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# Working Paper Making state circular economy parks work for Indian states (Part 2): An economic analysis using the ICRIER's Sampada WSUT model

Working Paper, No. 424

Provided in Cooperation with:

Indian Council for Research on International Economic Relations (ICRIER)

*Suggested Citation:* Goldar, Amrita; Jain, Sajal; Verma, Ritika; Nair, Kartik (2024) : Making state circular economy parks work for Indian states (Part 2): An economic analysis using the ICRIER's Sampada WSUT model, Working Paper, No. 424, Indian Council for Research on International Economic Relations (ICRIER), New Delhi

This Version is available at: https://hdl.handle.net/10419/302224

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MAKING STATE CIRCULAR ECONOMY PARKS WORK FOR INDIAN STATES (PART 2): AN ECONOMIC ANALYSIS USING THE ICRIER SAMPADA WSUT MODEL

AMRITA GOLDAR SAJAL JAIN RITIKA VERMA KARTIK NAIR

JUNE 2024

424 WORKING PAPER

# Table of Contents

Ac	know	ledgementi
Ab	strac	t ii
1.	Intro	oduction1
	1.1	Policy Relevance
2.	Imp	act Evaluation and Rajasthan's Proposed IRRP: Literature Review2
3.	The	ICRIER Sampada Model4
	3.1	ICRIER Sampada Model Overview
	3.2	<i>Creation of the ICRIER Sampada Baseline</i>
4.	Imp	act Evaluation using the ICRIER Sampada Model11
	4.1	Employment in Waste Management
	4.2	Results from Baseline Runs and Employment Linkages
5.	Eval	uating Impact of Integrated Resource Recovery Park (IRRP)16
	5.1	IRRP: The Alternative Scenario
	5.2	Macroeconomic Impacts of IRRP
6.	Reco	ommendations21
7.	Con	clusion and Way Forward21
An	nexu	res22
Re	feren	ces41

# List of Figures

Figure 1:	MRF waste technology plants across Districts in Rajasthan	. 8
Figure 2:	Waste to compost Technology Plants across Districts in Rajasthan	. 8
Figure 3:	Map of the proposed IRRP in Rajasthan	17
Figure 4:	Details on the IRRP proposed in Rajasthan	18

# List of Tables

Table 1:	Schematic for the Waste Supply-Use Table (in units)
Table 2:	Annual Waste Generation in Rajasthan (in MTA)6
Table 3:	Amount of Waste Treated by Waste Type in Rajasthan (in MTA)7
Table 4:	Per Unit Costs of Waste Treatment (INR per MTA)10
Table 5:	Rajasthan Solid Waste Management and Scrap Waste Sector Employment Profile12
Table 6:	Formal vs Informal Employment in the Solid Waste Management and Scrap Waste Sector in Rajasthan
Table 7:	Availability of Social Security benefits in the Waste and Scrap Sector in Rajasthan13
Table 8:	Total Waste Generation Effects in Aggregated Intermediate Sectors (tonnes per lakh Rupees)
Table 9:	Total Waste Generation Effects in Waste Treatment Sectors (tonnes per tonnes treated)
Table 10:	Economic Stimulus Per Tonne Treated in Waste Treatment Sectors (Rupees lakh per tonne treated)
Table 11:	Material Recycling Facility Plant Categorisation on Actual Output (MTA) as per SBM data
Table 12:	Projected Material Recycling Facility Plant Capacity for proposed IRR park, Rajasthan
Table 13:	Employment numbers as per Material Recycling Facility Plant Capacity
Table 14:	Economic Stimulus from IRRP
Table 15:	Additional Employment from IRRP (Initial Phase)
Table 16:	Indirect Employment Created in Aggregated Intermediate Sectors

#### Acknowledgement

We are grateful to our partners, the International Institute of Sustainable Development (IISD) and ClimateWorks Foundation, without whom this working paper would not have been possible.

We want to thank Dr. Deepak Mishra, Director and CE, Indian Council for Research on International Economic Relations (ICRIER), who encouraged, inspired and motivated the team in the entirety of the project. We are thankful to the administrative and events team at ICRIER for their unfailing support with logistics, event management, organization, and other associated tasks.

We are also thankful to Dr. Vijai Singhal (Rtd. Chief Environmental Engineer, Rajasthan State Pollution Control Board), Dr. Parveen Kumar (Head Research and Development, Exigo Recycling) and Mr. Mayur Karmarkar (India Team Leader, Copper Alliance) for their valuable inputs and guidance. We are also thankful to our reviewer, Dr. Akhilesh Kumar Sharma (Assistant Professor, Institute for Studies in Industrial Development (ISID)) for his extensive feedback and comments from which this paper has immensely benefitted.

Lastly, the errors, if any, in this paper are the authors' responsibility alone.

#### Abstract

Recycling activities remain at a nascent stage in the country. While the environmental benefits of recycling are well-established, there are several macroeconomic benefits like employment creation. There is an essential need to focus on waste management policies and measures that can aid an effective functioning of the entire waste management system in the country. In line with this perspective, this paper attempts to assess the macroeconomic gains of the proposed Integrated Resource Recovery Park (IRRP) in the state of Rajasthan using the ICRIER *Sampada* Waste Supply-Use Table (WSUT) model. The WSUT model includes (a) standard monetary input-output table elements, (b) waste generation by intermediate sectors, waste treatment sectors, and final demand sectors, and finally, (c) waste treated by waste treatment methods. These are used to calculate the Leontief inverse of the WSUT. This, when pre-multiplied by changes in the final demand sector, provides the total effects. The analysis highlights direct and indirect benefits in terms of enhanced economic activity and job creation.

The ICRIER *Sampada* WSUT model assesses the direct and indirect impacts of waste management policies and consumption patterns on various macroeconomic parameters. The model incorporates data for monetary transaction values and physical quantities of waste flows, making it capable of accurately evaluating all stages of the consumption process, including purchase, use, and disposal. It provides a comprehensive view of Rajasthan's economy and waste flows in the form of a 47 by 47 matrix, which includes thirty-seven intermediate sectors, four waste treatment technologies (incineration, composting, landfill, and material recovery process), and six waste types (municipal solid waste – dry waste, wet waste, inert waste; hazardous waste; bio-medical waste; and plastic waste).

The results highlight that the additional waste treatment undertaken by plants located in the park will result in gains across other linked sectors. An additional treatment of 2.68 lakhs metric tonne per annum (MTPA) of waste, or 5.5 percent of the total waste treated in the state, could lead to additional economic activity of INR 169.48 crores annually for the state. Pulling all the elements together leads to the derivation of the indirect employment that the IRRP in its first phase could lead to. The indirect effects of the park (in terms of its trickle-down effects on employment) could be as much as 45 percent of direct effects.

Keywords: Circular economy, Economic modelling, Waste management

JEL classification: Q53, Q52, C67

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# Making State Circular Economy Parks Work for Indian States (Part 2): An Economic Analysis Using the ICRIER's *Sampada* WSUT Model

Amrita Goldar<sup>1,2</sup>, Sajal Jain<sup>3</sup>, Ritika Verma<sup>4</sup> and Kartik Nair<sup>5</sup>

#### 1. Introduction

India's economic growth has been accompanied with the rise in the quantum of waste generation. Rising standards of living have led to increased levels of waste generation, albeit the processing of the same has remained relatively restricted. In 2021-22, the electronic waste or e-waste generation in the country stood at 16,01,155 tonnes, of which about 33 percent was collected and processed (MoEFCC, 2023). Further, plastic waste generation stood at 41,26,997 tonnes per annum (TPA) in 2020-21, of which about 27 percent quantity of waste was processed (CPCB, 2022). The municipal solid waste generation stood at 1,60,039 tonnes per day (TPD) in 2020-21, with 50 percent of the waste quantity being processed (PIB, 2022). Waste recycling thus needs to form a crucial component of policy discussions. Recycling activities remain at a nascent stage in the country. In the diverse types of waste categories, the collection and treatment methods differ and so do recycling activities. There is an essential need to focus on waste management policies and measures that can aid an effective functioning of the entire waste management system in the country.

Initial studies have looked at the waste recycling sector to point out relevant gaps and issues. Moerenhout et al., (2022) focused on the battery recycling sector and found that there exist detrimental skill gaps in the waste recycling industry. The study stressed that majority of labour currently employed in the waste sector was low skilled and movement to more complicated forms of battery waste recycling in the future may face difficulties. The study also found the existing battery recycling system to lack technology standardization. It strongly suggested haronization of technology to play a pivotal role in making a recycling unit more profitable whilst increasing the recycling capacity and coverage. Another major roadblock in the sector was found to be the transportation cost of waste. These gaps point to the lack of an institutional capacity in the recycling sector.

In that context, the concept of 'eco-industrial' parks (EIPs) has gained momentum. The idea of EIPs was initially presented at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro (UNIDO, 2021). The EIP concept has evolved to address a number of societal problems, including environmental pollution and climate change, promoting resource efficiency and improved management of resources through its deployment globally. EIPs are a mix of both industrial ecology and cleaner production, where the waste of one is input to the other. As a result, there is zero waste production making the process more environmentally friendly (Goldar et al., 2024). However, the success of developing such industrial parks is mainly dependent on the emergence of innovative network governance that enable different companies to find common ground and find ways to reuse and recycle industrial by-products (Mathews et al., 2018).

The state of Rajasthan has planned to establish a similar integrated resource recovery park (IRRP) that has the potential to address current gaps for the recycling sector. The park aims to co-locate diverse types of waste recyclers (Government of Rajasthan, 2022). While the success of the park is dependent on multiple factors like establishment of strong networks between recyclers and government authorities, etc., such parks can contribute to a significant extent towards adding to the sustainability of the state as well as facilitate macroeconomic gains.

Through the ICRIER *Sampada* Waste Supply-Use table (WSUT) model, this paper attempts to analyze the economic impact of the proposed waste recycling park in the state of Rajasthan. The ICRIER *Sampada* WSUT model assesses waste management policies' direct and indirect impact and consumption patterns

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on various macroeconomic parameters. The model incorporates data for monetary transaction values and physical quantities of waste flows, thus capable of correctly evaluating all stages of the consumption process – purchase, use, and disposal. Ensuring a holistic development of the State, the idea is to assess if macroeconomic gains can serve as one of the principal criteria for the establishment of such parks in the country, beyond the core sustainability initiative.

#### 1.1 Policy Relevance

In a diverse country like India, different types of generated waste command effective waste management systems that incorporate the essential 3 Rs of Reduce, Re-use, and Recycle. There are various waste management rules that have been put in place to deal with different types of waste. Some of these include the Hazardous Waste Management Rules, the Solid Waste Management Rules, Plastic waste management rules, etc. Over time, additional types of waste like e-waste, batteries, etc., have gained greater recognition and thus a separate set of rules for their management have also been introduced. At the same time, existing rules have been amended and new upgraded iterations have been introduced to ensure a credible system in place for waste management in the country. In addition, many widespread national initiatives such as the 'Swachh Bharat Mission', 'Waste to Wealth Mission', etc., have been introduced as part of the commitment towards effective waste and pollution management.

Similarly, the state of Rajasthan has been taking an active stance towards management of waste in the state. The State has diverse norms and rules in place, to guide the process of waste collection as well as treatment. Encompassing multiple recovery facilities, waste treatment units, collection centers along with several programs and campaigns to advance recycling and promote responsible waste management practices among the public, the state of Rajasthan has been diligently working towards sustainable development. In fact, when the State registered a significant 9.7 percent of the total hazardous waste generation in the country in 2021-22, the recyclable component of the same also made a significant share of 7.8 percent of the national total (CPCB, 2023). Further, when e-waste collection registered an increase of about 34 percent in 2021-22, the state impressively showcased a material recovery efficiency of about 88 percent (Government of Rajasthan, 2022). The announcement of the IRRP by the State serves as an opportunity to combine environmental benefits with macroeconomic gains.

To be able to tap on this potential, there is an essential need to assess the extent of these gains and thereby encourage the recycling agenda through both, an environmental as well as an economic development perspective. This study contributes to literature to provide an assessment of macroeconomic gains and impacts of waste management initiatives through the ICRIER *Sampada* model, keeping the proposed IRRP in the state of Rajasthan as a case study. The analysis will help determine the viability of the park to accrue benefits in terms of sustainability as well as economic development, thereby serving as a prototype for similar initiatives in other states of the country.

The structure of the rest of the paper is as follows. Section II discusses the illustrative case study of Rajasthan's IRRP and facilitates a literature review of other impact evaluation studies to draw focus on the existing gaps in literature on green economic development assessment with respect to recycling; Section III provides an overview of the ICRIER Sampada model, discussing the waste input-output framework as well as components of the baseline of the model; Section IV expounds on the employment angle of waste management and the impact evaluation through the ICRIER Sampada model for the State; Section V lays out the alternative scenario as adopted for the modelling exercise to evaluate the impact of the park in Rajasthan; Section VI presents the policy recommendations from the entire analysis; Section VII concludes the paper and provides a way forward to the research.

# 2. Impact Evaluation and Rajasthan's Proposed IRRP: Literature Review

The IRRP in the state of Rajasthan is anticipated to house diverse waste types and the respective recycling facilities. Moreover, the State also plans to focus on skill development within the park for the workers involved in waste processing in the premises as well as on promotion of state of the art technologies in the park. In addition, a one location processing zone will help to reduce transportation costs of waste (Government of Rajasthan, 2022). With the location of the park to have been decided as the Jaipur district, multiple state government departments and officials are engaged in the setting up of the park, including the Rajasthan State Pollution Control Board (RSPCB), Rajasthan State Industrial Development and Investment Corporation (RIICO), amongst others.<sup>6</sup>

Keeping the park as the reference point of sustainable waste management practices and of establishment of circular economy in the State, the current study undertook an impact evaluation assessment to assess the arising macroeconomic gains. An impact evaluation analysis serves as a key inputs to aid policymaking as well as helps in setting benchmarks for investment decisions towards achievement of desired developmental objectives from infrastructure projects. This methodology is often used to understand the economic implications of different initiatives in diverse sectors like transport, water supply, energy, etc. In fact, in a similar vein as the current analysis, Sahu et al. (2021) looked at the economic impact of the establishment of infrastructure in the form of a refinery in the Ratnagiri district of Maharashtra. This study found the refinery to facilitate significant economic contributions to the state as well as to the country with respect to output, income, employment, and tax revenue.

The literature is rich with a variety of such assessments of traditional infrastructure projects. However, the linkages between economic benefits from primarily environmental or sustainable initiatives have been looked at with mixed opinions. In general, a tradeoff is assumed between environment programs and local growth, with one necessarily replacing the other. Further, the benefit of employment creation as a result of environmental initiatives has had the community divided. The relatively new concept of green economic development stresses on employment and economic investments generated through environmental protection initiatives. With respect to conventional green energy sectors, while the opposers argue that the long term employment impacts are negative due to job displacements (Frondel et al., 2010; Greenstone, 2002; Hughes, 2011; Morris et al., 2009), the supporters argue against any trade off and that the clean energy industries actually create more labour intensive jobs, thereby balancing any job losses (Feiock and Coutts, 2013; Fitzgerald, 2010; Portney, 2009; Fankhauser et al., 2008).

As a crucial subsector of circular economy, waste recycling carries potential to facilitate employment and other gains. Connecticut Economic Resource Center (2012) found recycling activities in the state to have a significant impact on total sales, with associated employment gains. In the impact analysis based on an input-output model, over a period of seven years (2006 to 2012), the study found direct employment gains to average 2,710 jobs per year, with indirect and induced gains at an additional 755 jobs and 1,325 jobs per year, respectively. Similarly, an economic impact analysis of recycling in South Carolina by Hefner (2014), again based on input-output modelling, suggested recycling to provide for 54,121 jobs in 2014, with noted impacts on labour income as well as state and local taxes. In a more recent analysis, Liu et al. (2020) undertook an empirical evaluation using a fixed effects regression model, of the employment impact of recycling programs in Florida from 2000-2011. The study found a 0.4 per cent job growth in overall solid waste and recycling industry for a one percentage point increase in recycling rate of the county. However, the study noted a concentration of the employment effects in the recycling processing sector in comparison to the waste collection sector.

The literature however also notices restricted assessments accompanied with a lack of comparison for the newer types of waste like e-waste. A review by the International Labour Organization (ILO) examined existing information on the treatment of waste electrical and electronic equipment (WEEE), creating a pool of estimates and analysis that provides details on the creation of decent work in WEEE treatment. The analysis covered countries like China, Serbia, Argentina, Nigeria, South Africa, Bangladesh (Dhaka), and India (New Delhi). A striking feature of the analysis was the lack of comparability due to different variables across economic, societal, regulations, branches of treatment, etc. (ILO, 2019). Similar to the current analysis of a resource recovery park, McMahon et al. (2021) undertook an analysis of job creation potential of a certified e-recycling facility in Ireland, involved in the entire pretreatment process of e-waste in the country. Through an examination of labour requirements at the facility, the study established that the potential for job growth exists in the WEEE sector as well. It was observed that the WEEE left out from proper treatment had the potential to create and support about 12-14 full-time equivalent jobs. The establishment of the recycling facility thus provided merit for not only environmental conservation but also for economic gains to the country.

<sup>6</sup> For further details, please refer to our ICRIER working paper, Goldar et al. (2024)

The current analysis attempts to constructively contribute to the existing literature on the relation between circular economy and sustainability with developmental macroeconomic gains. By means of quantitative analysis and through coverage of multiple types of wastes, the idea is to establish the concept that infrastructure initiatives need not only be sustainable but also facilitate multiple benefits in terms of macroeconomic gains to the country. The next section elaborates on the quantitative modelling adopted by the study.

#### 3. The ICRIER Sampada Model

The study focuses on the development of an indepth understanding of the employment linkages arising out of the establishment of waste recycling park in the state of Rajasthan. The analysis looks at the employment growth potential in a quest to understand macroeconomic implications of the growth in the identified recycling processing zone in the state. The scope also includes a focus on the quality of jobs available in the waste sector, with a qualitative assessment of the skills prevalent in the sector at the state-level. The motivation behind the analysis is to examine if potential employment creation can serve as a primary metric for evaluation and establishment of similar sustainability projects in other parts of the country.

#### 3.1 ICRIER Sampada Model Overview

This sub-section elaborates on the construction of the various components of the ICRIER *Sampada* WSUT model.

#### Waste Input-Output Modelling

Waste generation accompanies all economic activities necessitating waste treatment. Similar to the flow of goods between sectors in the economy, a corresponding flow of waste is also linked to waste treatment sectors. However, conventional inputoutput analysis (IOA) primarily addresses the flow of goods and overlooks waste flows, hindering a comprehensive understanding of their intertwined effects. This limitation is especially critical for life cycle assessment (LCA) of waste management.

The Leontief pollution abatement model, an early form of environmental extension of IOA, could be explored within the context of waste management (Leontief 1970, 1972). In his approach, he expanded the traditional IOA to include considerations of pollutant emissions, the process of removing these pollutants, and the interconnectedness between regular goods producing sectors and sectors that are focused on pollution abatement. However, a major weakness of this assessment was that it assumed a rigid one-to-one relationship between pollutants (waste) and abatement methods (waste treatment), which in turn does not align with the complex reality of waste management involving diverse waste types and treatment methods.

Nakamura and Kondo's (2002) Waste Input–Output (WIO) framework, developed as an improvement of the Leontief model, enabled the consideration of various waste types and treatment combinations. It accommodated the joint treatment of different waste types within a single method and vice versa, offering a more accurate representation of waste management's intricacies. Using the concept of allocation matrix (or S matrix), the WIO framework was able to adapt the Leontief model to waste management issues. Several offshoots of the WIO model integrate an engineering process waste management model with the inputoutput framework, synergizing the strengths of IOA and engineering models.

