2) component manufacturing, 3)	Only manufacturing jobs are included.	1. Based on GCAM (additional manufacturing required to meet additional solar capacity in 2047). 2. The market is the	Covers only capital expenditure costs.	Current prices for market opportunity; only capital expenditure for investment; job numbers do not consider a declining factor.

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			Jobs	Market opportunity (MO)	Investment opportunity (IO)	
		deployment, and 4) end-of-life cycle management. In this report, the manufacturing process of the wind value chain is covered. For wind components, the scoping includes wind turbine manufacturing, and manufacturing of components like blades, tower, nacelle and monitoring and control system.		investment of wind farms in wind turbines.		
12	Manufacturing of solar PV modules	Establishing manufacturing facilities that assemble solar cells together to produce solar modules.	Only module manufacturing jobs.	1. Based on GCAM (Das et al. 2025). (additional manufacturing required to meet additional wind capacity in 2047). 2. Assuming that 100 per cent of total domestic demand is met by domestic module manufacturing and that annual domestic demand in 2047 will be 116 GW as per the GCAM model.	The investment required for nameplate module manufacturing capacity addition is INR 250 crore per GW.	Market opportunity estimated at current market prices.
13	Battery manufacturing	Consists of electrode coating, cell assembly and battery pack	Only direct jobs for high-automation manufacturing.	1. Based on batteries required for BESS and for EVs in 2047.	Building and land costs are 1000 USD/sq metre.	Market opportunity estimated at current market prices. Here, market opportunity is the actual

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		assembly.		2. Battery prices are according to 2024 values; the market opportunity is the value of the expected output from manufacturers and not the market demand.		manufacturing capacity multiplied by battery prices, but the actual demand is higher; only land, building and equipment are considered for investment; jobs consider a high automation scenario and not current automation levels.
14	AgriPV		Only direct jobs under different project stages are considered.	1. NITI Aayog's IESS model level-03 was used, as well as the GIZ and CSTEP report on agri PV potential. 2. Recently discovered tariff from the SERCs tariff order.	1. Total capital expenditure from the recent tariff order of the states. 2. Land costs are not considered in the investment	All the calculations are done based on the assumption that 50 per cent of the projected agriculture demand will be solarised by 2047. Current discovered tariff for the market opportunity, which may change with falling module prices.
15	Electrolyser manufacturing and green hydrogen deployment	The analysis covers electrolyser manufacturing and green hydrogen deployment, but does not include the RE required for the same.	Based on interviews with Indian electrolyser manufacturers, we consider an employment coefficient of 283 FTEs/GW of annual electrolyser output.	1. Based on the NITI Aayog report. 2. Market potential in electrolyser manufacturing is estimated as the product of production volume and the electrolyser price, accounting for margins and exports.	The investment required for electrolyser manufacturing is USD 182 million per GW. Investment for GH2 deployment is based on the following cost trajectory of alkaline electrolysers: - 2030: USD 625 per kW - 2040: USD 450 per kW - 2050: USD 200 per kW.	The sector is not yet mature, thus all quantitative indicators - jobs, market and investment may change as the sector matures.

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			Jobs	**Market opportunity (MO)**	**Investment opportunity (IO)**	
16	Manufacturing of electric vehicles	The manufacturing FTE jobs incorporate replaced (from ICE) and additional EV manufacturing jobs using the per vehicle job coefficients obtained from the NCAER study on automotive sector employment.	Manufacturing jobs: For the estimation of job opportunity in the mobility sector across different segments, the direct manufacturing jobs per vehicle coefficients are adopted from the March 2022 report by NCAER and SIAM (Bhandari et al. 2022). As the current facilities are doubling to provide both ICE and E-vehicles, and EV manufacturing in India remains at a nascent stage, we assume the job intensity for EV and ICE vehicles to be the same.	1. The Transportation Fuel Forecasting model (TFFM) was used. 2. The prices of models are averaged to determine the price of a certain vehicle segment.	For calculating investment opportunities in different EV segments, the methodology from the CEF December 2020 report on "Financing India's Transition to Electric Vehicles" (Singh et al. 2020) is applied. We calculate the cost of manufacturing segment-wise EVs across the years as an Investment opportunity. We have assumed the cost of vehicle manufacturing to be a portion of the battery costs and have assumed an annual learning rate of 2 per cent (for a decade till 2035) against enhanced manufacturing efficiencies.	- Limitation in terms of EV manufacturing-specific job coefficient, as most of the big OEMs manufacture all fuel-type vehicles in the same manufacturing unit. - Unmatured EV market. - Limited data in public for jobs in the 4W manufacturing segments.
Circular economy						
17	Electrical and electronic equipment waste (e-waste) recycling	Eleven identified categories of electronics through stakeholder consultations have been studied. E-waste generated from the sale of these 11 categories has been estimated.	1. Only recycling jobs have been calculated. 2. Does not consider any reduction in employment due to increased automation of various recycling operations. 3. The FTE coefficient derived during the first phase of this study (done for Odisha) has been used.	The average of the last five years' prices for recovered materials has been used. Where such data was not available, 2024 prices are used.	Costs per tonne have been kept constant till 2047.	Automation has not been accounted for. Waste generated from only selected categories has been calculated. Several factors, as mentioned under assumptions, have been kept constant till 2047: - employment factor - prices of recovered materials.

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			Jobs	Market opportunity (MO)	Investment opportunity (IO)	
18	Plastic waste recycling	Recycling: Procurement, unloading and storage of waste, its recycling, extrusion and pelletisation.	Does not consider any reduction in employment due to increased automation or scaling, or the efficiency of various recycling operations.	Plastic consumption continues at the same rate, and towards the same sectors till 2047. The BAU scenario assumes the current recycling rate to be the same till 2047. For an ambitious scenario, flexible packaging consumption reduces by 20 per cent from 2025 onwards, assuming that the single-use plastic ban is completely enforced. For the ambitious scenario, the recycling rates reach 90 per cent by 2047 for all plastic categories except MLP, which reaches 60 per cent due to its comparably lesser recyclability. All the recycled plastic will be sold in the market. The prices of recycled plastic have been kept constant till 2047.	Machinery costs per tonne have been kept constant till 2047. Additionally, land lease rates have been considered.	Automation has not been accounted for. Several factors, as mentioned under assumptions, have been kept constant till 2047: - employment factor - prices of recycled plastic.
19	Resource recovery from the organic fraction of	Only focusing on the organic fraction of municipal solid waste.	Only direct jobs from compositing & Bio-CNG operations have been considered. - As per CPCB,	OFMSW is processed for composting through Windrow composting, and revenue is calculated for	1) There are many methods to treat organic waste. For this study, the following technologies are considered: vermi-composting, CBG	1) Inflation is not considered. 2) Direct employment is created across all stages of a value chain.

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	municipal solid waste (OFMSW)	Processing of wet waste at the facility, which includes the operation and maintenance of the plant, producing the compost and Bio-CNG. Market calculations are for the sale of compost, Fermented Organic Manure (FOM) and Bio-CNG.	waste treated is considered 50 per cent. It is assumed that, between the two processing methods—centralised and decentralised—80 per cent of the operations will be centralised and 20 per cent decentralised.	compost as a product. Similarly, the total biogas production from OFMSW is considered through the CBG plant, and revenue is calculated for Biogas converted into BioCNG as a product.	plant and windrow composting. 2) The plant or setup life span is different for each of the three treatment techniques, as the life span depends on multiple factors like machinery durability, wear and tear and operational efficiency. 3) Since the scenarios focus on a shift towards centralised waste processing by 2047, the study assumes an average lifespan of 22 years. This means a full renewal of capital investment for processing and treatment setup will be required every 22 years.	3) Primary products considered: Bio-CNG and compost are used as the main output streams for evaluating investment, market opportunity, and job creation. 4) Different end-use economics: The cost and value of products vary depending on where and how they are used, so different economic contexts are factored into the assessment. 5) Rationale for chosen ratio: Among the 10 scenarios, the selected one offers a market opportunity higher than the required investment while avoiding scenarios with the lowest job creation, striking a balance between feasibility and impact. 6) The calculations for investment opportunity and market opportunity assessment are limited to the setting up of the CBG plants. Other components, such as infrastructure for electricity generation, an integrated waste management system, and the sale of biofertiliser,