The present paper applies the Lenzen and Reynolds (2014) WSUT extension of Nakamura and Kondo's (2002) WIO framework to the state of Rajasthan for the year 2018-19. The WSUT is a logical extension of the WIO framework, as it incorporates the flexible characteristics of the (monetary) Supply-Use Table (SUT) concept, and thus allows for two representations of the waste data—waste by type and waste by treatment method—to be presented simultaneously in one table. As the allocation matrix (similar to the S matrix mentioned above) is incorporated directly into the table, understanding the full range of activities related to waste generation and processing within the economy becomes easier.

#### Waste Supply-Use Table Framework

A schematic of the WSUT is presented in Table 1. As can be observed, there are three parts to the table – (a) standard monetary input-output table elements, that can be distinguished between intermediate consumption and  $(T_{11} \in \mathbb{R}^{N1 \times N1})$  final demand ( $f \in \mathbb{R}_{N1 \times NF}$ ) and gross output( $x_1 \in \mathbb{R}_{N1 \times 1}$ ) (b) waste generation by intermediate sectors ( $W_{31} \in \mathbb{R}_{N3 \times N1}$ ), waste treatment sectors ( $W_{32} \in \mathbb{R}_{N3 \times N2}$ ) and final demand sectors ( $W_F \in \mathbb{R}_{N3 \times NF}$ ), and finally, (c) waste treated by the N<sub>2</sub> waste treatment methods ( $W_{23} \in \mathbb{R}_{N2 \times N3}$ ). The vectors  $x_1$ ,  $x_3$ , and  $x_2$  are the total output of N<sub>1</sub> goods and services sectors, N<sub>3</sub> waste types, and N<sub>2</sub> waste treatment methods for the economy.

#### Table 1: Schematic for the Waste Supply-Use Table (in units)

	Intermediate demand	Waste treatment	Waste types	Final demand	Gross
	Sectors `1N <sub>1</sub>	sectors 1N <sub>2</sub>	$1N_3$	Sectors 1N <sub>f</sub>	Output
Intermediate supply	T <sub>11</sub>	T <sub>12</sub>		f	X <sub>1</sub>
sectors 1N <sub>1</sub>	(INR Lakhs)	(INR Lakhs)		(INR Lakhs)	(INR Lakhs)
Waste treatment			W <sub>23</sub>		X2
Sectors 1N <sub>2</sub>			(Mtpa)		(Mtpa)
Generation of waste by	W <sub>31</sub>	W <sub>32</sub>		W <sub>F</sub>	X3
type 1N <sub>3</sub>	(Mtpa)	(Mtpa)		(Mtpa)	(Mtpa)

Source: Based on Lenzen and Reynolds (2014)

The WSUT in balanced form is written as:

$$\begin{pmatrix} T_{11} & T_{12} & 0\\ 0 & 0 & W_{23} \\ W_{31} & W_{32} \end{pmatrix} \begin{pmatrix} 1_1\\ 1_2\\ 1_3 \end{pmatrix} + \begin{pmatrix} f\\ 0\\ W_f \end{pmatrix} \mathbf{1}_F = \begin{pmatrix} x_1\\ x_2\\ x_3 \end{pmatrix} \quad \text{(Equation 1)}$$

This can also be expressed in the coefficient form as below:

$$\begin{pmatrix} A_{11} & A_{12} & 0 \\ 0 & 0 & S_{23} \\ G_{31} & G_{32} & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} + \begin{pmatrix} f \\ 0 \\ W_f \end{pmatrix} \mathbf{1}_F = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$
 (Equation 2)

where input coefficient matrices are defined as  $A_{11} = T_{11}\hat{x}_1^{-1}$ ,  $A_{12} = T_{12}\hat{x}_2^{-1}$ ,  $G_{31} = W_{31}\hat{x}_1^{-1}$ , and  $G_{32} = W_{32}\hat{x}_2^{-1}$ . It needs to be highlighted here that the matrix  $S_{23}$  ( $\in \mathbb{R}_{N2\times N3}$ ) is the same as Nakamura and Kondo's (2002) allocation matrix. The elements of  $S_{23}$  refer to the share of waste type *j* that is treated by treatment method *i*, and are normalized according to  $\sum_j S_{23}$  (*i*, *j*) = 1.

The Leontief inverse of the WSUT is thus formulated as follows:

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} I - A_{11} & -A_{12} & 0 \\ 0 & I & -S_{23} \\ -G_{31} & -G_{32} & I \end{pmatrix}^{-1} \begin{pmatrix} f \\ 0 \\ W_f \end{pmatrix} \mathbf{1}_F \quad \text{(Equation 3)}$$

Each of the elements of the above partitioned matrix are discussed below.

#### 3.2 Creation of the ICRIER *Sampada* Baseline

values in monetary terms.

## a. Monetary Input-Output (Matrices T<sub>11</sub> and f)

The construction of the WSUT for the baseline year 2018-19 is based on the Input-Output (IO) tables prepared by Chaudhuri, Pratap and Pohit (2024). In order to make the model manageable, the 137-sector structure has been aggregated to create a structure of 37 sectors in the current paper. This accounts for inter-industry demand, final demand, and output

The national-level IO table was however downscaled to sub-national levels using the methodology discussed in Annexure 1.

#### b. Waste generation in Rajasthan (Matrices $W_{31}$ and $W_{F}$ )

WIO calculations utilize the waste generation data for the state of Rajasthan, sourcing information from the diverse state annual reports for various waste categories. The study classifies waste into four types: Municipal Solid Waste (MSW), hazardous waste, bio-medical waste, and plastic waste. MSW is further classified into three categories, namely, wet waste, dry waste, and inert waste. This classification was based on a detailed analysis of existing literature (PIB, 2016; MoHUA, 2021). Wet Waste, or biodegradable waste, encompasses organic materials capable of decomposition. It includes food waste, kitchen scraps, vegetable and fruit peels, tea leaves, coffee grounds, etc. Dry Waste consists of non-biodegradable recyclable waste and includes materials that do not decompose quickly and are often suitable for recycling. This category involves materials such as paper, cardboard, plastic, glass, metal, and certain types of packaging materials. Lastly, the third classification of waste, inert waste, consists of non-biodegradable non-recyclable waste. It comprises of materials that neither decompose easily nor can be easily recycled or repurposed. This category includes construction and demolition debris, inorganic non-biodegradable materials, etc. These materials are often disposed of in landfills. Examples include ceramics, thermocol, rubber, and certain types of plastics that are not readily recyclable. Subsequently, based on insights gleaned from national references and waste management guidelines, MSW was apportioned into the three main segments in the following manner: wet waste

accounting for 50 percent, dry waste comprising 30 percent, and inert waste making up 20 percent.

Compiling waste generation data, Table 2 provides the total waste generated by each waste type on an annual basis in the state of Rajasthan, measured in Metric Tons or MTA. In 2019-20, a total of 13,73,740 MTA of waste was generated from the state's households, commercial establishments, and institutions within a municipality (RSPCB and CEE, 2022). This estimate includes general household waste as well as other non-hazardous waste materials. The second largest category was formed by hazardous waste generation at 5,87,554 MTA of the total waste (RSPCB, n.d). This form of waste necessitates specialized handling, treatment, and disposal techniques. Further, bio-medical waste generation stood at 7,551 MTA (RSPCB, 2019), indicative of the volume of waste generated from healthcare facilities, including hospitals, clinics, and laboratories. Bio-medical waste contains potentially infectious materials that require careful management to prevent disease transmission. A total of 1,64,405 MTA of plastic was generated within the state of Rajasthan (RSPCB and CEE, 2022). Plastic waste is a major environmental concern due to its persistence and potential impact on ecosystems, underscoring the need for proper waste management and recycling practices.

#### Table 2: Annual Waste Generation in Rajasthan (in MTA)

Waste Type	Dry Waste	Wet Waste	Inert waste	Hazardous waste	<b>Bio-Medical waste</b>	Plastic Waste
Waste Generated	480809	618183	274748	8092583	7551	164405

*Source: Authors' compilation, from multiple RSPCB reports* 

Post obtaining the waste generation numbers, the next step involved the allocation of this generated waste to the waste-generating 37 sectors of the WSUT. Allocation shares were computed on the basis of total *intermediate inputs* consumed by each of the 37 sectors as well as waste generation profiles for each producing and consuming sector for all of the six waste types mentioned above. Specifically for industries, the profiles for waste generation were estimated using production figures derived from the Annual Survey of Industries (ASI) database, assuming waste to be a monetised joint product in this case. This involved a mapping of 52 product lines catering to waste in the National Product Classification (NPC) code structure in ASI data for 2018-19 with the 15 WSUT industries to obtain the waste generation profile for each industry.

It must be mentioned here that the Matrix  $W_{31}$  depicts net waste generation by sectors, not gross. This means that specifically for industries, the figure for gross waste generation estimated earlier is subtracted by recycling amounts to derive net generation. In some industries and waste types, the quantum of recycling was much higher than the waste generation. In such cases, the numbers in  $W_{31}$  show up as negative values.

The amount of waste recycled by industries, or the amount of waste being utilised as inputs in the production processes of the 15 industries under analysis, was also computed based on the ASI database for the baseline period of 2018-19. MoSPI's ASI serves as India's primary source of industrial statistics, offering the most comprehensive data on organised manufacturing (MoSPI, 2021). Data for only domestic inputs or consumption of waste has been considered for the analysis.

This involved the development of a concordance between the NPC codes that cater to diverse types of waste with the 37 sectors in the model. This was achieved through the mapping of all waste NPC to the six types of waste being considered in the analysis.

It needs to be highlighted here that following Equation 3, both matrices f and  $W_F$  constitute the exogenous variables for the analysis. For the purposes of the study, the focus would be more on  $W_F$  as a key determinant of the changes discussed in the Alternative Scenario. As mentioned above, the Leontief Inverse when multiplied by changes in final demand (or  $W_F$ ) provides a measure of the total changes from a particular change in the system.

# c. Waste treatment and Waste disposal technologies (Matrix W<sub>23</sub>)

After waste generation, data was collected on the amount of waste being treated by waste types. Table 3 furnishes data on the quantity of different types of waste treated annually in the state of Rajasthan. The table illustrates the quantum of waste being treated with respect to the technologies used for recovery of waste. The same has been sourced from the Rajasthan State Pollution Control Board (RSPCB) annual reports, reflecting waste management and treatment efforts in the state. The figures are expressed in MTA for different waste categories, providing insight into the scale of waste treatment activities.

The total treated amount of MSW was 24,46,384 MTA, which is categorized as per the aforementioned three waste categories. Further, hazardous waste amounting to 21,67,607 MTA had been treated, primarily utilizing materials recovery facilities (MRFs), with a portion also being sent to landfills. Additionally, in 2019-20, a total of 5,660 MTA of biomedical waste underwent treatment (RSPCB, 2019). The data pertaining to plastic waste corresponds to the year 2020-21, with a cumulative 2,45,985 MTA of plastic waste undergoing treatment (RSPCB and CEE, 2022). We assume that treatment capacities remained nearly similar year-on-year.

		Dry MSW	Wet MSW	Inert MSW	Hazardous Waste	Biomedical Waste	Plastic Waste
	Incineration	2,31,835	1,47,531	42,152		4,892	
Waste	Composting		3,22,182				
Treatment	Landfill	4,84,199	7,53,478	4,45,138	13,72,974	768	
	MRF	17,881		1,987	7,94,633		2,45,985
Total Waste		7,33,915	12,23,192	4,89,277	21,67,607	5,660	2,45,985

Table 3: Amount of Waste Treated by Waste Type in Rajasthan (in MTA)

Source: RSPCB annual reports

Along with the quantities of waste being treated, the selection of treatment technologies utilised was also made. Majorly, the selection of waste treatment technologies for the analysis are customized to align with the specific characteristics of the waste categories, treatment objectives, and the local regulatory and environmental conditions. Selection of appropriate waste treatment technology requires a thorough evaluation of these criteria to identify the most fitting and sustainable solution for proper handling and management of distinct types of waste generated in each location. Several crucial factors are considered, including waste composition, quantity, resource recovery, cost, and economics, to name a few. The study covers four waste treatment technologies: incineration, composting, landfill, and MRF process. The selected treatment technologies are based on data from the online portal of Swatch Bharat Mission Urban<sup>7</sup> (SBM) on waste treatment. Figure 1 and 2 illustrate locational maps for MRF and waste-tocompost treatment technologies, respectively, in the state of Rajasthan at the district level, along with information on plant output capacities (in MTA). The data pertaining to functional waste technology plants was collected from the same SBM database.<sup>8</sup> As the data records inputs for only these two technologies, the locational map for the other two technologies could not be represented due to lack of adequate data points.

<sup>7</sup> Available at: <u>Swachh Bharat Urban (http://swachhbharaturban.gov.in/SolidWasteM.aspx)</u>

<sup>8</sup> SBM data was found to be in correlation with RSPCB annual report data.

### Figure 1: MRF Waste Technology Plants across Districts in Rajasthan



Source: Authors' construction

### Figure 2: Waste to compost Technology Plants across Districts in Rajasthan



Source: Authors' construction

Waste treatment data for the state of Rajasthan including 81 ULBs (Urban Local Bodies) was collected from the portal. Further, the total amount of waste treated, as sourced from RSPCB, was attributed to the types of waste treatment technologies. This was based on shares estimated from the SBM data on waste treatment by different technologies. However, few further modifications had to be made as it only covered MSW.

It is noteworthy that the study found that the data for treatment (including landfill) does not equate to waste generation. It is very often seen that waste is left in dumpsites located across different cities before being eventually sent to the landfill. For the purpose of this study, this waste has not been accounted for. The study assumes that this difference occurs because of recycling by industries that is often un-/underreported.

# d. Waste management technology-wise costs (Matrix T<sub>12</sub>)

The study attempts to provide a detailed cost model to ascertain economic viability of solid waste management systems. As previously mentioned, the technologies considered to construct the model include MRF, composting, incineration, and landfill waste process.

Among these technologies, dry waste and recyclable waste are segregated at source, and are further segregated in an MRF facility after division into various components that can be recycled or sold. The waste is divided into different streams namely paper, plastic, packaging paper, bottles and many others that could further be sold to manufacturing hubs for recycling. The aim of the facilities is to maximize the process of recycling process while generating revenues (CPHEEO, 2020). It ensures availability of scarce resources and reduces environmental impacts. It is vital for each ULB to have an MRF facility as it reduces waste disposal significantly as well as maximizes resource recovery and efficiency. MRFs play a vital role in managing dry waste and, if implemented efficiently, can help recover INR 17, 023 crores by 2025, adding INR 11, 836 crores annually to the domestic economy (MoHUA, 2021).

The biodegradable waste component of MSW can be processed through composting. The process yields bio-fertilizer popularly known as city compost (MoHUA, 2017). The compost can be used as a soil conditioner and nutrient provider. It is a simple and effective technology that requires minimal capital expenditure (CAPEX) and operating expenditure (OPEX). It is one of the best processes for biological stabilization and has a benefit-cost ratio greater than 1 for all scales of operation (Mandpe, Kumari, & Kumar, 2020). This cost-effective technology ensures sustainable and ecological management of biodegradable waste.

Meanwhile, other types of waste such as nonbiodegradable MSW, commingled waste that is not suitable for processing, pre and post processing rejects, and non-hazardous waste are disposed in landfills that are scientifically built to prevent environment pollution and health risks. However, the use of this technique can produce landfill gases such as methane, a potent contributor to global pollution, and leachate which is detrimental to the health of the environment as well as humans (Pujara, Pathak, Sharma, & Govani, 2019). In recent times, environmental awareness has highlighted this waste treatment technique to be highly unsustainable since dumping grounds that are often used as landfills lack foundations, liners, cover soil, and treatment facility (Singh, 2020). The state of Rajasthan currently reports 13 constructed landfills (RSPCB, 2021).

In line with the waste management techniques, the government of India has introduced a Waste-toenergy (WtE) policy under the Municipal Solid Waste Management Rules, aimed at harnessing the potential of generated and discarded waste. Technologies under this policy will help generate substantial quantity of energy while simultaneously reducing waste. Incineration is a useful technology in this regard, involving complete combustion of waste to recovery heat that is in turn used to produce power through steam turbines (MNRE, n.d.). It is a useful technology for treating unprocessed or minimally processed refuse and waste of high calorific value. In Rajasthan, two regions (Jaipur and Jodhpur) boast of waste to energy plants with a cumulative capacity of 331122 MTA (RSPCB and CEE, 2022). However, the CAPEX required to use this technology is notably high and can range from INR 4,350 lakhs to INR 29,000 lakhs depending on plant capacity. This technology is best suited for ULBs that have a population of 10 lakhs or above and waste generation exceeding 550 ton per day (MoHUA, 2017).

Analysing the economics of waste management is crucial, as the technologies used to treat waste entail huge investments and operational costs. Estimating the CAPEX required to operate a treatment plant is essential for planning effective waste management. Therefore, to conduct a comprehensive analysis, capital costs, operations and management (O&M) costs, and revenue were taken into consideration in the current analysis. The capital component takes into account costs incurred on civil, mechanical, electrical, and other components involved in the construction of the plant. O&M cost includes costs incurred in the operations of the plant including labour cost, and electricity, repair, and maintenance expenses (Sharma & Chandel, 2021). The financial data on costs were primarily extracted from government reports (NIUA, 2019; MoHUA, 2017). Additionally, few cost-related data points were also sourced from the methodology of Sharma and Chandel (2021). The costs extracted from these sources were further converted into per unit costs, which were subsequently multiplied by the amount of waste treated. These were then allocated to account for intermediate inputs sourced from the 37 goods and services sectors of the model. Table 4 below provides a comprehensive view of the costs that have been incorporated in the model.

Financial Parameter	Incineration	Composting	Landfill	MRF	C&D Waste Management
Capital Cost	617.40	250.55	457.33	520.37	210.25
Construction	173.86	62.64	457.33	400.29	52.56
Machinery	443.54	187.91		120.09	157.69
<b>Operational Costs</b>	262.74	269.33	600	430.09	400
Transport	300	169.33	300	150	0
Collection	300	100	300	150	200
Chemicals	49.39				
Power				130.09	200
Total Cost	1266.79	519.88	1057.33	950.46	610.25

#### Table 4: Per Unit Costs of Waste Treatment (INR per MTA)

Source: Authors' construction

#### e. Waste from waste treatment (Matrix $W_{32}$ )

A waste disposal technique can change the waste composition, yet it cannot completely remove it. The remaining material after treatment is deposited in designated landfill areas. Considering a landfill as the last destination for waste material can be assumed as releasing residues into the environment. Consequently, this becomes an additional source of emissions, alongside the typical emissions like carbon dioxide ( $CO_2$ ), nitrogen oxides (NOx), sulfur oxides (SOx), biochemical oxygen demand/chemical oxygen demand (BOD/COD), nitrate, and phosphate, which are released into the air and water.

In the realm of waste management, it is customary to define waste based on its proportions of combustible elements, moisture, and residual matter. These aspects hold significant significance within waste management, profoundly influencing how specific waste treatment procedures function. To illustrate, the degree to which a certain amount of waste diminishes through incineration hinges on the makeup of its residual matter, which in turn is influenced by how thoroughly the waste is sorted before being introduced into the incineration process.

Waste generated from waste treatment technologies can vary depending on the specific methods and processes employed. Waste treatment technologies are designed to mitigate the environmental impact of waste by reducing its volume, toxicity, and potential for harm. However, these processes can still result in the generation of certain waste products. One such by-product is ash, a solid residue produced through combustion of waste. Ash consists of a blend of inorganic materials like sand, glass, and metals, and it can also encompass a portion of organic matter. The exact composition of ash hinges on the type of waste subjected to combustion. Ash can be generated by various waste treatment technologies. Chief among these is Municipal Solid Waste Incineration (MSWI), which stands as a significant source of ash production in waste treatment (Ferreira et al., 2003). MSWI ash is a composite of bottom ash and fly ash. Bottom ash constitutes the non-combustible residue that settles at the base of the combustion chamber. In contrast, fly ash denotes the ash carried by flue gas out of the

combustion chamber, subsequently collected by air scrubbers. Furthermore, ash can also originate from domains such as coal combustion, wastewater treatment, and hazardous waste treatment. The ash generated by waste treatment technologies presents a potential environmental hazard due to its tendency to contain heavy metals, dioxins, and other pollutants.

This study puts forward the notion of estimating the ash content releases from the treatment technologies by looking at it from a pragmatic angle of waste treatment. While looking at the various treatment technologies, incineration is one of the primary sources of ash produced. According to Nakamura and Kondo (2002), it was estimated that 5.4 percent of ash is produced by treatment technologies using incineration. Further, an attempt was made to ascertain the ash content generated by MRFs. As per the study conducted by Fyffe et al. (2016), 60 percent of residue from MRFs is used to process Solid recovered Fuel (SRF). Existing literature suggests that the amount of ash involved in SRF ranges from 1.55-22 weight percentage. The average value within this range was calculated and subsequently multiplied by 60 percent, yielding a value of 7.2 percent. The result has been applied in the context of this study.

In addition, the principles of mass balance reductions in treated waste due to recycling efforts made by industries are accounted for in this column as well. Therefore, increased recycling efforts would be reflected as higher values for the same.

#### 4. Impact Evaluation using ICRIER *Sampada* Model

#### 4.1 Employment in Waste Management

State level action will play a critical role in ensuring effective waste management and recycling practices to complement national level initiatives. In a country as diverse as India, various states display varying rates of waste collection and generation for different types of waste. Setting up an IRRP in the state of Rajasthan requires a stocktake of the current waste management structure in the state. Comprehension of the unique features of the waste management paradigm in a state will help in effective designing of the park. At the same time, understanding the existing resources of the state and the current shortcomings of the waste management sector will help identify gaps and possible roadblocks towards successful set up and operations of the park. Our forthcoming working paper, Goldar et al., (2024) details out a framework for successful operations of the said park.

With the quantum of employment generation from the park as one of the primary research objective, it is essential to explore the existing employment profile of the solid waste management and scrap waste sector in the state of Rajasthan. This not only serves as critical inputs to the ICRIER Sampada model, but also contributes to efficient planning for the setting up mechanism of the park as well as for establishing concordance between the requirements of the state with those of the park. This sub-section thus elaborates on the existing employment patterns in the relevant solid waste management and scrap waste sector in the focus state of Rajasthan. It facilitates not only the current job estimates of the sector in the State, but also presents an analysis of the quality of jobs in the sector in terms of skilled labour shares and the social security benefits available to the employed workers. For the same, data from Periodic Labour Force Survey (PLFS) for 2019-20 has been utilised. For all technical details of the assessment, please refer to Annexure 3

# a) State level employment profile of the waste sector in Rajasthan

The data analysis showcased interesting insights of the solid waste management and scrap waste sector in the State. As can be seen in Table 5, the assessment found that the total employment in the wasterelevant sectors of the State formed a marginal share of 0.3 percent in the total all industry employment of the State. However, the same waste-relevant sector employment also formed a constructive share of 7 percent in the estimated total national level solid waste management and scrap waste sector employment. Further, it is interesting to note that of the considered 11 industry components, Rajasthan's solid waste management and scrap waste sector employment is restricted to seven sectors, namely collection of non-hazardous waste, collection of hazardous waste, treatment of non-hazardous waste, treatment of hazardous waste, materials recovery, wholesale of textile fibres, and wholesale of metal and non-metal waste and scrap. In addition, it was observed that all these sectors involved usual principal activity employment<sup>9</sup>, with no subsidiary employment shares.

<sup>9</sup> Under the PLFS methodology, the usual principal status activity of a person is determined as the status/activity on which the person spent relatively long time (major time criterion) during the 365 days preceding the date of the survey. In addition to this usual principal status/activity, some economic activity pursued for 30 days or more during the reference period of 365 days preceding the date of survey is considered as subsidiary activity engagement (NSS, 2020).

An analysis of the estimates in Table 5 reveals that the two collection of waste sectors, along with the sector of wholesale of metal and non-metal waste and scrap are the only three sectors that register a double digit share of the total waste and scrap-relevant employment in the State. In that, the industry division of collection of non-hazardous waste takes more than half of the total waste and scrap relevant employment. It is followed by the wholesale of scrap sector and the collection of hazardous waste, respectively. These results can be interpreted as the waste sector in the state of Rajasthan to be more deeply rooted in the traditional roles of waste collection and sale of scrap.

The analysis highlights critical policy gaps. The waste and scrap sector in the state is severely restricted in terms of adequate workforce to ensure treatment of the anticipated rising levels of waste in the State. The absence of workforce to engage in either the collection or treatment of hazardous waste suggests a significant dearth of on ground waste management services in the State. With the state's ambitious EV policy, it also needs to prepare for the incoming battery waste along with other e-waste components. Further, the material recovery industry that is gradually gaining importance in the country records a small share of the total waste and scrap relevant employment in the State, indicative of a critical missing link in effectual waste management.

For greater granularity, a skill-based assessment of the waste and scrap sector employment was also undertaken. For details on the formation of the skill component, please refer to Annexure 3. As can be seen in Table 5, the State's solid waste management and scrap waste relevant sector is heavily dependent on a low skilled workforce. Low skilled employment leads the sector, forming a substantial share of 59.6 percent of the total waste-relevant employment in the State. Further, it was also observed that high skill employment forms a meagre share of 1 percent of the total waste-relevant employment.

Discussions on any form of waste management definitely involve a mention of the informal sector. On the basis of the distinction in PLFS<sup>10</sup>, data analysis signifies a majority share of 79.2 percent of the total solid waste management and scrap waste-relevant employment in the State to be engaged in informal enterprises, as can be seen in Table 6. Of the seven waste-relevant industry divisions in the State, four industry divisions showcase a complete dependency on informal enterprises.

				Employm	ent in Industry di	ivisions					
					Treatment and						
State	Total Employment in the state	Collection of non- hazardous waste	Collection of hazardous waste	Treatment and disposal of non- hazardous waste	disposal of toxic live or dead animals and other, contaminated waste, disposal of used goods; incineration of hazardous waste	Materials recovery	Wholesale of textile fibres etc.	Wholesale of metal and non- metal waste and scrap n.e.c.	Total Waste and Scrap relevant employment in the State	Share of waste sector employment in State's total employment	Share of state's waste sector employment in total National waste sector employment
Rajasthan	2,71,56,973	37,055	10,568	1,561	1,301	4,121	1,337	12,800	68,743	0.3%	7%
Share of industry divisions in state's waste sector employment		53.9%	15.4%	2.3%	1.9%	6%	1.9%	18.6%			

#### Table 5: Rajasthan Solid Waste Management and Scrap Waste Sector Employment Profile

Tu ductor divisions	Skill based employment						
industry divisions	High	Medium	Low				
Collection of non-hazardous waste	0	4,121	32,934				
Collection of hazardous waste	0	10,568	0				
Treatment and disposal of non-hazardous waste	719	842	0				
Treatment and disposal of toxic live or dead animals and other, contaminated							
waste, disposal of used goods; incineration of hazardous waste	0	1,301	0				
Materials recovery	0	4,121	0				
Wholesale of textile fibres etc.	0	1,337	0				
Wholesale of metal and non-metal waste and scrap n.e.c.	0	4,779	8,021				
Total	719	27,069	40,955				
Share of skills in state's total solid waste management and scrap waste relevant employment	1%	39.4%	59.6%				

Source: Authors' calculations, based on data from PLFS 2019-20

<sup>10</sup> The coverage classifies proprietary and partnership enterprise types as informal sector enterprises for usual status workers in industry groups/divisions 014, 016, 017, 02-99 of NIC-2008 (NSS, 2020). The NIC-2008 industry codes that are being utilised in the current study for the analysis fall within the same.

# Table 6: Formal vs Informal Employment in the Solid Waste Management and Scrap Waste Sector in Rajasthan

	Employment in	Employment in	Formal Share in	Informal Share in
Industry	<b>Formal Sector</b>	Informal Sector	the Sector total	the Sector total
	Enterprises	Enterprises	employment	employment
Collection of non-hazardous waste	8,284	28,771	22.4%	77.6%
Collection of hazardous waste	5,284	5,284	50%	50%
Treatment and disposal of non-				
hazardous waste	719	842	46.1%	53.9%
Treatment and disposal of toxic live				
or dead animals and other,				
contaminated waste, disposal of used				
goods; incineration of hazardous				
waste	0	1,301	-	100%
Materials recovery	0	4,121	-	100%
Wholesale of textile fibres etc.	0	1,337	-	100%
Wholesale of metal and non-metal				
waste and scrap n.e.c.	0	12,800	-	100%
Total	14,287	54,456		
% of total State employment in solid				
waste management and scrap waste	20.8%	79.2%		
sector				

Source: Authors' calculations, based on data from PLFS 2019-20

#### b) Quality of jobs

Quality of employment can serve as a critical determinant of both, making the sector more attractive to prospective workers as well as retaining the currently employed workers. The OECD Job Quality Framework takes a multi-dimensional approach to the idea and defines job quality on three basis which include earnings quality, labour market security, and quality of working environment (Cazes, Hijzen and Saint-Martin, 2015). In this section, we assessed the quality of jobs in the State solid waste management and scrap waste sector on the basis of availability of social security benefits to the workers

employed in the sector. As majority of workers engaged in this sector are low skilled, social security benefits like pension, provident fund (PF), gratuity, healthcare, maternity benefits to employee, etc., serve as significant contributors to their lives and thus job satisfaction. The data for these parameters is available in the PLFS database.

Data analysis showcases that the quality of jobs in the waste and scrap sector of Rajasthan is not at a satisfactory level. As can be observed in Table 7, for all seven waste-relevant sectors in the State, a majority share of the workforce is either not receiving or is not eligible for any social security benefits.

### Table 7: Availability of Social Security Benefits in the Waste and Scrap Sector in Rajasthan

	Solid waste management and scarp waste sector industry										
	divisions in the State of Rajasthan										
	D	E	F	G							
Share of the workforce eligible for/receiving some sort of social	1.20/	500/									
security in the total State waste-relevant employment	1.2%	50%	-	-	-	-	-				
Share of the workforce not eligible for/status not known, with											
respect to receiving some sort of social security in the total State	-	50%	46.1%	-	80.7%	-	69%				
waste-relevant employment											

where A is Collection of non-hazardous waste, B is Collection of hazardous waste, C is Treatment and disposal of non-hazardous waste, D is Treatment and disposal of toxic live or dead animals and other, contaminated waste, disposal of used goods; incineration of hazardous waste, E is Materials recovery, F is Wholesale of textile fibres etc., and G is Wholesale of metal and non-metal waste and scrap n.e.c.

Source: Authors' calculations, based on data from PLFS 2019-20

#### **Employment Coefficients for the SUT Analysis**

To make the numbers derived above amenable to the WSUT analysis, sectoral labour coefficients were calculated. Labour coefficients measure the labour required to produce the gross output for each sector. From an economic theory perspective, labour coefficients are the reciprocal value of labour productivity, the neoclassical unit of product value. While the abovementioned numbers expound only on the waste-relevant employment creation, employment numbers were calculated for each of the 37 WSUT goods and services sectors and the four waste treatment sectors. These employment numbers were sourced from PLFS 2019-20 as well.

The aforementioned employment numbers were then divided by the output produced by each sector to derive the sector-specific labour coefficients. The figures for the value of output produced were taken from the Rajasthan Regional Input- Output (RIO) table. It is important to note here that waste treatment is clubbed together in the 'other services' sector in typical IO tables. Therefore, to the extent production costs and linkages with other sectors are known for the four waste treatment sectors (i.e. Matrix  $T_{12}$ ), this was deducted from the 'other services' sector to avoid double counting. The relative shares of intermediate input use between 'other services' and waste treatment sectors were then used to estimate the revised net product taxes, value added and output values for the concerned sectors. The derived employment coefficients are presented in Annexure 4.

For this purpose, the waste treatment allocation matrix  $(W_{2})$  was utilised to estimate shares. Of the six types of waste being considered, for the allocation of employment estimates only four types of waste were considered. These include the dry waste, wet. waste, inert waste, and hazardous waste. This was due to the fact that the NIC code structure caters to the broad categories of hazardous and non-hazardous waste treatment and collection, along with material recovery. Shares of treatment of each type of waste by the four considered waste treatment technologies were thus estimated. In order to allocate employment across these four waste treatment technologies, these shares were then appropriately adjusted and multiplied with the obtained employment estimates for the waste sector (deducted from the other services sector, as explained previously). The entire three categories of MSW were considered as nonhazardous waste. Overall, the allocation contains the actual employment for the state of Rajasthan in that treatment technology (if it exists), in addition with the share of hazardous and non-hazardous waste being

treated by that particular technology, multiplied with the collection or treatment employment that prevails in the State.

# 4.2 Results from Baseline Runs and Employment Linkages

Continuing the discussion from earlier, Annexure 5 displays a simplified WSUT constructed for Rajasthan for 2018-19. It presents the waste flows of Rajasthan as a 47 by 47 table (with thirty-seven intermediate sectors, four treatment sectors, and six waste types). Waste volumes are reported in physical units of million tonnes and monetary units of INR one lakh. The W<sub>31</sub> part of Annexure 5 presents a breakdown of waste type generated by each intermediate sector of Rajasthan's economy. Waste generation by treatment sector is listed in the W<sub>32</sub> section. The W<sub>23</sub> section provides the waste volumes processed by each treatment type. The  $W_F$  section provides the Rajasthan's MSW data. The  $x_2$  and  $x_3$  sections give the total tonnages of waste sorted by treatment type or waste type.

Annexure 6 and 7 display the aggregated direct and total waste generation multipliers created from Rajasthan's WSUT, that is presented as Annexure 5. With the matrices being defined in different monetary and physical units, the coefficients need to be interpreted in multiple scales (lakh Rupees per lakh Rupees; lakh Rupees per metric tonne; metric tonne per metric tonne, and finally, tonnes per lakh of Rupees). Corresponding with Equation (2) and (3), the G31 and G32 sections of the Annexure 6 and 7 show the waste generation coefficients and multipliers.

To explain this further, Annexure 6 presents the direct waste generation multipliers: the waste that was produced directly in the associated sectors due to economic activity within that sector. Annexure 7 presents the total waste generation multipliers determined through the Leontief inverse, that includes the waste produced in an individual sector, as well as the waste produced throughout the supply chain enabling this sector's production.

The three tables – WSUT, Coefficient matrix and Leontief Inverse- allow us to derive some interesting results. Sectoral comparison of direct, indirect and total waste generation is presented in Table 8 and 9. These correspond to  $W_{31}$  and  $W_{32}$  components discussed earlier. Table 8 presents the waste generation by intermediate sectors. To allow for clearer comprehension, the 37 sectors have been aggregated into eight larger sectors. Direct waste generation refers to the waste produced by a specific industry during its own on-site production activities. On the other hand, indirect waste generation pertains to the amount of waste created across the supply chain due to the production processes of all industries involved in creating the final product. The total waste generation encompasses both direct waste from the industry itself and the indirect waste from the broader supply chain.

Table 8 and 9 presents the direct, indirect and total waste generation, in tonnes per lakh Rupees and tonnes per tonnes for the intermediate industry sectors and the expanded waste treatment sectors. From Table 8 we observe that the services sector has the largest direct and total waste generation amongst various intermediate sectors.

Services is followed by the mining sector, for direct waste generation and total waste generation effects. Manufacturing, on the other hand, has a negative direct impact and a significantly high indirect effect. This is due to the fact that direct effects from the manufacturing sector incorporate figures for recycling. Without recycling, the direct waste generation effects would be a much higher positive value.

Despite the varying values of waste generation effects, it is important to note that in most cases the indirect effects may be as large as, if not larger than, the direct effects in terms of waste generation. Usage of an input-output based modelling system is thus useful as it can capture both the direct as well as indirect effect of waste.

Table 8:	Total Waste	Generation	Effects	in	Aggregated	Intermediate	Sectors	(tonnes	per	lakh
	Rupees)									

	Direct Effects	Indirect Effects	Total Effects
Agriculture	0.00	0.04	0.05
Mining	0.23	0.48	0.71
Forestry	0.00	0.02	0.02
Manufacturing	-0.32	0.67	0.35
Construction	0.06	-0.06	-0.01
Utilities	0.01	0.10	0.11
Transport	0.00	0.03	0.04
Services	0.87	0.79	1.66

Source: Authors' Computation

As Table 2 has already shown, landfill (Lf) is the dominant treatment method in Rajasthan in terms of tonnes treated. The results in Table 9 indicate that landfill generates smaller direct and total waste tonnages compared to the various recycling treatments. It appears that material recycling facilities exhibit a higher degree of "inefficiency" when considering both direct and total waste generation impacts. This is because, when treating a metric ton of waste, these facilities yield a larger quantity of waste products. However, this observation is misleading, as the recycled materials (such as plastics, glass, metals, etc.) undergo additional processing, becoming useful resources in subsequent cycles. From a technical perspective, recycling through these seemingly inefficient methods could be interpreted as macroeconomically converting one type of waste into larger quantities of other types rather than genuine 'treatment'. Also, following Reynolds, et.al. (2014) one could argue "...that once landfilled, the waste material can then no longer be used as an input of production." Thus, higher "waste generation" in the MRF sector following industrial or final sector intervention is a positive outcome rather than a negative one.

#### Table 9: Total Waste Generation Effects in Waste Treatment Sectors (tonnes per tonnes treated)

	Direct Effects	Indirect Effects	Total Effects
Incineration	0.05400	0.07506	0.12906
Composting	0.00000	0.00120	0.00120
Landfill	0.00000	0.00015	0.00015
MRF	0.83129	1.00688	1.83816

Source: Authors' Computation

Three waste management techniques yield ash that is considered direct waste generation in Table 9. Nevertheless, minimal indirect effects are observed for all three scenarios (namely, incineration, material recovery facility, and construction and demolition waste management). These findings also indicate that technologically advanced treatment processes generate more waste per ton treated than the less technologically advanced and labor-intensive landfill treatment method.

Looking at the results from economic stimulus point of view, provides interesting insights. The phrase 'economic stimulus' refers to the monetary value associated with treating an extra ton of waste through each specific method (Reynolds, et. al, 2014). While it is true that waste management as an activity is not done to create an economic stimulus, in so far that it is related to demand creation for materials, labour, energy and machinery, it leads to positive impacts in the economy. Another way of looking at it could be that these 'costs' enable the choice of treatment approaches that generate useful products or material resources through recycling, instead of merely disposing of waste in landfills. Given these two positive aspects, coupled with increased employment, consumption, and lower environmental loads, signifies a stimulus.

Based on the costs, MRF provides the highest total economic activity per tonne treated. As indicated in Table 10, for every tonne of waste disposed of via material recovery stimulates INR 0.05228 lakh direct, or INR 0.06306 lakh in total economic activity. Incineration and Landfilling are the second and third highest in terms of total stimulus provided. Among technologies, composting has the lowest direct effects.

Taking the direct and indirect costs or stimulus together shows that recycling provides a larger economic stimulus than the conventional option of landfill per tonne of waste treated. This also indicates that there is room to improve the economic stimulus associated with waste treatment by diverting waste from landfill to recycling.

 Table 10: Economic Stimulus Per Tonne Treated in Waste Treatment Sectors (Rupees lakh per tonne treated)

	Direct Effects	Indirect Effects	Total Effects
Incineration	0.01267	0.01979	0.03246
Composting	0.00520	0.00701	0.01221
Landfill	0.01057	0.01242	0.02300
MRF	0.05228	0.01078	0.06306

Source: Authors' Computation

#### 5. Evaluating the impact of IRRP

A number of Indian states such as Maharashtra, Delhi, and Rajasthan have initiated the creation of waste recycling parks. Rajasthan, in particular, stands out as one of the pioneering states in advancing the idea of industrial parks dedicated to treating waste (including e-waste) as a valuable commodity (Goldar et al., 2024).<sup>11</sup> The Park in Rajasthan is slated for establishment in the Jaipur district and has been designated for the establishment of waste processing facilities that would allow the exchange of various waste streams. It is envisioned to span 44 hectares and serveas the first IRRP in India. It is expected that many more states would learn from Rajasthan's case to understand the costs and benefits of setting up a similar facility. The ICRIER *Sampada* model facilitates a feasibility analysis of the impact on the waste management system in the state of Rajasthan post the establishment of the IRRP. An essential contribution of this study is thus not only the pre-feasibility analysis of the park to understand the potential benefits but also to enrich the literature on the economic benefits of waste recycling for the local as well as national economy. To re-iterate, the analysis helps establish an economic criteria for taking up new recycling projects over and above the environmental ones, perhaps capable of being replicated for other states.