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						have not been factored into the estimates.
20	End-of-life vehicle (ELV) waste management	Scrapping operations, which include the collection and transportation of ELVs to registered vehicle scrapping facilities (RVSFs), their storage and sorting, dismantling, and deep dismantling.	Does not consider any reduction in employment due to increased automation or scaling, or the efficiency of various recycling operations. Job scope includes collection, storage, dismantling and deep dismantling.	The recovery of steel and aluminium has only been considered. The average weight of each type of vehicle is calculated, excluding the fuel and battery weight. Average prices of scrap steel and aluminium for the year 2024 have been used.	Investment for a registered vehicle scrapping facility is only included with land costs.	Automation has not been accounted for. Only the recovery of steel and aluminium has been considered Several factors, as mentioned under assumptions, have been kept constant till 2047: - employment factor - prices of recycled plastic.
21	Lithium-ion battery waste recycling	Partial transportation to the recycling facilities, sorting, testing and discharging, recycling (dismantling and physical separation) and refining undertaken at the recycling facility.	Does not consider any reduction in employment due to increased automation or scaling, or the efficiency of various recycling operations. Refining jobs are only based on pilot operations.	Five-year average prices of virgin materials have been used to estimate the MO.	Investment includes machinery, land and building.	Refining jobs consider pilot operations and, therefore, may be reduced over the years due to commercial operations and automation. Several factors, as mentioned under assumptions, have been kept constant till 2047: - employment factor - average of five-year prices of virgin materials
22	Used water treatment and reuse	- Domestic sewage treatment. - Sale of treated used water.	- Estimated average STP size to be 22 MLD based on CPCB data from 2021 (details in methodology document).	- Projections for sewage generation are based on NMCG targets (cited in the paper).	- Projections for sewage generation are based on NMCG targets (cited in the paper).	- Only data for the STPs are available, so our estimates do not consider other aspects of the value chain, such as sewage pipelines, pumping

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			- Projections for sewage generation are based on NMCG targets (cited in the paper).			stations, etc.
23	Used cooking oil to biodiesel	This analysis focuses on the collection, storage, and recycling of UCO from the commercial sector for biodiesel production. Household generation of UCO is not accounted for.	Management and construction jobs have not been considered. Collection, warehousing and recycling jobs have been calculated.	The current price of biodiesel for the year 2024 has been considered for estimating the market opportunity.	Investment includes machinery, land and building.	- Household collection of UCO has not been accounted for. - This study assumes that 90 per cent of commercially collected UCO will be available for biodiesel production by 2047, driven by policy support and initiatives like RUCO.
Bioeconomy and nature-based solutions						
24	Bamboo-based products	Bamboo cultivation, harvesting, and the production of finished bamboo products (agarbatti, activated charcoal, housing, furniture and packaging).	Direct employment generated from bamboo cultivation, harvesting, and the production of finished bamboo products has been considered. Does not consider any reduction in employment due to increased automation across the bamboo sector, especially in areas of harvesting and processing into advanced products.	The total number of products required in 2047 for each sector was multiplied by the sale rate of bamboo products at B2B, either through stakeholder consultations or through rates mentioned on third-party sites such as IndiaMART.	The total investment needed to realise the projected market opportunity is based solely on capital expenditure (CAPEX). When determining the number of units or facilities required to meet 2047 demand, any decimal values were rounded up.	Current prices for the market opportunity, only capex for investment; job numbers do not consider a declining factor.
25	Bio-based packaging from renewable sources	This value chain estimates JMI potential across two packaging sub-sectors: paper-packaging (which	FTEs are considered across feedstock aggregation, construction and maintenance of mills/plants. The plant sizes considered are 100 TPD, 9 TPD,	The total market is calculated as the revenue generated from the volume of bio-based packaging materials produced in the	To calculate the total investment, the capital expenditure required to establish one plant/mill is multiplied by the total number of mills needed to fulfil the projected demand in	Current prices for market estimation.

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		includes agro-based and bamboo) and plastic packaging (which includes agro-based PLA and seaweed-based plastics). The choice of raw materials was made to include second-generation and third-generation feedstocks only. The analysis assumes that the demand for bio-residue-based paper will go from 11.3 per cent of the total packaging paper currently to 20 per cent in 2047. For bio-plastic packaging, the analysis assumes that the bioplastic sector will grow at a rate of 22 per cent CAGR between 2025 and 2047. PLA production within total bioplastics will occupy the current global shares, i.e 35 per cent. Seaweed-based plastic packaging will occupy 5 per cent of the	and 100 TPD for an agro-based paper mill, a seaweed-based plastic plant, and an agro-based plastic plant, respectively.	year 2047. Prices considered are: - Paper- INR 72/kg - Plastic from seaweed- INR 435/kg - Plastic from agro residue- INR 217.5/kg.	2047. Capex required to establish: - One 100 TPD agro residue-based paper mill- INR 450 CR - One 9 TPD seaweed-based plastic plant- INR 12 CR - One 100 TPD agro residue-based plastic plant- INR 1000 CR.	

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			Jobs	Market opportunity (MO)	Investment opportunity (IO)	
		total bioplastic production.				
26	Generating biofuels from agricultural residues (2G) (CBG, Bioethanol)	Second-generation biofuels have been considered- Compressed Biogas (CBG) and Bioethanol. For CBG, we have considered an increased blending of CBG with CNG and PNG and its usage as an automotive and domestic fuel, respectively, within the City Gas Distribution (CGD) network across India (according to the national SATAT scheme). For Bioethanol, we consider an ambitious increase in the blending percentage of ethanol with petrol till 2047 under the EBP programme of India.	Jobs generated across the construction of plants, their O&M and agri-residue collection. Jobs based on fuel demand (CBG and bioethanol) in 2047 have been considered.	The total CBG demand calculated as per the ambitious scenario in 2047 was multiplied by the CBG procurement price set by the government to arrive at the potential market opportunity for CBG in India. The total ethanol demand calculated as per our ambitious scenario in 2047 (based on 30 per cent blending) was multiplied by the estimated price for 2G-based bioethanol in India, to arrive at the potential market opportunity for 2G bioethanol in India.	Investments are intended to cover all costs incurred for asset creation (CAPEX). In cases where the total number of units/facilities required to satisfy the demand by 2047 resulted in decimal places, it was rounded off.	Current prices for market opportunity, only capex for investment; job numbers do not consider a declining factor due to the possible rise of automation in the sector.
27	Bio-inputs	The bio-input value chain consists of the following sub-value chains: 1) biofertilisers and biopesticides; 2) biostimulants;	**Biofertilisers and biopesticides:** Total FTE = FTE/MT of biofertilisers and biopesticides X Total MT biofertilisers and biopesticides required as per scenario considered	The following key assumptions were made for estimating the market sizing in units for the respective bio inputs:	To calculate the total investment required to realise the projected market opportunity, we only considered capital expenditure (CAPEX) costs. When the total number of units/facilities needed by	One limitation of the study is that it does not account for future improvements in farm management practices, seed varieties, and bio-input formulation technologies. Over time, these advancements are

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			Jobs	Market opportunity (MO)	Investment opportunity (IO)	
		3) natural farming inputs; 4) organic fertilisers; and 5) indigenous seed production and processing. The rationale behind the exclusion of organic fertilisers from our scope of work is that the government already supports the production, marketing, and supply of organic fertilisers, such as FOM and PROM, through the Market Development Assistance (MDA) program. This program specifically targets the production of FOM and PROM as a byproduct during CBG production (PIB 2023). Our calculations show that the FOM/PROM generated during the production of CBG by 2030 and 2047 is sufficient to meet India's organic fertiliser requirements for the	**Biostimulants:** We used the FTE calculated and considered by CEEW as part of the report titled 'How a Green Economy can deliver Jobs, Growth, and Sustainability in Odisha'. We calculated the total jobs by multiplying the FTE required to produce the amount of biostimulant needed for one hectare of land by the total area in hectares considered in the ambitious scenario. **Natural farming inputs:** One BRC is needed per 50 hectares; we calculated the total number of BRCs required. **Indigenous seeds:** For seed production, we follow the same set of activities as used for producing any crop under natural or organic farming practices. However, when selecting crop fields for seed production, we implement additional measures to ensure genetic purity. These measures require extra labour, resulting in additional person-days beyond	**Biofertilisers and biopesticides:** We calculated each crop's biofertiliser and biopesticide needs according to the recommended Package of Practices (PoP). We assumed that 100 per cent of farmers practising organic farming would adopt these centrally produced bio-inputs following the recommended PoP for respective crops. **Biostimulants:** We assumed a 100 per cent adoption rate of biostimulants with farmers practising organic farming in India using centrally produced biostimulants as per the recommended dosage of 1.2 litres per hectare per year. The required dosage of biostimulant, which does not vary significantly for different crops, is 1.2 litres per hectare per year (Sagarika, n.d). We multiplied this dosage by the total area in hectares under the ambitious scenario to	2030 and 2047 resulted in decimal places, the number was rounded off to the nearest whole number. Total Investment Opportunity = (Total number of units required by 2030/2047) x (CAPEX required to set up one unit) The capital cost for setting up a bio-input production unit varies significantly depending on capacity, type of input, technology, raw materials used, and other factors.	likely to reduce the quantity of bio-inputs required, potentially leading to lower input demand than current estimates suggest.