This section elaborates on the details of the IRRP in the state of Rajasthan and the creation of the alternative modelling scenario for the ICRIER *Sampada* model. It also elucidates the modelling results from the aforementioned alternative scenario.

<sup>11</sup> At the time of the study, Rajasthan's plans for setting up the waste recycling park were near completion. As mentioned in an earlier working paper by the authors, Rajasthan had identified the parcel of land, commissioned site plan design, as well as initiated the tender process for land allocation to interested entities.

However, when considering the broader perspective, the generation of e-waste entails significant environmental, health, and social costs that require consideration. Firstly, factors such as resource depletion, toxic substances, and energy consumption contribute to environmental costs. Secondly, health costs are also a critical aspect to consider, encompassing issues related to exposure and community health. Thirdly, social costs, which include economic and digital disparities that can arise due to societal imbalance also need to be accouted for. Efforts to address these costs might involve promoting responsible e-waste management practices, encouraging recycling, and ensuring proper disposal through appropriate channels for treating the generated e-waste.

#### 5.1 IRRP: The Alternative Scenario

India's first IRRP is to be set up in the Tholai village of Jaipur district in Rajasthan. Based on stakeholder consultation as well as grey literature, the Park would be spread across an area of 44 hectares, comprising of 100 plots (1,000 sqm -10,000sqm area). The plots would be available for setting up of waste processing units for different types of wastes such as e-waste, plastic waste, hazardous waste, end-of-life vehicles, metal scraps, etc.

The anticipated land use in the IRRP appears to follow the following pattern, according to data from key informants as shown in Figure 3.

- 1. Processing zone individual industrial plots for Micro, Small and Medium Enterprises (MSME) and large-scale industries (Registered Vehicle Scrapping Facility (RVSF) and waste recycling units).
- 2. Infrastructural zone road network, vehicle including truck parking area, logistics hub, warehouse, treatment plants (water, effluent, solid waste), dumping yard, stormwater treatment and storage, captive power plant (solar), and landscaped green area.
- 3. Non-processing zones entry gate, administrative office, laboratory and incubation centre, disaster mitigation centre, medical centre, common facilities and convention centre, one stop services building, gender-inclusive amenities, recreation centre, commercial areas.



#### Figure 3: Map of the proposed IRRP in Rajasthan

*Source: Arora and Prakash, 2023* 

The composition of plots by types of waste disposal is unknown because the IRRP project is still at the Expression of Interest (EOI) stage. the name *Rajasthan Patrika* provided some essential information about the park, as can be observed from Figure 4. The advertisement suggests that the initial bidding will be carried out for 19 out of the 100 plots envisaged, in the first phase. It can thus be inferred that the other plots would be allotted in later stages.

An exploration of grey literature, specifically an advertisement<sup>12</sup> published in the newspaper daily by

### Figure 4: Details on the IRRP proposed in Rajasthan



Source: Newspaper excerpt; Rajasthan Patrika

For the alternative scenario of the ICRIER *Sampada* model i.e. the setting up of IRRP in the state of Rajasthan, the direct impact in terms of the units being set up in the first phase and the investment requirement was estimated. It was assumed that the facilities in the proposed IRRP will be based on MRF technology. The previously mentioned SBM data was utilised to flesh out this assumption in terms of the size of the plant and costing for the same.

As per the data, 13 plants utilise MRF technologies across the state of Rajasthan as shown in Table 11 below. With a combined designed plant capacity of **749.55 (TPD)**, these plants have an actual output of **518.05 (TPD)** which translates to a Capacity Utilisation Factor (CUF) of 0.691 (refer to Annexure 8). A deliberate attempt has been made to draw a distinction between plants with different plant capacities. Using the same SBM data, details for three different plant capacity categories were drawn out.

<sup>11</sup> Article was published on September 21st, 2023

### Table 11: Material Recycling Facility Plant Categorisation on Actual Output (MTA) as per SBM data

Plant Category	Actual Output (MTA)	Count	Actual Output (MTA)	Project Cost (in INR Cr.)
Small	<2000	7	7,407.68	1.40
Medium	2000-20,000	4	28,086.75	18.97
Large	>20,000	2	1,34,685.00	35.00
	Total	13	1,70,179.43	55.37

Source: Swachh Bharat Mission Urban data

Based on the assumption outlined earlier, the estimated output for the proposed 19 plants in the IRRP was derived, as shown in Table 12.

#### Table 12: Projected Material Recycling Facility Plant Capacity for proposed IRRP, Rajasthan

Plant Category	Actual Output (MTA) Count Actual Output (MTA)		Project Cost (in INR Cr.)	
Small	<2000	10	10,582.39	2
Medium	2000-20,000	6	56,173.50	37.94
Large >20,000		3	2,02,027.50	52.5
Total		19	2,68,783.39	92.44

Source: Authors' Computation

For establishing the park with a total of 19 MRF technology plants (10 small, 6 medium and 3 large), the analysis estimates that the total project cost will be approximately INR 92 crore and will provide a recycled material output of 2.68 lakhs MTPA (as shown in Table 12). Using the utilisation factor of 0.691 as derived earlier, the proposed IRRP will be able to treat around 3.88 lakhs MTPA of waste.

As outlined earlier in section 4, the waste recycling industry will be a significant source of direct employment for the state in the future. However, in addition to generation of direct jobs in the waste recycling industry, it will also support the creation of indirect jobs in other sectors of the economy through the demand for new products made from recycled materials. This in turn will support jobs in manufacturing, retail, and transportation.

Using input from discussions with stakeholders, an estimate of employment figures in operational recycling facilities in Rajasthan was gathered, as depicted in Table 13. Based on the previously collected data and estimations, these employment estimates were interpreted for assessment of employment in the IRRP. Given that the construction of the IRRP in Rajasthan includes 19 MRF technology plants (10 small, 6 medium, and 3 large), this may lead to the creation of 250 jobs in small recycling facilities, 600 jobs in medium recycling facilities and 3,000 jobs for large recycling facilities.

### Table 13: Employment numbers as per Material Recycling Facility Plant Capacity

Labour Type Job Description		Small	Medium	Large
	Office Administration	5	20	200
Skilled Labour	Business development	5	20	200
	Logistics	5	20	200
Unskilled Labour Black mass making, leaching, material extraction		10	40	400
Total		25	100	1000

*Source: Stakeholder consultations* 

#### 5.2 Macroeconomic Impacts of IRRP

This particular section brings together results derived in preceding sections by way of estimating the impact of Rajasthan's IRRP in its initial phase. With additional waste generated by final demand sectors and treatment done by plants located in the park, there would be gains across other linked sectors. The study estimates that additional treatment of 2.68 lakhs MTPA (estimated in Table 12), or 5.5 percent of the total waste treated in the state, could lead to additional economic activity of INR 169.48 crores annually for the state (presented in Table 14). This gain would be spread across different sectors that provide inputs for the operations of this park.

#### **Table 14: Economic Stimulus from IRRP**

	Direct Effects	Direct Effects Indirect Effects		Additional Waste Treatment	Additional Economic Activity
	(Rupees lakh per tonne treated )	(Rupees lakh per tonne treated	(Rupees lakh per tonne treated	(in tonnes)	(in Rupees lakh)
MRF	0.05228	0.01078	0.06306	268783.4	16948.49

#### Source: Authors' Computation

Translating this economic stimulus in terms of gains in employment that the IRRP could induce needs a look at the Leontief inverse of waste treatment technology costs and interactions with the rest of the economy, related employment coefficients (i.e., employment/output ratio) and the additional waste treatment that the IRRP could potentially do. Pulling all the elements together leads to the derivation of the indirect employment that the IRRP in its first phase could generate. Table 15 below presents the additional state employment that may be created due to the park in its first phase. It is interesting to note here that the indirect effects of the park (in terms of its trickle-down effects on employment) could be as much as 45 percent of direct effects.

#### Table 15: Additional Employment from IRRP (Initial Phase)

	Direct Effects	Indirect Effects	Total Effects
IRRP	3850	1742	5592

Source: Authors' Computation

Looking at the computations from a different vantage point, i.e. from the sectors where the trickledown benefits would manifest, also presents some interesting insights. Table 16 parses the data into the sectors where these indirect employment gains would be visible with the setting up of the IRRP (Initial Phase). As can be seen, gains are made across the board, but most employment opportunities occur in the construction, manufacturing, services, and transport sectors.

#### Table 16: Indirect Employment Created in Aggregated Intermediate Sectors

Sectors	Employment Creation
Agriculture	82
Mining	28
Forestry	1
Manufacturing	388
Construction	618
Utilities	25
Transport	221
Services	379
Total	1742

Source: Authors' Computation

#### 6. Recommendations

The study provides the following policy recommendations:

- While the success of the IRRP is dependent on multiple factors like the establishment of strong networks between recyclers and government authorities, etc., there is a critical need to establish guidelines for the development of such parks in India. An ICRIER working paper presents a framework that encompasses five critical factors for the development of such parks in India (Goldar et al., 2024). These five factors include understanding the demand for these parks, reviewing the existing legislative and regulatory frameworks, financing the parks, operationalising the park, and post-establishment monitoring. It is critical that the IRRP as well as other similar structures in different state adopt and establish such frameworks to ensure a holistic establishment of the park and thus the development of the state.
- The prevalent employment structure in the waste sector of Rajasthan highlights critical policy gaps. Scattered employment within the sector, with a dominance of the informal sector signifies the need for major policy-level interventions. Furthermore, the dominance of low skill levels and the complete absence of high skilled workforce adds to the woes. A healthy balance of all skill level employment is necessary to ensure smooth operations of any industry division and thus the entire sector. The current skill landscape of Rajasthan's solid waste management and scrap waste sector raises concerns and indicates a significant skill gap, underscoring the urgent need for greater skilling initiatives. The State could encourage collaborations with Skill Councils to run training programs as per the requirements of the diverse industry components of the waste sector. Moreover, these programs could be integrated as part of various waste management policies of the State to help inculcate the practices and behavior at the base itself.
- From a waste technology perspective, a large portion of waste is currently being sent to landfills. Besides the potential environmental risks, such as emissions and possible leaching, there is also a missed economic opportunity.

By focusing on recycling (via the Mission Lifestyle for Environment or the LiFE Mission), establishing efficient reverse supply chains for collection and transportation, and creating material recovery infrastructure, it is possible to improve the economic stimulus associated with waste treatment by diverting waste from landfills to recycling.

• While the IRRP is in its initial phases, the study highlights the significant positive spillover effects it could potentially have in terms of additional economic activity and employment creation. This study could, therefore, be considered a prefeasibility study since the entire park has not yet become operational. An impact evaluation study conducted 3-5 years after the setup of the entire park would further illuminate the benefits accruing to the local economy.

#### 7. Conclusion and Way Forward

Similar to the resource recovery park in Rajasthan, other comparable initiatives have been introduced in other states as well. Maharashtra has announced the setting up of four circular economy parks in the state for diverse industries. The primary focus of these parks has been stated to be the recycling of scraps and other wastes (PTI, 2023). The Delhi cabinet has also approved the setting up of an e-waste eco-park in the national capital for effective e-waste management of the state, focusing on recycling and re-manufacturing (ANI, 2022). The successful operation of these parks will provide benefits to states as well as to the country. There will be multiple macroeconomic benefits such as increase in output, investments, employment generation, etc., while at the same time facilitating long-term socio-economic development. Therefore, a similar feasibility and impact assessment can be undertaken for all such future endeavors across states.

The ICRIER *Sampada* model, in its future iterations, would cover greater number of waste types as well as waste treatment technologies to enable more granular explorations. These improvements would be critical to understand policy impacts from multiple facets – behavioral nudge from LiFE Mission, waste technology improvements and cost-efficiency, critical raw material policy and recoveries from recycling, etc.

#### Annexures

Annexure 1: Methodology adopted to downscale national-level IO table to sub-national level

#### **RIO construction**

The national Input-Output (IO) serves as a benchmark model for the estimation of some regional components. The construction of a regional IO table entails the estimation of regional final demand and supply, regional intermediate consumption, regional household savings, and regional direct tax payments and subsidies. Therefore, the present paper adds to the literature by constructing a regional (State) IO table with the help of national coefficients as provided in the India IO table in Chaudhuri, Pratap and Pohit (2024).

Chaudhuri, Pratap and Pohit (2024) provides IO table for the base year 2018-19 using the National Supply Use Table (SUT) provided by the Ministry of Statistics and Programme Implementation (MoSPI), Government of India. They provide a symmetric 65-sector IO. However, for the purposes of the current study, these sectors were aggregated to a lesser number of 37 sectors for the creation of a regional IO (RIO) tables for the state of Rajasthan. The key data requirement for input-output tables were – sectoral value of output, inputs consumed, value addition by each sector, and final demand consumption by households, governments, rest of the country and the rest of the world. The RIO table is estimated at purchaser's price.

Concordances between the selected 37 sectors (see Annexure 2) and the National Industries Classification (NIC) codes-2008 and the National Product Classification For Manufacturing Sector (NPCMS) codes-2011 was developed to facilitate mapping of values across different variables and datasets.

The details of the methodology for the estimation of the regional components to prepare the regional IO table are as provided below.

#### **Output Structure**

**Primary Sector:** Crops' Livestock, Forestry & Logging, Fishing & Aquaculture and Mining and Quarrying (M&Q)

The estimates for Gross State Value Added (GSVA) for Rajasthan, for the aforementioned primary sectors

for 2018-19 were obtained from the Ministry of Statistics and Programme Implementation (MoSPI). With specific reference to the M&Q sector, since the state level GSVA data does not provide a bifurcation between the subcomponents of mining of (a) coal & lignite, (b) petroleum & natural gas and (c) iron ore, (d) non-ferrous metal ores and (e) other mining, national level ratios were used to arrive at the same. Similarly, data pertaining to the state-wise Gross Value of Output (GVO) for the sub-sectors for the state in question, was calculated using the national level ratios of GVA/GVO, obtained from the all-India *Supply and Use Table*.

Secondary Sector: Food and Beverages, Textile and Apparel, Leather, Basic Metals and Metal Products, Electric and Electronic Equipment, Machinery and Equipment, Transport Equipment, Coke and Refined Petroleum Products, Chemical and Chemical Products, Pharmaceuticals, Rubber and Plastic Products, Non-metallic Mineral Products, Wood Products, Paper and Printing, and Other Manufacturing

Similar to the primary sectors, the estimates for Gross State Value Added (GSVA) for Rajasthan, were obtained from MoSPI. However, they were aggregated under the heading 'manufacturing'. The value-added figure was disaggregated into the aforementioned secondary sectors using information from ASI. Relative shares were computed using ASI value added totals for each sector and were then multiplied with the 'manufacturing' value added figure from MoSPI. State-wise GVO for the secondary sectors was calculated using the national level ratios of GVA/GVO, obtained from the all-India *Supply and Use Table*.

Service Sector: Construction, Electricity, Gas, Water Supply, transport services, storage and warehousing, communication, trade, hotel and restaurants, financial services, real estate and professional services, other services and public administration and defence

The estimates for GSVA for Rajasthan, for the aforementioned service sectors for 2018-19 were obtained from the MoSPI. With specific reference to the <u>Electricity, Gas, and Water Supply</u> sectors, the state level GSVA data does not provide a bifurcation between these sub-components. It provides a single value for all three, clubbed into one. Therefore, national level ratios were used to arrive at the numbers for the three sub-components. Similarly, data pertaining to the state-wise GVO for the sub-sectors for the state in question was calculated using

the national level ratios of GVA/GVO, obtained from the all-India *Supply and Use Table*.

#### Input Structure

Primary Sector: Crops, Livestock, Forestry & Logging, Fishing & Aquaculture and Mining and Quarrying (M&Q)

Secondary Sector: Food and Beverages, Textile and Apparel, Leather, Basic Metals and Metal Products, Electric and Electronic Equipment, Machinery and Equipment, Transport Equipment, Coke and Refined Petroleum Products, Chemical and Chemical Products, Pharmaceuticals, Rubber and Plastic Products, Non-metallic Mineral Products, Wood Products, Paper and Printing, and Other Manufacturing

Service Sector: Construction, Electricity, Gas, Water Supply, transport services, storage and warehousing, communication, trade, hotel and restaurants, financial services, real estate and professional services, other services and public administration and defence

The value of inputs was calculated by subtracting GVA from GVO and the input structure that was used followed the same proportions as adopted by Chaudhuri, Pratap and Pohit (2024) for the all India IO for 2018-19.

### **Final Demand**

#### Gross Fixed Capital Formation (GFCF)

The data for GFCF for Rajasthan was obtained from the *Handbook of Statistics on Indian States* published by the Reserve Bank of India. The estimates so found were then distributed across sectors in the same proportion as adopted by Chaudhuri, Pratap and Pohit (2024).

#### <u>Government Final Consumption Expenditure</u> (GFCE)

The GFCE data for Rajasthan was collected from the *Economic and Purpose Classification of Rajasthan State Budget 2020-21.* The figures so obtained were then distributed across sectors based on the proportions adopted by Chaudhuri, Pratap and Pohit (2024).

#### Private Final Consumption Expenditure (PFCE)

For the calculation of item-wise PFCE, data from National Sample Survey Office (NSSO) 68th Round

Household Consumption Expenditure Survey (2011-12) has been used. As a first step in the process, a concordance was developed between the selected 37 sectors and the items of consumption in the NSS consumer expenditure survey. Each item code pertaining to diverse consumer categories in various blocks of the 68th NSS consumer expenditure survey was mapped with the 37 sectors of the SAM. The previously developed concordance between the 37 sectors and the NIC codes under the study was further utilised to aid the classification of consumer items as well as to clear any discrepancies in the classification hence developed. The state totals have been used to calculate relative shares and distribute the figures for PFCE computed by Chaudhuri, Pratap and Pohit (2024).

#### Taxes

The data for tax revenue collected by Rajasthan was sourced from the *Budget at a Glance 2020-21* document. The data so obtained was further bifurcated into direct and indirect taxes.

#### **Subsidies**

The data for subsidies provided by the states was collated from the *State Finances Audit Report of the Controller and Auditor General of India 2022* which has been subsequently concorded to the 37 sectors included as part of the study.

#### Net Exports (Rest of the World and Rest of India)

The data for net exports of goods has been computed using data from state-wise principal exports and imports available on web based platform, India Stats. The exported and imported commodities as found in the state trade data were concorded with the NPCMS codes-2011. It facilitated the mapping exercise of trade data with the 37 sectors, utilising the previously developed concordance between the sectors and the NPCMS codes. The products thus concorded were then aggregated as per the 37 sectors. The data for net exports of services has been computed using the Prowess database and the India IO table from Chaudhuri, Pratap and Pohit (2024). It is constructed using state-wise and product-wise shares of exports and imports of companies in the service sector available in Prowess data. The state export and import proportions in all-India are then estimated for Rajasthan and then multiplied with productwise export and import data of services provided in the India IO table. Net exports are derived as the difference between exports and imports. If the value of net exports is negative, this implies that the state is a net importer, and if it is positive, the state is a net exporter.

The present paper does not separately compute interstate goods and services movement because of the unavailability of reliable data. Directorate General of Commercial Intelligence and Statistics (DGCI&S) provides data on state-wise and product-wise movement of few goods (not services), that too only by road. There are many caveats of using this data and will be attempted to be incorporated in subsequent iterations (following Saluja, 2014). For the present analysis' purpose, the difference between production values and demand totals have been taken to represent inter-state trade of goods and services.