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		ambitious scenarios considered. Therefore, the creation of additional organic fertiliser production units is unnecessary.	those needed for normal crop cultivation. Key activities include additional ploughing and roguing (the removal of non-target crop varieties). To estimate the person-days required for indigenous seed production, we conducted three stakeholder consultations with various farmer-producer organisations (FPOs) involved in indigenous seed production. For estimating the full-time equivalent (FTE) requirements for processing indigenous seeds, we relied on data from the DPR reports published by the relevant agricultural government bodies and FICCI, and we validated these findings through stakeholder consultations.	calculate the total biostimulant requirement for all crops in 2030. **Natural farming inputs:** India uses over 50 different natural farming inputs. However, we included only Ghana Jeevamrutham, Drava Jeevamruthum, Kashayam, Agniastra, Panchgavya and Neemastra in our analysis as they are the most common natural farming inputs used by farmers across different agro-climatic zones, making them compatible with local agricultural practices. Since the amount and type of natural farming input required do not vary significantly across crops (NCNF 2022), we multiplied the dosage required in litres per hectare per year for each input by the total area in hectares under the ambitious scenario. This calculation provided the total natural farming input requirement for all crops in 2030.		

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				Biofertiliser and biopesticides: To estimate the potential market opportunity for biofertilisers in India, we multiplied the total amount required by 2030 and 2047 by the sale rate of INR 230/kg from the OUAT biofertiliser production unit. For biopesticides, we used the price of Azadirachtin 1500 ppm, set at USD 9.6 /litre. This price is based on the Meghalaya government's approved rate of USD16 0.48 for 50 ml of Azadirachtin 1500 ppm. Biostimulant: To estimate the potential market opportunity for biostimulants in India, the total amount of biostimulants required by 2030 and 2047 for different scenarios was multiplied by the sale rate of the biostimulant production unit, set at USD16 6.63/litre (CSMCRI, n.d). **Natural farming inputs:** To estimate the potential		

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				market opportunity for natural farming in India, we multiplied the total amount of natural farming inputs required by 2030 and 2047, as per different scenarios considered as part of the free agriculture value chain, by the selling price for each natural farming input. The selling prices in USD 16 per litre are $ 0.18 for Ghana jeevamrutham7, $0.30 for neemastra7, and $0.30 for agniastra. **Indigenous seeds:** To estimate the potential market opportunity for indigenous seeds in India, we calculated the total indigenous seed requirements for major crops for 2030 and 2047, based on various scenarios within the chemical-free agriculture value chain. We then multiplied these quantities by the average selling price in INR. Whenever possible, we used the current average		