Annexure 2: List of 37 sectors being used in the constructed IO table for 2018-19

S No.	Sectors
1	Agriculture
2	Livestock & Livestock Products
3	Forestry and Logging
4	Fishing & Aquaculture
5	Mining of Coal & Lignite
6	Mining of Petroleum and Natural Gas
7	Mining of Iron Ore
8	Mining of Non-ferrous metal ores
9	Other Mining
10	Manufacturing of Food and Beverages
11	Manufacturing of Textile and Apparel
12	Manufacturing of leather and related products
13	Manufacturing of Basic metals and metal products
14	Manufacturing of Electric and Electronic Equipment
15	Manufacturing of machinery and equipment n.e.c.
16	Manufacturing of Transport
17	Manufacturing of coke and refined petroleum products
18	Manufacturing of chemical and chemical products except pharmaceuticals, medicinal and botanical products
19	Manufacturing of pharmaceutical; medicinal chemicals and botanical products
20	Manufacturing of rubber & plastic products
21	Manufacturing of other non-metallic mineral products
23	Manufacturing of Wood Products
22	Paper And Printing
24	Other Manufacturing
25	Construction
26	Electricity
27	Gas
28	Water supply
29	Transport services
30	Storage & warehousing
31	Communication
32	Trade
33	Hotels & Restaurant
34	Financial services
35	Real estate, ownership of dwelling & professional services
36	Other Services
37	Public administration & defence

#### Annexure 3: Employment analysis

For the purpose of assessment of existing employment in the waste sector of the state of Rajasthan, the study utilised secondary data source of Periodic Labour Force Survey (PLFS) for the estimates of 2019-20. PLFS is the new and modified version of the quinquennial employment-unemployment survey (EUS) rounds of the National Sample Survey Organisation (NSSO) aimed at measuring quarterly changes in various labour market statistical indicators in urban areas and generating annual estimates for these indicators both for rural and urban areas. The employment results are based on PLFS data for only 'first-visit' rounds, for both rural and urban areas.

a) Identification of solid waste management and scrap waste industries

The PLFS dataset provides information on several macroeconomic parameters for different industries in the economy, recognised through the National Industrial Classification (NIC)-2008 codes. NIC codes have been utilised for the identification of existing solid waste management and scrap waste

industries through a meticulous mapping exercise, at a detailed 5-digit level. Since there exists no specific categorisation of a particular type of waste in the NIC code structure, the selected industry codes were based on the identification of any direct or indirect connection with solid waste collection, processing, or scrap waste sale. This exercise aids to capture the solid waste management and scrap waste sector in its optimum entirety, including collection and treatment activities as well as ultimate end sale of diverse waste scrap.

The mapping exercise identified 11 industries (Table A.1 below), relevant to the group of solid waste management and scrap waste sector. These 11 industry divisions thus represent the solid waste management and scrap waste sector in the secondary data analysis for a comprehensive understanding of the existing employment structure in the sector. While we recognise that the assessment based on these industries will represent broad estimates, it will nonetheless help in the identification of existing employment patterns, gaps, and other specificities of the sector.

#### Table A. 1: NIC codes mapping of solid waste management and scrap waste sector

Classification area	NIC 2008 code (5 digit)	NIC 2008 description	
Waste	38110	Collection of non-hazardous waste	
	38120	Collection of hazardous waste	
	38210	Treatment and disposal of non-hazardous waste	
	38221	Treatment and disposal of toxic live or dead animals and other,	
	38221	contaminated waste, disposal of used goods; incineration of hazardous waste	
	38300	Materials recovery	
	39000	Remediation activities and other waste management services	
	46693	Wholesale of plastic materials in primary forms	
	46694	Wholesale of rubber	
	46695	Wholesale of textile fibres etc.	
	46696	Wholesale of paper in bulk	
	46699	Wholesale of metal and non-metal waste and scrap n.e.c.	

Note: n.e.c : not elsewhere classified

b) Skill profiling of the employment in the solid waste management and scrap waste sector

Skills form an essential pillar in the development of a productive workforce. There are multiple studies that link employment and productivity gains with increase in skill composition. Apart from productivity gains, skill development also plays a significant role in facilitating economic and social empowerment of vulnerable groups (Das, 2015; Tara and Kumar, 2016) as well as organisation level benefits such as greater growth due to a more skilled and productive workforce (Saini and Budhwar, 2008; Panda, 2015), more opportunities for the development of innovation and entrepreneurship capabilities (Bhardwaj, 2014; Hukampal and Bhowmick, 2016) etc. Any change in a sector structure or composition initiates changes in the workforce quantum as well as demands a stocktake

of the prevalent skills in the sector to identify avenues of new or upgradation of those existing skills in the sector.

It is anticipated that the growth in the types, magnitude, and composition of waste in the country will demand a different set of skills for waste management activities than those existing with the current workforce. For instance, with the expansion of consumer electronic durables as well as the new incoming battery waste, e-waste processing will change and command an informed workforce to undertake those changes in management activities. The existing level of skills for waste management activities could require both new skilling requirements and/or upgradation. The establishment of the aforementioned ERP park can also serve as a hub of skill development or skill exchange with the establishment of recycling initiatives of multiple waste industries. It is thus essential to review the existing skill prevalence in the waste sector which will aid in the identification of gaps for efficient organisation and planning within the ERP as well as for future policy making and implementation of initiatives.

#### Defining skill

To achieve this objective, a skill variable was introduced in the secondary data analysis based on the level of educational attainment. The usage of educational attainment as a skill identifier medium is based on the universal acceptance of education as one of the most important determinants for defining skilled population. In addition, with an increased emphasis on 'Skilling India' and evolution of the National Skills Quality Framework (NSQF), skills may no longer be defined by general educational attainment alone (Ministry of Finance, 2016). It is thus vital to extend the scope of skill formation beyond general education to include technical and vocational education/training as well. The current analysis thus defines the skill component to be based on an amalgamation of general and technical education levels as well as on any vocational training received.

The elaborative classification of skill levels and their education composition is as indicated below:

- **High skill:** Graduate, post-graduate and above, and/or technical education with diploma/ certificate course for graduate and above level.
- **Medium skill:** General education with primary, middle, secondary, higher secondary or diploma/ certificate course, and/or technical education with technical degree or diploma/ certificate course below graduate level, and/or received vocational training
- Low Skill: Not literate to below primary general education. Essentially, it is assumed that the entire population is low skilled with different education and training levels adding later to the skill set of the worker.

It needs to be pointed out that the criterion of vocational training has been exclusively applied for medium skill workers. The low and high skill levels are based on only general and technical education parameters, assuming that maximum variability in employment would exist for workers with medium level of skill. Workforce with medium level of skills is assumed to have a higher probability of up-skilling and thus moving further up on the employment ladder. They are hence more open to training programs and avenues of skill upgradation, in comparison with the low and high level skill set workforce which would have relatively limited scope and motivation for additional training.

## Annexure 4: Employment coefficients

S.No.	Sector		Output	Empt-Output Coefficient
1	Agriculture	13265305	13024015	1.018527
2	Livestock	1154578	12342867	0.093542
3	Forestry and Logging	9191	2693493	0.003412
4	Fishing & Aquaculture		101504	0
5	Coal & Lignite		1050411	0
6	Mining of Petroleum & Natural Gas	2383	1160535	0.002053
7	Iron Ore	2791	627544	0.004447
8	Non-ferrous metal ores	17693	421755	0.041951
9	Other Mining	212761	1248113	0.170466
10	Food & Beverages	288412	6426942	0.044875
11	Textile & Apparel	661147	3864086	0.1711
12	Manufacture of leather and related products	85716	379042	0.226139
13	Basic Metals & Metal Products	187637	6551891	0.028639
14	Electric & Electronic Equipment	55371	2343887	0.023624
15	Manufacture of machinery and equipments n.e.c.	101900	1995832	0.051056
16	Manufacture of Transport	70451	3951083	0.017831
17	Manufacture of coke and refined petroleum products		4406965	0
18	Manufacture of chemical and chemical products except pharmaceuticals, medicinal and botanical products	17680	3293308	0.005368
19	Manufacture of pharmaceutical; medicinal chemicals and botanical products	27658	1379793	0.020045
20	Manufacture of rubber & plastic products	34990	1477465	0.023682
21	Manufacture of other non-metallic mineral products	359449	1815325	0.198008
22	Paper & Printing	23446	866698	0.027052
23	Wood Products	343760	1077128	0.319145
24	Other Manufacturing	381958	929880	0.41076
25	Construction	3621116	20356406	0.177886
26	Electricity	73327	5324959	0.01377
27	Gas	2550	745522	0.00342
28	Water supply	89229	681408	0.130948
29	Transport Services	997653	8248200	0.120954
30	Storage & warehousing	2132	94171	0.02264
31	Communication	72161	3345991	0.021566
32	Trade	2210592	14472799	0.152741
33	Hotels & Restaurant	372122	1540255	0.241598
34	Financial Services	146717	4784925	0.030662
35	Real estate, ownership of dwelling & professional services	382890	12878857	0.02973
36	Other Services	1669465	13140559	0.127047
37	Public administration. & defence	212742	3891127	0.054674
	Total	27156973	162934745	

## Annexure 5: WSUT for Rajasthan

Waste Supply- Use Table, 2018-													
19, (in Rs crore)													
		1	2	3	4	5	6	7	8	9	10	11	12
G. 11				Forestry and	Fishing &	Coal &	Mining of Petroleum	Iron	Non ferrous	Other	Food &	Textile &	Manufacture of leather
S No.	Product X Product	Agriculture	Livestock	Logging	Aquaculture	Lignite	& Natural Gas	Ore	metal ores	Mining	Beverages	Apparel	and related products
1	Agriculture	402823	1633309	0	35	5	0	0	0	4192	1/46009	286752	0
2	Livestock	0	85476	0	3516	0	0	0	0	202	493044	8393	15080
3	Forestry and Logging	0	158/32	4660	0	1	4	0	0	1/1	1/6/2	140	66
4	Fishing & Aquaculture	0	0	0	1663	0	0	0	0	0	118235	6	0
5	Coal & Lignite	0	0	0	0	/18	23/1	42	896	14800	23293	30286	145
6	Mining of Petroleum & Natural Gas	0	0	0	0	45520	1/2414	0	0	24084	0	/40	0
/	Iron Ore	0	0	0	0	0	0	0	0	207	0	1	0
8	Non-terrous metal ores	0	0	0	0	0	228	0	0	965	5421	33	726
9	Other Mining	0	126142	0	1068	0	338	0	0	19978	1202208	4699	/20
10	Toutile & Amonal	0	120145	0	4008	106	224	708	500	<u> </u>	28015	850652	19155
11	Menufrature of looth on and valated and duste	0	0	8770	29	716	234	/98	309	801	58915	6020	18133
12	Manufacture of feather and related products	0	0	0402	0	/10	280	20227	261	2002	2125	4124	1000
13	Electric & Electronic Environment	0	0	9495	00	0/1	369	29337	201	101	2133	4154	1900
14	Manufacture of machinery and aquinments n a a	57024	880	20080	17	1/309	657	22802	21	191 9270	2755	661	602
15	Manufacture of Transport	0	0	17107	17	222	037	12	25	74	20700	0	13
10	Manufacture of coke and refined petroleum products	184471	0	1/10/	181	10252	3235	8466	3703	5575	8337	6698	602
17	Manufacture of chemical and chemical products excent	1044/1	0	44045	101	19232	3233	8400	3795	5515	8557	0098	002
18	pharmaceuticals medicinal and botanical products	484483	0	0	50	3164	3485	50607	38832	9436	49147	466646	49893
10	Manufacture of pharmaceutical: medicinal chemicals		0	0	50	5104	5405	50007	56652	7450	47147	400040	
19	and botanical products	0	181397	0	145	1	0	0	0	92	17758	4859	200
20	Manufacture of rubber & plastic products	0	0	4402	0	123	3	1611	6201	3766	63710	9855	12865
20	Manufacture of other non-metallic mineral products	0	0	0	0	14	0	0	0201	20127	21930	825	0
21	Paper & Printing	0	0	11547	0	4813	132	90	116	1766	7982	3562	332
23	Wood Products	0	35089	8058	32	3344	8	538	373	1604	13593	6325	215
23	Other Manufacturing	114001	75402	107383	123	22221	18515	43621	14750	10782	153179	181676	17433
25	Construction	0	1416	9399	666	32690	9931	43709	18887	150897	54882	150073	6186
26	Electricity	106203	0	528	2	6937	1407	25878	11850	12769	91724	140081	5787
20	Gas	0	Ő	489	1	6198	480	23959	10971	145	6978	2997	23
28	Water supply	45369	Ő	526	2	6663	519	25750	11791	111	1440	72	0
29	Transport Services	68910	140646	35646	867	52719	11716	16107	22667	14419	232746	113881	11173
30	Storage & warehousing	0	0	176	0	1292	0	164	7973	37	9397	3682	0
31	Communication	0	0	1826	0	690	0	0	1486	26	0	0	0
32	Trade	208600	425756	40352	1419	14215	13316	26122	10986	18579	687247	330911	32572
33	Hotels & Restaurant	0	0	0	0	0	0	0	0	0	0	0	0
34	Financial Services	525528	9033	3175	76	6796	10002	2443	4071	11783	65465	85833	14443
	Real estate, ownership of dwelling & professional							-					
35	services	0	0	32103	83	108893	53816	16538	39210	10740	18959	34565	2744
36	Other Services	398478	1251	48043	1976	38056	11605	18765	7268	24135	1308	1809	161
37	Public administration. & defence	0	0	0	0	0	0	0	0	0	0	0	0
ut .	Incineration	0	0	0	0	0	0	0	0	0	0	0	0
me	Composting	0	0	0	0	0	0	0	0	0	0	0	0
Wa	Landfill	0	0	0	0	0	0	0	0	0	0	0	0
Tr	MRF	0	0	0	0	0	0	0	0	0	0	0	0
20	Dry MSW	0	0	0	0	0	0	0	0	0	0	156245	-547
pe	Wet MSW	58896	0	0	0	0	0	0	0	0	93619	10282	0
Ţ	Inert MSW	0	0	0	0	51432	0	47914	27802	49158	0	0	0
ste	Hazardous Waste	0	0	0	0	0	0	0	0	0	0	0	0
Wa	Biomedical Waste	0	0	0	0	0	0	0	0	0	0	0	0
	Plastic Waste	0	0	0	0	0	0	0	0	0	32614	2407	1547
	Intermediate Input Use	2596799	2874539	437768	15085	395542	314579	368488	213813	378056	5277448	2738436	250354
	Net Product Tax	162307	179666	27362	943	24722	19662	23031	13364	23630	329854	171159	15648
	GVA	10427215	9468328	2255725	86419	654869	845957	259057	207942	870056	1149495	1125650	128688
	Output	13024015	12342867	2693493	101504	1050411	1160535	627544	421755	1248113	6426942	3864086	379042

		13	14	15	16	17	18	19	20	21	22	23	24
				Manufacture		Manufacture	Manufacture of chemical	Manufacture of		Manufacture			
		Basic		of machinery		of coke and	and chemical products	pharmaceutical;	Manufacture	of other non-			
		Metals &	Electric &	and		refined	except pharmaceuticals,	medicinal	of rubber &	metallic			
S		Metal	Electronic	equipments	Manufacture	petroleum	medicinal and botanical	chemicals and	plastic	mineral	Paper &	Wood	Other
No.	Product X Product	products	Equipment	n.e.c.	of Transport	products	products	botanical products	products	products	Printing	Products	Manufacturing
1	Agriculture	1902	225	159	112	0	12068	6642	30825	393	2189	2168	28168
2	Livestock	2	1	1	0	0	247	343	0	0	0	74	2807
3	Forestry and Logging	358	567	418	520	82	5552	23156	239	1526	58246	164145	6143
4	Fishing & Aquaculture	3	1	0	0	0	415	16	0	0	0	1	714
5	Coal & Lignite	603616	158	657	222	44227	27790	1530	2438	136406	13652	1151	15659
6	Mining of Petroleum & Natural Gas	2	66	62	71	3215805	267880	0	240	646	0	0	34519
7	Iron Ore	300285	687	1203	14277	0	35	0	0	1971	0	39	5626
8	Non-ferrous metal ores	206420	7489	2504	568	0	2289	154	106	9170	58	1384	18898
9	Other Mining	143306	7953	2172	2218	0	178739	1691	3818	189640	2776	5181	37510
10	Food & Beverages	349	80	133	126	0	27596	8333	220	750	1002	313	13800
11	Textile & Apparel	1954	4111	1774	7951	4368	38479	7098	24768	1409	2012	15663	17662
12	Manufacture of leather and related products	28	339	67	833	0	2	0	163	0	48	2633	491
13	Basic Metals & Metal Products	1898821	385550	470051	538875	0	16752	1138	16504	32862	5855	60220	138313
14	Electric & Electronic Equipment	14743	450082	84313	175466	0	453	921	1897	502	772	1257	15794
15	Manufacture of machinery and equipments n.e.c.	101959	131908	184672	270183	11647	9733	28580	6649	3295	364	9941	17789
16	Manufacture of Transport	4731	47502	48229	688998	0	0	0	643	158	0	184	10167
17	Manufacture of coke and refined petroleum products	114078	3442	2598	3179	59981	43949	1530	8374	24024	558	358	19409
	Manufacture of chemical and chemical products except												
18	pharmaceuticals, medicinal and botanical products	56582	49424	23894	72073	42546	949606	152917	510328	85870	73491	77640	61960
	Manufacture of pharmaceutical: medicinal chemicals and				,								
19	botanical products	200	2019	4	9	0	17004	169151	904	697	92	131	6867
20	Manufacture of rubber & plastic products	8061	57480	30885	119205	51	13736	10054	89488	2312	10207	18703	9346
21	Manufacture of other non-metallic mineral products	3162	16674	9144	7554	0	9444	1982	2743	191200	204	1935	5055
22	Paper & Printing	1004	4884	2045	2160	2469	5573	2038	6389	2747	59146	328	3589
23	Wood Products	5974	5115	2664	21055	82	14352	108	1390	12939	84505	98080	8845
24	Other Manufacturing	297494	63382	94333	222703	19049	77748	56361	37843	67729	89940	36118	82220
25	Construction	170828	152015	100110	95744	15581	51397	49198	70576	69991	40716	23541	30826
26	Electricity	310804	28842	27570	31907	16582	82068	34781	50724	118012	27835	18413	20487
27	Gas	4008	1341	1673	6659	0	3744	1061	814	192	322	408	655
28	Water supply	0	4	12	0	70	631	83	0	137	0	0	49
29	Transport Services	212181	66756	48478	117289	154696	120120	24735	45190	51750	23361	31409	34671
30	Storage & warehousing	0	0	0	0	0	118	0	0	0	0	0	1538
31	Communication	0	0	0	0	0	0	0	0	0	0	0	1014
32	Trade	605548	195727	141517	348733	200357	266481	71698	128245	123577	69620	94337	88544
33	Hotels & Restaurant	0	0	0	0	0	0	0	0	0	0	0	0
34	Financial Services	100087	122648	63802	99947	51769	88534	58119	43802	62541	39231	30932	29194
35	Real estate, ownership of dwelling & professional services	119598	15594	11481	37506	33336	136264	34944	37567	14073	1068	905	13273
36	Other Services	1029	788	335	1256	0	431	389	577	548	295	550	962
37	Public administration. & defence	0	0	0	0	0	0	0	0	0	0	0	0
nt	Incineration	0	0	0	0	0	0	0	0	0	0	0	0
ste	Composting	0	0	0	0	0	0	0	0	0	0	0	0
Wa eat	Landfill	0	0	0	0	0	0	0	0	0	0	0	0
L L	MRF	0	0	0	0	0	0	0	0	0	0	0	0
	Drv MSW	-811031	41079	385045	169081	-108	29260	8362	99685	0	0	0	0
bes	Wet MSW	0	-3	0	0	-750	-58992	-5139	-973	-39589	-70964	0	0
Tyl	Inert MSW	429510	0	0	0	0	0	0	0	-1273775	0	Ő	24
te	Hazardous Waste	554223	1121	36652	384353	-617	1009725	0	-2	-231955	0	0	-27991
Vas	Biomedical Waste	0	0	0	0	0	0	0	0	0	0	0	0
>	Plastic Waste	32686	11265	8386	17844	23933	-270380	4627	-216489	7460	3755	4314	4836
	Intermediate Input Use	5289118	1822851	1356961	2887399	3872697	2469234	748752	1123463	1207069	607566	698139	782559
	Net Product Tax	330584	113933	84814	180470	242054	154334	46799	70219	75445	37974	43636	48912
	GVA	1262773	521035	642641	1063684	534268	824285	631041	354002	608256	259133	378989	147322
	Output	6551891	2343887	1999603	3951083	4406965	3293519	1379793	1477465	1815325	866698	1077128	929880