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				selling prices for indigenous seeds for each crop; if that data was unavailable, we assumed a fixed percentage increase over the existing seed prices for that particular crop. IMPORTANT NOTE: All the market potential estimations are based on the current market prices, as it is extremely difficult to predict the market prices for 2030 and 2047.		
28	Biofibre manufacturing	Feedstock Scoping Principles: 1) Sector-specific attribution: Only those feedstocks whose value chains can be exclusively attributed to a specific industry were considered. Ancillary or sector-agnostic industries, including B2C actors serving multiple products, were excluded. 2) Net Job Creation: Feedstocks were included	Direct job creation from 1) biomass collection and aggregation for extraction units: It includes the gathering, sorting, and storage of raw materials. The primary feedstocks in this case are banana pseudostems for banana fibre production, coconut husks for coir extraction, and pineapple leaves for PALF (pineapple leaf fibre) extraction and 2) Manufacturing of biofibre, wherein greenfield biorefineries are set up. This	To determine the market opportunity for bio-based fibres (BBFs) such as coir, banana fibre, and pineapple leaf fibre (PALF) in India, we estimated the total fibre production for each category by 2047. This production volume was then multiplied by the current market prices: INR 350 per kg for banana fibre, INR 27 per tonne for coconut coir, and INR 494 per kg for PALF. Market value estimates are based on current biofibre prices	The investment requirement was calculated to cover all capital expenditure (CAPEX) needed for asset creation to achieve the projected fibre production levels by 2047. When estimating the total number of units or facilities required to meet the expected demand, any fractional values were rounded to the nearest whole number. CAPEX for various stages of the value chain, based on stakeholder consultations, are as follows: 1) Biomass aggregation (FTE/TPD) 0.3 for coconut coir, 0.2 for banana fibre. 2) For extraction	

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			Jobs	**Market opportunity (MO)**	**Investment opportunity (IO)**	
		only if their adoption for BBF production results in net new job creation. Furthermore, five scoping parameters were set and assessed for a list of feedstocks that can be readily introduced into the Indian market: 1) Availability for Industrial Production 2) TRL for Production 3) Presence of Manufacturers in India 4) Feedstock is a non-fibre and non-timber crop, and 5) Feedstock is an agricultural residue/waste (2G biomass).	includes 2a) Operation & Maintenance of fibre extraction units and 2b) Design and construction of extraction units. Additionally, the net job creation principle was used in the scoping, wherein feedstocks were included only if their adoption for BBF production results in net new job creation. This framework directly links fibre production volume to employment generation, providing a comprehensive view of job creation within the sector. Stakeholder consultations were done to determine FTEs.	validated through stakeholder consultations. It is assumed that 1 USD = 87 INR.	unit (INR crore): 0.3 for 2.5TPD or 0.1 for 10 TPD unit for coconut coir, 0.25 for banana fibre, and 0.1 for PALF.	
29	Nutraceuticals	The scope entails the production of medicinal and aromatic plants, since raw material availability forms the raw materials for the wellness and nutraceutical industry. We consider the	Direct jobs from cultivation up until harvest and on-farm processing have been considered.	Market opportunity is determined by multiplying the total volume harvested across the nine species by their current market prices.	Considering the capital expenditure required to cultivate one ha of land with a particular species, the investment required was calculated as the total area under cultivation in 2047 times the cost required to cultivate one ha of land.	Current prices for market estimation.

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			Jobs	Market opportunity (MO)	Investment opportunity (IO)	
		cultivation of 80 per cent of traded species across 2Million hectares of cultivable wasteland to limit encroachment towards farming land in view of food security concerns.				
30	Bio-based feed (Compound cattle feed)	Compound cattle feed manufacturing for bovines only has been considered with standard formulations as recommended by NDDB based on energy requirement, crude fibre requirements and crude protein requirements.	FTEs considered: Construction, Design and Commissioning, O&M, Packaging and Transportation.	Market opportunity is calculated based on the increase in penetration from 15 per cent in 2025 to 30 per cent in 2047. This was calculated based on the demand increase for CCF for the milk projections aspirations.	Only CAPEX for the construction of the CCF plant, machinery installation and inventory facilities, etc. This excludes land costs.	Job numbers do not consider a declining factor due to the possible rise of automation in the sector.
31	Seaweed cultivation	The scope considers seaweed farming in India in the onshore and offshore marine areas covering a total of 159305.9 ha. A supply-side roadmap of the seaweed sector was developed for both sub-sectors. Species selected for the analysis included commercially	FTEs considered across: For onshore cultivation- labour for establishing the plot, plot maintenance, harvest/reseeding, and drying. For offshore cultivation- unloading from truck, hiring crane, watch and ward, trawlers for grid, deployment, beach landing craft, skilled labour during grid and raft deployment, daily maintenance,	Market opportunity is calculated as the revenue generated from the total seaweed biomass harvested in 2047. Prices considered for each species are: Kappaphycus alvarezii- INR 70/kg Gracilaria dura- INR 60/kg Gracilaria edulis- INR 20/kg.	The investment required is calculated as the total cost to establish the required number of plots/units in 2047. The cost to establish one plot is considered as INR 50000 and USD 2 million for onshore and offshore, respectively.	Current prices for market estimation.