		25	26	27	28	29	30	31	32	33	34	35	36	37
												Real estate, ownership		Public
					Water	Transport	Storage &			Hotels &	Financial	of dwelling &	Other	administration.
S No.	Product X Product	Construction	Electricity	Gas	supply	Services	warehousing	Communication	Trade	Restaurant	Services	professional services	Services	& defence
1	Agriculture	25148	45631	9	9429	38700	0	0	113207	165366	0	496	12725	165082
2	Livestock	9609	16019	0	38	0	0	0	38292	334000	0	100	0	195027
3	Forestry and Logging	569256	46676	ů 0	103	110442	ů 0	ů 0	21834	0	0	217	0	25
4	Fishing & Aquaculture	457	85	ů 0	5	161	ů 0	ů 0	12520	1975	0	21	0	0
5	Coal & Lignite	3835	610242	2	18	9466	0	0	17523	0	0	267	0	0
6	Mining of Potroloum & Notural Gas	5177	252	170067	-+0	0	0	0	12/02	0	0	1/2	0	0
7	From Orea	020	233	1/000/	0	0	0	0	2692	0	0	143	0	0
0	Non formous motol area	920	1120	0	0	0	0	0	21007	0	0	69	0	0
0	Other Mining	1042	7740	1	11	0	0	0	21907	0	0	222	0	0
9	Food & Deverages	0465	5227	1	761	0	0	0	29931	65228	0	592	0	122100
10	roou & Develages	9403	16077	119	/01	26700	1767	4421	00427	03328	1155	10705	22474	122199
11	Textile & Apparel	33300	16077	4	80	36700	1/6/	4421	99427	16	1155	10/95	32474	1604
12	Vianulacture of leather and related products	925	234	0	52456	0	0	12227	120200	0	0	9	122502	1312
13	Basic Metals & Metal Products	2456187	238894	134335	53450	512	0	12337	138288	6	0	11423	122503	4/5
14	Electric & Electronic Equipment	508/30	100001	25556	4462	2/064	257	08002	9/9//	8	21.00	14450	30939	4024
15	ivianufacture of machinery and equipments n.e.c.	53488	24206	5/43	1311	156850	/9	3/9/	104332	36	3168	9002	-30/3	694
16	ivianufacture of Transport	810257	34396	10875	82	24060	34	2462	10/481	150	3606	20390	48808	19097
17	Manufacture of coke and refined petroleum products	88393	683117	50177	45857	893413	5742	108797	650401	2848	0	188301	257573	305
10	Manufacture of chemical and chemical products except	100220	10/27	00	0.5.5.5	100	10.55	20211	001107	17	<u>_</u>	1.550	22/7	2.
18	pharmaceuticals, medicinal and botanical products	109239	10635	29	25657	108	1857	28244	231137	16	0	1572	2267	21
10	Manufacture of pharmaceutical; medicinal chemicals and	00.51			-	_	0	0	-	0	0	1150//	1 (20 20	1.((2))
19	botanical products	3351	144	1	5	0	0	0	7864	0	0	117266	162050	16631
20	Manufacture of rubber & plastic products	960789	5442	18	7187	124010	3236	11834	66160	55925	0	66482	91147	172
21	Manufacture of other non-metallic mineral products	1846420	125083	121	44	0	0	0	10002	23	0	98	46	0
22	Paper & Printing	2382	24423	9879	495	34149	676	239438	93765	0	44648	158575	54259	756
23	Wood Products	459032	14935	5348	352	1495	204	5885	134632	0	1501	14503	7092	2261
24	Other Manufacturing	87126	82131	5798	8382	100958	1225	79529	122650	36393	57809	80527	259464	10810
25	Construction	22367	60859	37159	117164	519570	11998	114351	120337	58770	45709	582753	266396	45553
26	Electricity	1141624	2374	15	2377	200769	24	5932	60600	9231	286750	136942	196434	27082
27	Gas	671	134	0	7	82315	20	6322	1655	3044	0	143	203	0
28	Water supply	159760	9528	86	3948	84451	22	5597	242	666	51742	12599	195	44473
29	Transport Services	454611	138219	20166	12607	383880	11292	105437	259101	45228	151265	234939	94286	78976
30	Storage & warehousing	267	220	544	3	21314	1675	295	61332	205	0	18883	0	4515
31	Communication	0	4984	504	351	580100	52	95723	46039	34748	150296	365055	839840	15894
32	Trade	1371595	349681	53628	25117	267555	2528	83493	382695	95764	18255	109234	153648	85411
33	Hotels & Restaurant	0	2924	0	0	63115	0	96342	0	0	154030	46098	318785	22459
34	Financial Services	286180	185929	21135	19508	353420	356	187639	227115	21589	39216	372992	457093	0
35	Real estate, ownership of dwelling & professional services	1484292	260537	14266	10771	470057	1896	617198	167115	75653	327659	486090	722397	15315
36	Other Services	5348	6929	3268	14241	61330	637	187479	33311	5739	15787	118833	290579	0
37	Public administration. & defence	0	0	0	0	0	0	0	0	0	0	0	0	0
nt	Incineration	0	0	0	0	0	0	0	0	0	0	0	0	0
ste me	Composting	0	0	0	0	0	0	0	0	0	0	0	0	0
Va eat	Landfill	0	0	0	0	0	0	0	0	0	0	0	0	0
- E	MRF	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dry MSW	218949	0	0	0	0	0	0	0	0	0	0	0	0
bes	Wet MSW	0	0	0	0	0	58896	0	0	353373	0	0	0	0
Tyl I	Inert MSW	881526	0	0	0	0	0	0	0	0	0	0	0	0
fe	Hazardous Waste	0	0	0	0	0	0	0	0	0	0	0	0	0
/as	Biomedical Waste	0	0	0	Ő	0	0	0	0	0	0	4245	0	0
12	Plastic Waste	52014	12661	2276	1461	18655	183	8314	14384	4066	5475	12769	18121	3537
	Intermediate Input Use	12954167	3153149	566854	363865	4645967	45578	2070555	3582291	1012726	1363555	3180274	4418152	880974
	Net Product Tax	809669	197080	35430	22743	290385	2849	129415	223903	63298	85226	198775	276146	55063
	GVA	7421406	2173100	178668	317543	3614810	48593	1275436	10890508	527520	3421370	9698583	8630033	3010153
<u> </u>		20375572	5326330	7/5522	681/09	8260786	9/171	33/5001	14472700	1540255	1784025	12878857	13152021	3801127
	թուհու	20313313	3320339	143322	001400	0200700	741/1	3343771	1++/2/99	1340233	T/0474J	120/003/	13132921	307112/

			Waste Treat	ment				W	aste Types				
							Wet	Inert	Hazardous	Biomedical	Plastic		
S No.	Product X Product	Incineration	Composting	Landfill	MRF	Drv MSW	MSW	MSW	Waste	Waste	Waste	<b>Final Demand</b>	Total Use
1	Agriculture	0	0	0	0	0	0	0	0	0	0	8290244	13024014.68
2	Livestock	0	0	0	0	0	0	0	0	0	0	11140597	12342866.85
3	Forestry and Logging	0	0	ů 0	0	0	0	0	0	0	0	1502541	2693492.56
4	Fishing & Aquaculture	0	0	0	0	0	0	0	0	0	0	-34774	101504.20
5	Coal & Lignite	0	0	0 0	0	0	0	0	0	0	0	-511031	1050411.18
6	Mining of Petroleum & Natural Gas	0	0	0	0	0	0	0	0	0	0	-2789645	1160535.11
7	Iron Ore	0	0	0	0	0	0	0	0	0	0	298198	627544 49
8	Non-ferrous metal ores	0	0	0 0	0	0	0	0	0	0	0	146683	421755.35
9	Other Mining	0	0	ů	0	0	0	ů	0	ů 0	0	422081	1248112.61
10	Food & Beverages	0	ů	ů	0	0	0	Ő	ů 0	ů	Ő	4651688	6426942 37
11	Textile & Apparel	0	0	0	0	0	0	0	0	0	0	2579832	3864086.39
12	Manufacture of leather and related products	0	0	0 0	0	0	0	0	0	0	0	300005	379041.64
13	Basic Metals & Metal Products	0	0	0 0	0	0	0	0	0	0	0	-233975	6551891.45
14	Electric & Electronic Equipment	0	ů 0	ů 0	0	0	0	ů 0	ů 0	0	0	818489	2343886 79
15	Manufacture of machinery and equipments n e c	1891	605	ů 0	7005	0	0	ů 0	ů 0	0	0	703047	1995832.46
16	Manufacture of Transport	0	0	0	0	0	0	0	0	0	0	2051235	3951082.62
17	Manufacture of coke and refined petroleum products	0	0	0	0	0	0	0	0	0	0	865307	4406965.23
17	Manufacture of chemical and chemical products except pharmaceuticals	Ŭ	Ŭ		0	Ŭ	Ū	Ŭ	Ŭ	Ŭ	0	005507	1100903.23
18	medicinal and botanical products	211	0	0	0	0	0	0	0	0	0	-429761	3293308.08
19	Manufacture of pharmaceutical: medicinal chemicals and botanical products	0	0	0 0	0	0	0	0	0	0	0	670950	1379793.11
20	Manufacture of rubber & plastic products	0	0	0	0	0	0	0	0	0	0	-387001	1477465.10
20	Manufacture of other non-metallic mineral products	0	0	0	0	0	0	0	0	0	0	-458505	1815324.84
22	Paper & Printing	0	0	0	0	0	0	0	0	0	0	80542	866698.45
23	Wood Products	0	0	0	0	0	0	0	0	0	0	105599	1077127.65
23	Other Manufacturing	0	0	0	0	0	0	0	0	0	0	-1906925	929880.41
25	Construction	741	202	13978	23349	0	0	0	0	0	0	16965888	20356406.42
26	Electricity	0	0	0	7588	0	0	0	0	0	0	2076028	5324959.28
20	Gas	0	0	0	0	0	0	0	0	0	0	577890	745522.04
28	Water supply	0	ů	ů	0	0	0	Ő	ů 0	ů	Ő	214871	681407 70
20	Transport Services	1279	546	9170	8750	0	0	0	0	0	0	4586313	8248200 39
30	Storage & warehousing	0	0	0	0	0	0	0	0	0	0	-39458	94171.34
31	Communication	0	0	0 0	0	0	0	0	0	0	0	1207364	3345991.37
32	Trade	0	0	0 0	0	0	0	0	0	0	0	7329738	14472798.58
33	Hotels & Restaurant	0	0	0 0	0	0	0	0	0	0	0	836501	1540255.00
34	Financial Services	0	0	0 0	0	0	0	0	0	0	0	1083502	4784924.81
35	Real estate, ownership of dwelling & professional services	0	0	0 0	0	0	0	0	0	0	0	7452355	12878857.35
36	Other Services	1279	322	9170	8750	0	0	0	0	0	0	11817541	13140559.47
37	Public administration. & defence	0	0	0	0	Ő	Ő	0 0	0	0	0	3891127	3891127.26
nt	Incineration	0	0	ů	0	231835	147531	42152	0	4892	0	0	426410.18
ste	Composting	0	0	ů 0	0	0	322182	0	0	0	0	0	322181.86
Vat	Landfill	0	0	0	0	484199	753478	445138	1372974	768	0	0	3056557.95
Lre L	MRF	0	0	0 0	0	1473451	739993	1275762	1574350	0	769573	0	5833129.15
	Dry MSW	0	0	0 0	1455570	0	0	0	0	0	0	437897	2189485.53
sed	Wet MSW	0	0	0 0	739993	0	0	0	0	0	0	824538	1963184.81
Tyi	Inert MSW	23026	0	0	1350130	0	0	0	0	0	0	176305	1763051.88
te	Hazardous Waste	0	0	0	779717	0	0	0	0	0	0	442099	2947323.91
Vas	Biomedical Waste	0	0	Ő	0	Ő	Ő	Ő	0	0	Ő	1415	5659.73
2	Plastic Waste	0	0	Ő	523589	Ő	Ő	Ő	0	0	0	423265	769573.28
<u> </u>	Intermediate Input Use	5402	1675	32318	55442	2189486	1963185	1763052	2947324	5660	769573	0	0.00
	Net Product Tax	338	105	2020	3465	0	0	0	0	0	0	0	0.00
	GVA	10341	3207	61871	106141	Ő	Ő	Ő	0	0	0	0	0.00
<u> </u>	Output	15743	4882	94189	161583	0	0	0	0	0	0	0	0.00

## Annexure 6: WSUT Coefficients Matrix for Rajasthan

		1	2	3	4	5	6	7	8	9	10	11	12
S No.	Product X Product	Agriculture	Livestock	Forestry and	Fishing & Aquacultur	Coal & Lignite	Mining of Petroleum	Iron Ore	Non- ferrous	Other Mining	Food & Beverages	Textile & Apparel	Manufacture of leather
				Logging	e		& Natural		metal ores				and related
1	Agriculture	0.03092925	0.13232818	0.00000000	0.00034008	0.00000456	0.00000000	0.00000000	0.00000000	0.00335903	0.27167026	0.07420949	0.00000000
2	Livestock	0.00000000	0.00692516	0.00000000	0.03464029	0.00000001	0.00000000	0.00000000	0.00000000	0.00016224	0.07671511	0.00217195	0.03978380
3	Forestry and Logging	0.00000000	0.01286020	0.00173003	0.00000000	0.00000111	0.00000379	0.00000000	0.00000000	0.00013739	0.00274969	0.00003624	0.00017446
4	Fishing & Aquaculture	0.00000000	0.00000000	0.00000000	0.01637883	0.00000000	0.00000000	0.00000000	0.00000000	0.00000024	0.01839677	0.00000153	0.00000000
5	Coal & Lignite	0.00000000	0.00000000	0.00000000	0.00000000	0.00068385	0.00204320	0.00006702	0.00212343	0.01185785	0.00362435	0.00783769	0.00038325
6	Mining of Petroleum & Natural Gas	0.00000000	0.00000000	0.00000000	0.00000000	0.04333524	0.14856418	0.00000000	0.00000000	0.01929602	0.00000000	0.00019160	0.00000000
7	Iron Ore	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00016612	0.00000000	0.00000013	0.00000000
8	Non-ferrous metal ores	0.00000000	0.00000000	0.00000000	0.00000000	0.00000007	0.00000000	0.00000000	0.00000000	0.00077289	0.00001389	0.00000843	0.00000000
9	Other Mining	0.00000000	0.00000000	0.00000000	0.00000000	0.00000042	0.00029109	0.00000000	0.00000000	0.01600658	0.00084507	0.00121611	0.00191563
10	Food & Beverages	0.00000000	0.01021989	0.00000000	0.04007870	0.00005895	0.00000000	0.00000000	0.00000000	0.00266562	0.20278661	0.00020732	0.00000000
11	Textile & Apparel	0.00000000	0.00000000	0.00325813	0.00028942	0.00010046	0.00020181	0.00127117	0.00120803	0.00064180	0.00605499	0.22014315	0.04789838
12	Manufacture of leather and related products	0.00000000	0.00000000	0.00000000	0.00000000	0.00068197	0.00000000	0.00000000	0.00000000	0.00000000	0.0000084	0.00155801	0.15545985
13	Basic Metals & Metal Products	0.00000000	0.00000000	0.00352457	0.00086554	0.00082964	0.00033493	0.04674919	0.00061822	0.00312628	0.00033219	0.00106973	0.00501355
14	Electric & Electronic Equipment	0.00000000	0.00000000	0.00384519	0.00000000	0.01653571	0.00000000	0.00006055	0.00004886	0.00015309	0.00042558	0.00019995	0.00028840
15	Manufacture of machinery and equipments n.e.c.	0.00444822	0.00007200	0.01450898	0.00017134	0.00178120	0.00056612	0.05400911	0.00208643	0.00670597	0.00323102	0.00017096	0.00159115
16	Manufacture of Transport	0.00000000	0.00000000	0.00635106	0.00047445	0.00021169	0.00000000	0.00001871	0.00005834	0.00005957	0.00000586	0.00000000	0.00003535
17	Manufacture of coke and refined petroleum products	0.01416390	0.00000000	0.01657443	0.00178531	0.01832801	0.00278780	0.01349094	0.00899322	0.00446710	0.00129722	0.00173330	0.00158844
18	Manufacture of chemical and chemical products except pharmaceuticals, medicinal and botanical products	0.03719921	0.00000000	0.00000000	0.00049429	0.00301218	0.00300259	0.08064243	0.09207188	0.00756043	0.00764706	0.12076496	0.13162845
19	Manufacture of pharmaceutical; medicinal chemicals and botanical products	0.00000000	0.01469653	0.00000000	0.00142524	0.00000054	0.00000000	0.00000000	0.00000000	0.00007403	0.00276304	0.00125744	0.00052875
20	Manufacture of rubber & plastic products	0.00000000	0.00000000	0.00163428	0.00000000	0.00011747	0.00000236	0.00256788	0.01470193	0.00301754	0.00991296	0.00255039	0.03393973
21	Manufacture of other non-metallic mineral products	0.00000000	0.00000000	0.00000000	0.00000000	0.00001330	0.00000000	0.00000000	0.00000000	0.01612612	0.00341224	0.00021351	0.00000000
22	Paper & Printing	0.00000000	0.00000000	0.00428704	0.00000000	0.00458202	0.00011408	0.00014294	0.00027432	0.00141518	0.00124195	0.00092173	0.00087592
23	Wood Products	0.00000000	0.00284288	0.00299163	0.00031104	0.00318316	0.00000726	0.00085743	0.00088463	0.00128513	0.00211493	0.00163692	0.00056645
24	Other Manufacturing	0.00875314	0.00610895	0.03986740	0.00121054	0.02115474	0.01595386	0.06951011	0.03497274	0.00863898	0.02383382	0.04701646	0.04599101
25	Construction	0.00000000	0.00011474	0.00348957	0.00655790	0.03112152	0.00855713	0.06965140	0.04478204	0.12089985	0.00853944	0.03883787	0.01632082
26	Electricity	0.00815440	0.00000000	0.00019619	0.00001500	0.00660373	0.00121266	0.04123722	0.02809585	0.01023040	0.01427176	0.03625204	0.01526796
27	Gas	0.00000000	0.00000000	0.00018163	0.00001389	0.00590027	0.00041349	0.03817835	0.02601178	0.00011620	0.00108575	0.00077548	0.00006066
28	Water supply	0.00348351	0.00000000	0.00019521	0.00001493	0.00634310	0.00044764	0.04103226	0.02795621	0.00008866	0.00022403	0.00001872	0.00000000
29	Transport Services	0.00529100	0.01139496	0.01323416	0.00853743	0.05018927	0.01009550	0.02566704	0.05374464	0.01155289	0.03621416	0.02947158	0.02947810
30	Storage & warehousing	0.00000000	0.00000000	0.00006535	0.00000000	0.00122962	0.00000000	0.00026079	0.01890442	0.00002950	0.00146209	0.00095281	0.00000000
31	Communication	0.00000000	0.00000000	0.00067776	0.00000000	0.00065712	0.00000000	0.00000000	0.00352273	0.00002122	0.00000000	0.00000000	0.00000000
32	Irade	0.01601657	0.03449406	0.01498117	0.0139/9/5	0.01353258	0.0114/3/2	0.04162643	0.02604745	0.01488537	0.10693223	0.08563/51	0.08593370
33	Hotels & Restaurant	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
25	Paul estate automic of dyselling & professional	0.04033007	0.000/3182	0.0011/80/	0.000/4/21	0.00040948	0.00801884	0.00589237	0.00903209	0.00944101	0.01018007	0.02221290	0.03810313
33	services	0.00000000	0.00000000	0.011918/4	0.00081000	0.10300/18	0.0403/148	0.02055558	0.09290704	0.00800482	0.00294980	0.00894311	0.00724017
36	Other Services	0.03059560	0.00010135	0.01783674	0.01946579	0.03622944	0.00999988	0.02990289	0.01723384	0.01933728	0.00020358	0.00046808	0.00042503
37	Public administration. & defence	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Waste Treatment	Incineration	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
reamont	Composting	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	Landfill	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	MRF	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Waste	Dry MSW	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.04043521	-0.00144430
Types	Wat MSW	0.00452207	0.0000000	0.0000000	0.0000000	0.00000000	0.0000000	0.00000000	0.0000000	0.0000000	0.0145((70	0.002((092	0.0000000
	Wet INSW In out MSW	0.00452207	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.01456670	0.00266082	0.00000000
	HIER INSW Harandaya Weste	0.00000000	0.00000000	0.00000000	0.00000000	0.04896336	0.00000000	0.07033122	0.00000000	0.03938385	0.00000000	0.00000000	0.00000000
	Riomedical Waste	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	Plastic Waste	0.00000000	0.00000000	0.00000000	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00507460	0.00062296	0.00408178
L	1 mone il uote	5.0000000	5.0000000	5.555500000	3.0000000	5.0000000	5.0000000	5.0000000	5.0000000	5.0000000	5.00007400	5.00002270	0.00100170

		13	14	15	16	17	18	19	20	21	22	23	24
						Manufacture	Manufacture of chemical	Manufacture of					
				Manufacture of		of coke and	and chemical products	pharmaceutical;		Manufacture of			
		Basic Metals	Electric &	machinery and		refined	except pharmaceuticals,	medicinal chemicals	Manufacture of	other non-			
		& Metal	Electronic	equipments	Manufacture	petroleum	medicinal and botanical	and botanical	ubber & plastic	netallic mineral	Paper &		Other
S No.	Product X Product	products	Equipment	n.e.c.	of Transport	products	products	products	products	products	Printing	Wood Products	Manufacturing
1	Agriculture	0.00029032	0.00009602	0.0000/9/1	0.00002833	0.00000000	0.00366421	0.00481410	0.02086368	0.00021657	0.00252526	0.00201291	0.03029236
2	Livestock	0.00000033	0.00000034	0.00000068	0.00000000	0.00000000	0.00007499	0.00024891	0.00000000	0.00000000	0.00000005	0.00006828	0.00301830
	Forestry and Logging	0.00003461	0.00024188	0.00020919	0.00013104	0.00001839	0.00108580	0.010/8229	0.00010103	0.00084043	0.00720439	0.13239174	0.00000373
4	Coal & Lignite	0.00000048	0.00000048	0.00000002	0.00000000	0.00000000	0.00012007	0.00001133	0.00000000	0.00000000	0.01575221	0.00106837	0.00070779
6	Mining of Petroleum & Natural Gas	0.00000028	0.00002831	0.00003099	0.00001787	0.72970971	0.08133556	0.00000000	0.00105022	0.00035576	0.00000000	0.00000000	0.03712151
7	Iron Ore	0.04583179	0.00029292	0.00060157	0.00361332	0.00000000	0.00001072	0.00000000	0.00000000	0.00108579	0.00000000	0.00003581	0.00604984
8	Non-ferrous metal ores	0.03150534	0.00319521	0.00125215	0.00014384	0.00000000	0.00069509	0.00011133	0.00007180	0.00505163	0.00006635	0.00128481	0.02032254
9	Other Mining	0.02187250	0.00339317	0.00108617	0.00056146	0.00000000	0.05427000	0.00122562	0.00258431	0.10446607	0.00320325	0.00481009	0.04033857
10	Food & Beverages	0.00005332	0.00003397	0.00006669	0.00003192	0.00000000	0.00837901	0.00603938	0.00014920	0.00041320	0.00115587	0.00029102	0.01484020
11	Textile & Apparel	0.00029829	0.00175396	0.00088727	0.00201238	0.00099125	0.01168337	0.00514402	0.01676417	0.00077594	0.00232114	0.01454140	0.01899398
12	Manufacture of leather and related products	0.00000424	0.00014458	0.00003375	0.00021086	0.00000000	0.00000055	0.00000005	0.00011026	0.00000000	0.00005506	0.00244425	0.00052842
13	Basic Metals & Metal Products	0.28981260	0.16449168	0.23507204	0.13638673	0.00000000	0.00508626	0.00082488	0.01117034	0.01810241	0.00675544	0.05590768	0.14874252
14	Electric & Electronic Equipment	0.00225018	0.19202357	0.04216471	0.04440948	0.00000000	0.00013753	0.00066762	0.00128389	0.00027666	0.00089042	0.00116694	0.01698498
	Manufacture of machinery and equipments										0.00040055		
15	n.e.c.	0.01556177	0.05627737	0.09235424	0.06838192	0.00264285	0.00295529	0.02071323	0.00450015	0.00181534	0.00042052	0.00922898	0.01913087
16	Manufacture of Transport	0.000/220/	0.02026617	0.02411916	0.17438202	0.00000000	0.00000000	0.0000002	0.00043530	0.00008/22	0.00000019	0.00017052	0.01093320
17	manufacture of coke and refined petroleum	0.01741143	0.00146841	0.00120022	0.00080453	0.01361044	0.01224200	0.00110010	0.00566757	0.01222416	0.00064425	0.00022225	0.02087241
1/	Manufacture of chemical and chemical	0.01/41145	0.00140841	0.00129932	0.00080433	0.01301044	0.01334399	0.00110910	0.00300737	0.01323410	0.00004423	0.00033223	0.02087241
	products except pharmaceuticals medicinal												
18	and botanical products	0.00863599	0.02108654	0.01194941	0.01824134	0.00965422	0.28832569	0.11082610	0.34540802	0.04730299	0.08479407	0.07208059	0.06663183
	Manufacture of pharmaceutical; medicinal												
19	chemicals and botanical products	0.00003058	0.00086121	0.00000221	0.00000230	0.00000000	0.00516292	0.12259142	0.00061159	0.00038403	0.00010632	0.00012123	0.00738503
20	Manufacture of rubber & plastic products	0.00123026	0.02452328	0.01544554	0.03017022	0.00001160	0.00417064	0.00728663	0.06056838	0.00127371	0.01177644	0.01736394	0.01005117
	Manufacture of other non-metallic mineral												
21	products	0.00048254	0.00711367	0.00457275	0.00191181	0.00000000	0.00286754	0.00143663	0.00185661	0.10532555	0.00023592	0.00179607	0.00543637
22	Paper & Printing	0.00015329	0.00208375	0.00102249	0.00054660	0.00056033	0.00169221	0.00147678	0.00432455	0.00151329	0.06824247	0.00030411	0.00385965
23	Wood Products	0.00091186	0.00218231	0.00133230	0.00532902	0.00001860	0.00435766	0.00007849	0.00094086	0.00712751	0.09750163	0.09105717	0.00951179
24	Other Manufacturing	0.04540583	0.02704133	0.04717568	0.05636497	0.00432237	0.02360623	0.04084774	0.02561347	0.03730947	0.10377261	0.03353177	0.08842001
25	Construction	0.02607305	0.06485589	0.05006513	0.02423239	0.00353551	0.01560557	0.03565613	0.047/6846	0.03855583	0.0469/869	0.02185546	0.03315032
26	Electricity	0.04/43/29	0.01230519	0.013/8/53	0.0080/562	0.003/6261	0.02491806	0.02520763	0.03433154	0.06500897	0.03211659	0.01/09455	0.02203149
27	Watan ayan ku	0.00001179	0.0003/198	0.00083071	0.00108343	0.00000000	0.00113074	0.000/0890	0.00033062	0.00010603	0.0003/1/0	0.00037800	0.00070441
20	Transport Services	0.03238469	0.00000133	0.02424397	0.00000000	0.03510269	0.03647163	0.01792693	0.00000000	0.00007337	0.02695452	0.02915953	0.03728497
30	Storage & warehousing	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00003596	0.0000009	0.00000000	0.02030717	0.00000000	0.00000000	0.00165367
31	Communication	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00109046
32	Trade	0.09242340	0.08350540	0.07077270	0.08826273	0.04546360	0.08091069	0.05196272	0.08680046	0.06807405	0.08032803	0.08758194	0.09522051
33	Hotels & Restaurant	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
34	Financial Services	0.01527611	0.05232658	0.03190711	0.02529600	0.01174702	0.02688140	0.04212128	0.02964681	0.03445171	0.04526446	0.02871698	0.03139491
	Real estate, ownership of dwelling &												
35	professional services	0.01825393	0.00665288	0.00574179	0.00949251	0.00756443	0.04137333	0.02532518	0.02542648	0.00775254	0.00123263	0.00083976	0.01427347
36	Other Services	0.00015703	0.00033623	0.00016767	0.00031796	0.00000000	0.00013098	0.00028192	0.00039029	0.00030204	0.00034071	0.00051056	0.00103413
37	Public administration. & defence	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Waste	<b>x</b> · · · ·	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Treatment	Incineration	0.00000000	0.0000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	Composing Londfill	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	MPE	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Waste	IVINI	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Types	Dry MSW	-0.12378576	0.01752603	0.19256068	0.04279360	-0.00002455	0.00888397	0.00606003	0.06747012	0.00000000	0.00000000	0.00000000	0.00000000
1,000	Wet MSW	0.00000000	-0.00000141	0.00000000	0.00000000	-0.00017024	-0.01791162	-0.00372477	-0.00065871	-0.02180830	-0.08187815	0.00000000	0.00000000
	Inert MSW	0.06555517	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	-0.70167893	0.00000000	0.00000000	0.00002593
	Hazardous Waste	0.08458971	0.00047835	0.01832940	0.09727802	-0.00014001	0.30657955	0.00000000	-0.00000152	-0.12777630	0.00000000	0.00000000	-0.03010165
	Biomedical Waste	0.00000000	0.00000000	0.000000000	0.00000000	0.00000000	0.00000000	0.000000000	0.00000000	0.000000000	0.00000000	0.000000000	0.00000000
	Plastic Waste	0.00498883	0.00480615	0.00419378	0.00451620	0.00543071	-0.08209469	0.00335356	-0.14652762	0.00410923	0.00433219	0.00400550	0.00520082

		25	26	27	28	29	30	31	32	33	34	35	36	37
												Real estate,		
												ownership of		Public
					Water	Transport	Storage &			Hotels &	Financial	dwelling &	Other	administration
S No.	Product X Product	Construction	Electricity	Gas	supply	Services	warehousing	Communication	Trade	Restaurant	Services	professional services	Services	& defence
1	Agriculture	0.00123421	0.00856706	0.00001232	0.01383683	0.00468483	0.00000000	0.00000000	0.00782203	0.10736262	0.00000000	0.00003850	0.00096747	0.04242531
2	Livestock	0.00047157	0.00300745	0.00000002	0.00005547	0.00000000	0.00000000	0.00000000	0.00264576	0.21684744	0.00000000	0.00000776	0.00000000	0.05012090
3	Forestry and Logging	0.02793813	0.00876329	0.00000003	0.00015085	0.01336941	0.00000000	0.00000000	0.00150865	0.00000000	0.00000000	0.00001684	0.00000000	0.00000644
4	Fishing & Aquaculture	0.00002242	0.00001599	0.00000000	0.00000696	0.00001952	0.00000000	0.00000000	0.00086505	0.00128229	0.00000000	0.00000165	0.00000000	0.00000000
5	Coal & Lignite	0.00018821	0.11457069	0.00000271	0.00007028	0.00114593	0.00000000	0.00000000	0.00121073	0.00000000	0.00000000	0.00002075	0.00000000	0.00000000
6	Mining of Petroleum & Natural Gas	0.00025408	0.00004748	0.22811754	0.0000002	0.00000000	0.00000000	0.00000000	0.00086318	0.00000000	0.00000000	0.00001107	0.00000000	0.00000000
7	Iron Ore	0.00004514	0.00004091	0.00000000	0.00000004	0.00000000	0.00000000	0.00000000	0.00025443	0.00000000	0.00000000	0.00001530	0.00000000	0.00000000
8	Non-ferrous metal ores	0.00009042	0.00021200	0.00000019	0.00000050	0.00000000	0.00000000	0.00000000	0.00151368	0.00000000	0.00000000	0.00000525	0.00000000	0.00000000
9	Other Mining	0.00892823	0.00145324	0.00000113	0.00001623	0.00000000	0.00000000	0.00000000	0.00206944	0.00000000	0.00000000	0.00001804	0.00000000	0.00000000
10	Food & Beverages	0.00046455	0.00098332	0.00015918	0.00111629	0.00000000	0.00000000	0.00000000	0.00560772	0.04241374	0.00000000	0.00004529	0.00000000	0.03140447
11	Textile & Apparel	0.00164414	0.00301844	0.00000575	0.00012669	0.00444273	0.01876716	0.00132141	0.00686990	0.00001045	0.00024148	0.00083822	0.00246893	0.00041222
12	Manufacture of leather and related products	0.00004541	0.00004768	0.00000000	0.0000006	0.00000000	0.00000000	0.00000000	0.00041906	0.00000000	0.00000000	0.00000066	0.00000000	0.00038869
13	Basic Metals & Metal Products	0.12054564	0.04485150	0.18018965	0.07844997	0.00006197	0.00000000	0.00368711	0.00955501	0.00000376	0.00000000	0.00088699	0.00931373	0.00012213
14	Electric & Electronic Equipment	0.01515228	0.02939179	0.03159681	0.00654808	0.00327617	0.00273260	0.02032352	0.00676973	0.00000524	0.00229050	0.00112199	0.00235381	0.00118832
15	Manufacture of machinery and equipments n.e.c.	0.00262512	0.00103566	0.00770331	0.00192448	0.01898732	0.00084281	0.00113474	0.00720884	0.00002343	0.00066201	0.00069895	-0.00023365	0.00017847
16	Manufacture of Transport	0.03976609	0.00645780	0.01458756	0.00012051	0.00291258	0.00036576	0.00073571	0.00742639	0.00009712	0.00075352	0.00158319	0.00371079	0.00490786
	Manufacture of coke and refined petroleum													
17	products	0.00433819	0.12825273	0.06730489	0.06729684	0.10815108	0.06097445	0.03251561	0.04493954	0.00184880	0.00000000	0.01462098	0.01958297	0.00007850
	Manufacture of chemical and chemical products													
10	except pharmaceuticals, medicinal and botanical	0.0052(120	0.00100667	0.00000000	0.00765051	0.00001010	0.01071002	0.00044110	0.01505046	0.000010.00		0.00010000	0.00015005	0.0000541
18	products	0.00536129	0.00199667	0.00003926	0.03765251	0.00001310	0.019/1893	0.00844119	0.0159/046	0.00001060	0.00000000	0.00012208	0.00017237	0.00000541
10	Manufacture of pharmaceutical; medicinal	0.00016446	0.00002700	0.00000147	0.0000700	0.00000000	0.00000000	0.0000000	0.00054220	0.00000000	0.0000000	0.00010521	0.01000040	0.00407405
19	chemicals and botanical products	0.00016446	0.00002708	0.00000147	0.00000798	0.00000000	0.00000000	0.00000000	0.00054338	0.00000000	0.00000000	0.00910531	0.01232048	0.00427405
20	Manufacture of rubber & plastic products	0.04/15395	0.00102176	0.00002458	0.01054/55	0.01501194	0.03436219	0.003536/1	0.0045/135	0.03630902	0.00000000	0.00516209	0.00692980	0.00004418
21	Manufacture of other non-metallic mineral	0.00061028	0 02248201	0.00016175	0 00006 408	0 0000000	0.0000000	0.0000000	0.00060111	0.00001517	0.0000000	0.0000758	0 00000240	0.0000000
21	products	0.09001928	0.02348391	0.00010173	0.00000408	0.00000000	0.00000000	0.00000000	0.00009111	0.00001317	0.00000000	0.00000738	0.00000349	0.00000000
22	Waad Draduata	0.00011090	0.00438331	0.01323170	0.00072602	0.00413387	0.00718003	0.0/1339//	0.0004/8/1	0.00000000	0.00933097	0.01231278	0.00412320	0.00019424
23	Other Manufacturing	0.02232834	0.00280390	0.00717585	0.00031031	0.00018102	0.00210104	0.00173893	0.00930238	0.00000000	0.00031300	0.00112009	0.00033923	0.00038119
24	Construction	0.00427001	0.01341970	0.00777000	0.01230122	0.01222141	0.12740760	0.02370849	0.00821470	0.02302810	0.01208140	0.00023207	0.01972073	0.00277821
25	Electricity	0.00109770	0.001142013	0.04984333	0.00248882	0.00289392	0.00025024	0.00177281	0.00831470	0.03813003	0.00933203	0.04324878	0.02023373	0.00606002
20	Gas	0.00002904	0.00044377	0.00001978	0.00348883	0.02430383	0.00023024	0.00177281	0.00418/14	0.00399310	0.03992778	0.01003300	0.00001544	0.00090002
27	Water supply	0.00003293	0.00002320	0.00000013	0.00001080	0.00990437	0.00020800	0.00163950	0.00011438	0.00197000	0.000000000	0.00001110	0.00001344	0.00000000
20	Transport Services	0.02231159	0.00178009	0.02704996	0.00379402	0.04647018	0.11991310	0.03151141	0.01790263	0.02936391	0.03161292	0.01824221	0.00716843	0.02029638
30	Storage & warehousing	0.00001311	0.02375004	0.00072974	0.00000370	0.00258019	0.01778837	0.00008822	0.00423776	0.02000000	0.00000000	0.00146617	0.00000000	0.02020038
31	Communication	0.000001011	0.00004152	0.00072974	0.00051567	0.00230013	0.00055046	0.02860826	0.00318111	0.02255985	0.03141029	0.02834526	0.06385196	0.00408459
32	Trade	0.06731566	0.06565130	0.00007020	0.00031307	0.07022332	0.02684689	0.02495302	0.02644237	0.02233383	0.00381516	0.02834320	0.00383190	0.02195015
33	Hotels & Restaurant	0.00000000	0.00054900	0.00000000	0.00000000	0.00764035	0.00000000	0.02879336	0.00000000	0.00000000	0.03219059	0.00357936	0.02423683	0.00577186
34	Financial Services	0.01404523	0.03490738	0.02834866	0.02862834	0.04278291	0.00378136	0.05607887	0.01569257	0.01401647	0.00819575	0.02896158	0.03475219	0.00000000
7	Real estate ownership of dwelling & professional	5.01107525	5.05 170750	5.02054000	5.02002034	5.012/02/1	5.00570150	0.00007007	5.01507257	5.01101047	0.00017575	0.02070120	5.05 175219	0.00000000
35	services	0.07284663	0.04891488	0.01913493	0.01580753	0.05690218	0.02013143	0.18445903	0.01154684	0.04911703	0.06847736	0.03774324	0.05492297	0.00393580
36	Other Services	0.00026249	0.00130086	0.00438377	0.02089915	0.00742423	0.00676622	0.05603092	0.00230160	0.00372621	0.00329927	0.00922695	0.02209239	0.00000000
37	Public administration. & defence	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Waste														
Treatment	Incineration	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	Composting	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
<u> </u>	Landfill	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	MRF	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Waste	Dry MSW	0.01074564	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Types	-													
	Wet MSW	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.62540839	0.00000000	0.00000000	0.22942517	0.00000000	0.00000000	0.00000000	0.00000000
	Inert MSW	0.04326386	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	Hazardous Waste	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	Biomedical Waste	0.000000000	0.00000000	0.00000000	0.000000000	0.00000000	0.00000000	0.00000000	0.00000000	0.000000000	0.00000000	0.00032959	0.00000000	0.00000000
	Plastic Waste	0.00255275	0.00237697	0.00305294	0.00214408	0.00225820	0.00194334	0.00248468	0.00099384	0.00264002	0.00114421	0.00099151	0.00137768	0.00090907