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		cultivated species with clear domestic and international demand.	supervising, harvest boat.			
32	Wetlands	For wetland management, wastelands have been identified for conversion into wetlands. Available land under wasteland for restoration to wetlands - 55,858.99 sq km (as per the Wasteland Atlas of India 2019). As per the Kunming-Montreal Global Biodiversity Framework (KM-GBF), wetlands are explicitly included in KM-GBF Target 2 on restoration and Target 3 on protected areas (the "30x30 target"). Hence, focusing on the 2030 target, 30 per cent of the available wasteland can be conserved by 2030, and the remaining land by 2047. For Ecological Mangrove Restoration, the linear growth model has been used in addition	Only direct employment opportunities generated from the management of wetlands and mangroves, their operations and management, as well as employment opportunities have been considered.	Market opportunity is calculated as the revenue generated from carbon credits generated from the sequestration of carbon. The price of one carbon credit is estimated to be USD 12.	The investment opportunity is calculated as the total cost to conduct all the activities under the wetland management and ecological mangrove restoration.	Current prices for market opportunity, no documented data on the implementation rate of ANR and IASM in India (therefore, a proxy in terms of annual tree plantation rate has been considered).

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		to the targets set under the MISHTI Guidelines. According to the latest estimates of ISFR 2023, the annual average growth rate of mangroves is 1.29 per cent. Building upon the targets set under the MISHTI scheme, as well as using the annual average growth rate based on ISFR 2023, provided approximately an additional area of 620 sq km for EMR for the year 2030 and an additional area of 1385 sq km for the year 2047.				
33	Sustainable forest management	Assisted Natural Regeneration (ANR) and Invasive Alien Species Management (IASM) have been considered under the scope of SFM at the national level. For ANR, we consider eligible areas to be Open forests inside RFAs, owing to the National Action Plan of	Under **ANR**, jobs across the following activities have been considered: 1. Rapid site assessments and site preparation in Year 1 2. Plantation at a density of 800 seedlings per hectare in Year 1 3. Maintenance and	Non-timber forest products (NTFPs) are the direct outputs from ANR sites, with an estimated value of INR 5,288 per hectare post-regeneration. The 2047 market accounts for a 5-year lag in harvesting, aligning with ANR implementation. Only additional or restored forest areas are considered	For SFM, we view the total investment as an input towards creating natural capital and establishing forests as a tangible ecological asset. To estimate the investment opportunity, we account for all costs incurred throughout the restoration process, including CAPEX for setting up nurseries, labour cost in O&M of nurseries, cost of planting material and CAPEX	

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		Desertification and Degradation, 2021. For IASM, activities are to be conducted in infested areas of varying densities within Recorded Forest Areas (RFA), as per ISFR 2023.	conservation per hectare each year from Year 2 through Year 5 includes transplantation, biomass clearance, fire line maintenance, etc. Under **IASM,** jobs across the following activities have been considered: 1. Rapid site assessments and site preparation in Year 1. 2. Practice of the cut-root-stock manual method on the identified site based on the infestation density, which is classified as High, Medium and Low. Plantation at a density of 300 seedlings per hectare in Year 1. 3. Transportation and drying of biomass, and biomass aggregation and transportation to biochar manufacturing units. 4. Biomass to biochar production, packaging and distribution at the decentralised level.	for the same (additionally, we will calculate carbon credits that could be generated from restoration). The market for IASM is calculated by quantifying the total biomass accumulated over the implementation period. This estimation is influenced by the infestation density and the variability in biomass availability across different infestation levels during the intervention. (Currently)	for biochar plants (in IASM).	
34	Sustainable	We consider two types of	Only direct employment	Tourism economy is captured	For eco-tourism centres, the	Current prices for the market

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	tourism	sustainable tourism, i.e. eco-tourism and agri-tourism, in our scope. Both of them are relatively new in comparison to other forms of tourism and have great potential for expansion. Central business units assumed in both forks of tourism are sustainable tourism centres that are run and managed by local communities.	opportunities generated from the construction of eco- and agri-tourism centres, their operations and management, as well as employment opportunities such as guiding services, etc, have been considered. We exclude capturing the jobs generated during the pre-establishment and post-establishment of sustainable tourism business units.	through consumer spending patterns, behaviours and preferences. These are mainly accounted for as per capita expenditure per day and per capita average duration of occupancy.	investment includes the construction of accommodations, such as guest rooms, as well as facilities for recreational and educational activities, like constructing nature trails, adventure activities, etc. In the case of agri-tourism centres, the investment primarily involves developing agricultural infrastructure, such as farming facilities, visitor accommodations, and spaces for educational workshops. In both cases, investment does not consider the land cost of the occupied facility.	opportunity, only capex for investment.
35	Chemical-free agriculture	We followed a rigorous selection framework to select three sustainable agriculture practices- organic farming, natural farming and agroforestry, of which agroforestry is a separate VC and organic and natural farming are clubbed together to represent one value chain titled chemical-free agriculture.	As part of the scoping, cultivation jobs under chemical-free agriculture (e.g., organic or natural farming) were excluded from the estimation of green jobs. Mobilising farmers is integral to scaling up chemical-free agriculture. CEEW's long-term longitudinal study on APCNF demonstrates that farmer–CRP interactions and field demonstrations significantly drive the adoption of natural	For our job and market estimation, we project the adoption of chemical-free agriculture based on target net sown area levels for two key timeframes. We developed ambitious scenarios for 2030 and 2047 for chemical-free agriculture through consultations with NITI Aayog and various ICAR institutes. By 2030, we estimate that 15 per cent of the net sown area will	NA (Investment for this value chain is CAPEX required for setting up bio-input production units, which is covered as part of the bio-input value chain).	1) Investment for this value chain is CAPEX required for setting up bio-input production units, which is covered as part of the bio-inputs value chain. 2) Job estimates include only support roles and exclude farm-level cultivation jobs, while the market opportunity is based on the total produce generated per hectare multiplied by price. As a result, the job and market opportunity figures are not directly aligned or

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			farming practices. Hence, we have included the jobs generated through farmer mobilisation and training in our analysis.	transition to chemical-free agriculture, while by 2047, this figure will increase to 25 per cent. Based on stakeholder consultations, we have assumed chemical-free produce is sold at a 20 per cent premium and therefore 20 per cent higher than the current minimum support prices of each crop considered under each crop type. Minimum support prices are considered, keeping in mind the variation in prices of crops across the country.		comparable.
36	Agroforestry	Agroforestry - Timber and horticulture species with crops, and hence, the extent of cultivation would be expanded only on crop lands. This excluded silviculture. Agri-silviculture - where only 35 per cent of timber shall come from agri-silviculture (the major share shall come	FTEs considered: 1. Agroforestry operations: site preparation, soil management, plantation, transplantation, weeding, maintenance and conservation, harvesting and primary processing (cutting, logging, etc) and transportation to manufacturing facilities - across the gestation cycles - Agrisilviculture - 20 years	1. Agri-silviculture: Timber is the primary product - average price is taken as INR 4000/metric cube of timber 2. Agri-horticulture: Fruits - INR 20000/tonne.	IO considers investment for nursery infrastructure set up and cost of cultivation (excluding labour costs) as they are assumed to be the creation of long-term assets (trees).	Investment does not consider labour costs and hence, RoI figures, if calculated, might be entirely representative of net returns.

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		from silviculture) in 2047. Agri-horticulture - where only 30 per cent of fruits shall come from agri-horticulture in 2047, with a combination of other crops on the land (vegetables are excluded as less than 1 per cent of vegetables are tree-based and 75 per cent of fruits are tree-based).	(Median - short, medium and long rotation crops); Agri-horticulture - 10 years 2. Nursery operations: Seed collection, seed processing, pre-sowing treatment, sowing, transplanting, shading, irrigation, weeding and hoeing, fertility maintenance, after care - disease control, control of white ants and rats, hardening, grading of plants, transportation.			