			Waste Treat	ment				Wast	e Types		
S No.	Product X Product	Incineration	Composting	Landfill	MRF	Dry MSW	Wet MSW	Inert MSW	Hazardous Waste	Biomedical Waste	Plastic Waste
1	Agriculture	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
2	Livestock	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
3	Forestry and Logging	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
4	Fishing & Aquaculture	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
5	Coal & Lignite	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
6	Mining of Petroleum & Natural Gas	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
7	Iron Ore	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
8	Non-ferrous metal ores	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
9	Other Mining	0.000000	0.000000	0.000000	0.000000	0	Ő	0	0	0	0
10	Food & Beverages	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
11	Textile & Apparel	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
12	Manufacture of leather and related products	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
13	Basic Metals & Metal Products	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
14	Electric & Electronic Equipment	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
15	Manufacture of machinery and equipments n e c	0.004435	0.001879	0.000000	0.006605	0	0	0	0	0	0
16	Manufacture of Transport	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
10	Manufacture of coke and refined petroleum products	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
18	Manufacture of chemical and chemical products except pharmaceuticals, medicinal and botanical products	0.000494	0.000000	0.000000	0.000000	0	0	0	0	0	0
19	Manufacture of pharmaceutical: medicinal chemicals and botanical products	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
20	Manufacture of phalmaceutean medicinal energies and obtained products	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
20	Manufacture of other non-metallic mineral products	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
21	Paper & Printing	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
22	Wood Products	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
23	Other Manufacturing	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
27		0.000000	0.000000	0.000000	0.022017	0	0	0	0	0	0
25	Electricity	0.000000	0.000020	0.004373	0.022017	0	0	0	0	0	0
20	Cos	0.000000	0.000000	0.000000	0.007130	0	0	0	0	0	0
27	Water supply	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
20	Transport Services	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
20	Storage & werehousing	0.000000	0.001075	0.000000	0.000231	0	0	0	0	0	0
21	Communication	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
22	Trade	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
32	Hotala & Destaurant	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
33	Financial Services	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
25	Paral actate automation of dwalling it professional convises	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
35	Other Services	0.000000	0.000000	0.000000	0.000000	0	0	0	0	0	0
30	Public administration & defence	0.003000	0.001000	0.003000	0.008231	0	0	0	0	0	0
Waste		0.000000	0.000000	0.000000	0.000000	0 105886	0.075140	0.022008	0	0 864204	0
Treatment	Composition	0	0	0	0	0.103880	0.073149	0.023908	0	0.004294	0
ļ		0	0	0	0	0.221149	0.104112	0.252492	0.465939	0.125706	0
		0	0	0	0	0.221148	0.383804	0.252482	0.405838	0.135/06	0
W/4-	MKr	0	0	0	0	0.6/296/	0.3/6935	0./2361	0.534162	0	1
waste Types	Dry MSW	0	0	0	0.249535	0	0	0	0	0	0
	Wet MSW	0	0	0	0.12686	0	0	0	0	0	0
	Inert MSW	0.054	0	0	0.231459	0	0	0	0	0	0
	Hazardous Waste	0	0	0	0.13367	0	0	0	0	0	0
	Biomedical Waste	0	0	0	0	0	0	0	0	0	0
	Plastic Waste	0	0	0	0.089761	0	0	0	0	0	0

## Annexure 7: Leontief Inverse of Rajasthan's WSUT Matrix

	Leontief Inverse of Rajasthan's WSUT Matrix												
		1	2	3	4	5	6	7	8	9	10	11	12
					•		Mining of		Ŭ		10		Manufacture of
				Forestry and	Fishing &		Petroleum &		Non-ferrous	Other	Food &	Textile &	leather and
S No.	Product X Product	Agriculture	Livestock	Logging	Aquaculture	Coal & Lignite	Natural Gas	Iron Ore	metal ores	Mining	Beverages	Apparel	related products
1	Agriculture	1.03430759	0.14293758	0.00355074	0.02129988	0.00378196	0.00192809	0.00999296	0.00758141	0.00769347	0.37289534	0.10863035	0.02286186
2	Livestock	0.00091441	1.00841324	0.00069626	0.03984490	0.00119507	0.00055644	0.00208023	0.00169235	0.00130833	0.09958650	0.00519278	0.04990297
3	Forestry and Logging	0.00122799	0.01466803	1.00427845	0.00162253	0.00482802	0.00146234	0.00778757	0.00635252	0.00630215	0.00932642	0.00735240	0.00679150
4	Fishing & Aquaculture	0.00007894	0.00031495	0.00010457	1.01766323	0.00010618	0.00006179	0.00031270	0.00021845	0.00015905	0.02377913	0.00038922	0.00039491
5	Coal & Lignite	0.00430434	0.00196898	0.00561027	0.00172934	1.00850564	0.00533494	0.02914090	0.01720327	0.02331683	0.01482554	0.02939043	0.01725968
6	Mining of Petroleum & Natural Gas	0.02678223	0.00938176	0.02608699	0.00694070	0.08939575	1.18604633	0.07764976	0.06365928	0.04459542	0.03802671	0.06512235	0.06189763
7	Iron Ore	0.00064710	0.00042525	0.00183835	0.00037036	0.00186375	0.00074325	1.00827468	0.00284384	0.00247750	0.00185451	0.00312030	0.00306811
8	Non-ferrous metal ores	0.00082343	0.00059391	0.00220745	0.00040605	0.00206135	0.00097386	0.00787720	1.00322185	0.00300123	0.00249678	0.00414122	0.00404544
9	Other Mining	0.00464419	0.00185289	0.00421917	0.00114595	0.00492951	0.00278751	0.01967399	0.01482064	1.02488174	0.00916794	0.02313107	0.02466154
10	Food & Beverages	0.00138893	0.01386894	0.00151031	0.05213530	0.00159711	0.00088873	0.00500576	0.00383563	0.00476877	1.26002816	0.00645634	0.00690326
11	Textile & Apparel	0.00207673	0.00156899	0.00669204	0.00160099	0.00325607	0.00175720	0.00973151	0.00870144	0.00358871	0.01513735	1.29184589	0.08300636
12	Manufacture of leather and related products	0.00004053	0.00005012	0.00009088	0.00002792	0.00089773	0.00004243	0.00021693	0.00014260	0.00009804	0.00019515	0.00259435	1.18442466
13	Basic Metals & Metal Products	0.01140/60	0.00710944	0.03174987	0.00690481	0.03459017	0.01248061	0.163010/1	0.05252029	0.04527893	0.0316/8/5	0.05374979	0.05323615
14	Electric & Electronic Equipment	0.00248512	0.00156157	0.00899132	0.00123207	0.02579531	0.00216/68	0.01657054	0.00953849	0.00698949	0.00/49/86	0.010/2900	0.00907832
15	Manufacture of machinery and equipments n.e.c.	0.00/038/2	0.00303159	0.02037637	0.00171976	0.00836507	0.002/3424	0.0/198551	0.01055580	0.01221246	0.01306807	0.01038445	0.01143499
16	Manufacture of Transport	0.00161928	0.00126359	0.01059244	0.001/4304	0.005/1/11	0.00193781	0.01265331	0.00/85142	0.00861074	0.00525095	0.00840413	0.00685323
17	Manufacture of coke and refined petroleum products	0.02318933	0.00829470	0.02551505	0.00685558	0.03/94839	0.0102/44/	0.05341309	0.04322792	0.01881084	0.03289127	0.0394/334	0.03424102
10	manufacture of chemical and chemical products except	0.05001240	0.01408062	0.01270622	0.00624414	0.01009546	0.01128667	0 15025200	0 16050722	0.02870407	0.06012454	0 25257257	0.27850667
10	Manufacture of pharmacautical: madicinal abamicals and	0.03991340	0.01498905	0.013/9032	0.00024414	0.01998540	0.01128007	0.15055588	0.10030733	0.028/040/	0.00013434	0.23237337	0.27839007
10	botonical products	0.00117541	0.01721670	0.00111566	0.00207707	0.00250511	0.00118828	0.00220552	0.00225715	0.00128025	0.00716811	0.00500044	0.00486020
20	Manufacture of rubber & plastic products	0.00216429	0.00170029	0.00526757	0.00207707	0.00250511	0.00252509	0.01626210	0.02639444	0.0128023	0.01933328	0.01383583	0.00480920
20	Manufacture of other non-metallic mineral products	0.00176075	0.00170029	0.00238426	0.00153973	0.00730823	0.00232307	0.01578774	0.01120248	0.03366344	0.00991727	0.01247695	0.00170855
21	Paper & Printing	0.00191828	0.00109381	0.00230420	0.00091722	0.00941498	0.00230117	0.00592945	0.00660153	0.00392684	0.00577722	0.00671218	0.00666557
22	Wood Products	0.001/1614	0.00426749	0.00562459	0.00144339	0.00742320	0.00212303	0.00895949	0.00702143	0.00686387	0.00786531	0.00981949	0.00778232
23	Other Manufacturing	0.01665145	0.01292909	0.05223374	0.00602436	0.03639170	0.02486391	0.10697828	0.05854342	0.02223926	0.05144943	0.08992279	0.08716066
25	Construction	0.00837797	0.00530522	0.01446759	0.01085958	0.05449342	0.01835486	0.11433490	0.08274918	0.13759189	0.03086669	0.07953127	0.05220902
26	Electricity	0.01631253	0.00506842	0.00774234	0.00390373	0.02056460	0.00710063	0.07271117	0.05092399	0.02865489	0.03595794	0.07337681	0.04747757
27	Gas	0.00035921	0.00031204	0.00073703	0.00029124	0.00696471	0.00083422	0.04008131	0.02758284	0.00088910	0.00254320	0.00266587	0.00175413
28	Water supply	0.00454629	0.00093756	0.00092478	0.00047302	0.00824339	0.00124991	0.04434888	0.03075374	0.00222103	0.00345110	0.00319360	0.00266992
29	Transport Services	0.01515074	0.01815425	0.02385788	0.01486986	0.06921598	0.01906324	0.06565139	0.08718053	0.02862350	0.07055897	0.07431845	0.07313769
30	Storage & warehousing	0.00025653	0.00032287	0.00046661	0.00026911	0.00194630	0.00032591	0.00150243	0.02025733	0.00050838	0.00305839	0.00258987	0.00137876
31	Communication	0.00558834	0.00245584	0.00500457	0.00301922	0.01346194	0.00490294	0.01141202	0.01727535	0.00573937	0.00929944	0.01052311	0.01051021
32	Trade	0.03165798	0.04750037	0.03540472	0.02758288	0.04300656	0.02436173	0.12093823	0.08064832	0.04787409	0.17982920	0.17607656	0.17460479
33	Hotels & Restaurant	0.00276511	0.00074241	0.00124368	0.00094230	0.00323558	0.00140625	0.00325826	0.00347399	0.00185402	0.00279752	0.00331108	0.00365376
34	Financial Services	0.04973770	0.01147205	0.01061001	0.00590036	0.02516574	0.01698983	0.03718395	0.03716641	0.02343552	0.04569802	0.06085179	0.07535945
35	Real estate, ownership of dwelling & professional services	0.01485896	0.00656233	0.02362125	0.00690056	0.13337238	0.06547560	0.07495848	0.13644126	0.03616724	0.02990418	0.05700186	0.05248315
36	Other Services	0.03400856	0.00565624	0.02006113	0.02163294	0.04202656	0.01376916	0.03800971	0.02459743	0.02350188	0.01615912	0.00973703	0.00625284
37	Public administration. & defence	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Waste													
Treatment	Incineration	0.00115812	0.00029876	0.00063686	0.00020119	0.00478172	0.00012776	0.00896588	0.00840053	0.00255393	0.00334784	0.01102979	0.00258834
	Composting	0.00105837	0.00023049	0.00018916	0.00022907	0.00190038	0.00008275	0.00332719	0.00460954	0.00085629	0.00423688	0.00286244	0.00057791
	Landfill	0.01468126	0.00379301	0.00610369	0.00215372	0.03564682	0.00249592	0.08602390	0.07710815	0.02121514	0.02560375	0.07808647	0.05330078
	MRF	0.01757630	0.00493819	0.01062017	0.00303806	0.08568009	0.00304895	0.17340276	0.14350850	0.04687786	0.03935797	0.12943949	0.05663184
Waste	D MOW	0.00520250	0.001.401.50	0.004172000	0.00070000	0.00000000	0.00041022	0.04100701	0.02/21/22	0.011/0/22	0.011/0010	0.00440044	0.01040010
Types	DIY M5W	0.00530350	0.00149158	0.00417208	0.000/2339	0.02082386	0.00041032	0.04188601	0.03631659	0.01169632	0.01160219	0.08449244	0.01840012
	Wet MSW	0.00644910	0.00140447	0.00115264	0.00139580	0.0115/9/8	0.00050420	0.02027391	0.02808780	0.00521775	0.02581701	0.01/44199	0.00352146
		0.00450367	0.00139/53	0.00425552	0.000/4158	0.069/89/4	0.00116143	0.12488609	0.10061213	0.03818898	0.00/13969	0.05163202	0.0150/623
	Hazardous Waste	0.02124230	0.00551903	0.00/86361	0.002/2/31	0.01925721	0.00411193	0.08038196	0.07059936	0.01498873	0.024311/2	0.09399430	0.09460654
	Dionicultar waste	0.00000490	0.00000216	0.00000779	0.0000227	0.00004396	0.00002158	0.000024/1	0.00004497	0.00001192	0.00000986	0.00016150	0.00001/30
1	riasue waste	-0.00302941	-0.00033431	0.00009823	0.00003108	0.00031448	-0.00043410	10.00420707	-0.00203410	0.00139933	0.0000000999	-0.00010100	-0.016322/8

Leontief I	nverse of Rajasthan's WSUT Matrix												
		13	14	15	16	17	18	19	20	21	22	23	24
-		10		10	10		Manufacture of	Manufacture					
							chemical and	of					
				Manufactura		Manufactura	chemical products	nharmacautic		Manufactura			
				of machinery		of any and	enemical products	ali madiainal	Manufaatura	of other nen			
		Dest. Matel	Florester P	of machinery		of coke and	except	al, meulcinal		of other non-			
		Basic Metals	Electric &	and	M	refined	pharmaceuticals,	chemicals and	of rubber &	metanic	D	Weed	04
C N		& Metal	Electronic	equipments	Manufacture	petroleum	medicinal and	botanical	plastic	mineral	Paper &	wood	Other
S No.	Product X Product	Products	Equipment	n.e.c.	of I ransport	products	botanical products	products	products	products	Printing	Products	Manufacturing
1	Agriculture	0.01013786	0.01040232	0.00984251	0.01148078	0.00330900	0.0182/545	0.016/0221	0.03648690	0.00843764	0.01605137	0.01219700	0.05138588
2	Livestock	0.00234307	0.00254257	0.00223939	0.00241358	0.00096070	0.00322130	0.00286058	0.00268480	0.00201426	0.00274074	0.00213004	0.00729189
3	Forestry and Logging	0.00757690	0.00937204	0.00797184	0.00833304	0.00265480	0.00911817	0.02473628	0.00875271	0.00850015	0.09715528	0.17317215	0.01661883
4	Fishing & Aquaculture	0.00035869	0.00035984	0.00034322	0.00039699	0.00012482	0.00071924	0.00045777	0.00046893	0.00027902	0.00045366	0.00031509	0.00157085
5	Coal & Lignite	0.15302196	0.04876676	0.05433051	0.04342926	0.01672402	0.02801625	0.01713712	0.02584161	0.10763070	0.03926805	0.02321515	0.05978155
6	Mining of Petroleum & Natural Gas	0.08091517	0.05533025	0.05234780	0.05460172	0.88929480	0.18758354	0.04890187	0.10046681	0.06519509	0.05989838	0.04796403	0.12776162
7	Iron Ore	0.06870749	0.01881218	0.02221185	0.02110478	0.00102713	0.00278542	0.00293493	0.00377098	0.00521584	0.00507244	0.00667559	0.02069513
8	Non-ferrous metal ores	0.04938068	0.01854504	0.01841992	0.01438490	0.00131014	0.00422975	0.00374880	0.00452279	0.00996448	0.00668456	0.00757703	0.03333923
9	Other Mining	0.04371468	0.02655530	0.02343334	0.02211355	0.00414347	0.08560143	0.01935602	0.04086221	0.13154998	0.02533716	0.02186962	0.06601422
10	Food & Beverages	0.00467572	0.00473646	0.00457500	0.00528351	0.00154435	0.01811761	0.01344126	0.00918765	0.00472749	0.00813381	0.00487445	0.02524578
11	Textile & Annarel	0.00813735	0.01130640	0.00915744	0.01259184	0.00410445	0.02652885	0.01513144	0.03648237	0.00746508	0.01583014	0.02870710	0.03511663
12	Manufacture of leather and related products	0.00035440	0.00050026	0.00032701	0.0006222	0.00008788	0.00073831	0.00017756	0.000/10297	0.000740508	0.00068662	0.003/1/1/	0.00101267
12	Pagia Matala & Matal Bradueta	1 40225711	0.28442121	0.45040062	0.24426215	0.01770241	0.05020224	0.05212000	0.07065299	0.07572051	0.00755007	0.12202120	0.00101207
13	Electric & Electronic Environment	1.46223/11	1.25(01080	0.43049962	0.34420213	0.01779241	0.03030334	0.03212090	0.07003288	0.07372031	0.08/3389/	0.13263136	0.2938/038
14	Electric & Electronic Equipment	0.02027826	1.23091080	0.07283697	0.0842164/	0.00389366	0.00909834	0.01038364	0.01248321	0.01215486	0.01396022	0.01139/80	0.03089055
15	Manufacture of machinery and equipments n.e.c.	0.03951639	0.09654079	1.1265/283	0.11311138	0.00/313/4	0.0135/251	0.03404608	0.01621920	0.00935084	0.01456009	0.023/3/68	0.04135213
16	Manufacture of Transport	0.01169643	0.04443943	0.04432326	1.22543654	0.00313807	0.00698369	0.00759255	0.00960431	0.00781789	0.01033331	0.00842744	0.02490465
17	Manufacture of coke and refined petroleum products	0.06941693	0.04449108	0.04253209	0.04191095	1.03157294	0.05052771	0.02798848	0.04840438	0.04993006	0.03762871	0.03264431	0.06656788
	Manufacture of chemical and chemical products except												
18	pharmaceuticals, medicinal and botanical products	0.06361615	0.09543116	0.07067290	0.09535412	0.02747455	1.43764678	0.20610374	0.55162073	0.10185073	0.18331023	0.15052903	0.15599739
	Manufacture of pharmaceutical; medicinal chemicals and												
19	botanical products	0.00265696	0.00360208	0.00234673	0.00270151	0.00134634	0.01043698	1.14255265	0.00589307	0.00255040	0.00341060	0.00242846	0.01198840
20	Manufacture of rubber & plastic products	0.01405180	0.04831527	0.03284266	0.05372573	0.00412369	0.01492330	0.01771208	1.07716906	0.01079144	0.02682079	0.02895841	0.02544721
21	Manufacture of other non-metallic mineral products	0.01399792	0.02711710	0.02041465	0.01548421	0.00337250	0.01456250	0.01194559	0.01669168	1.13139869	0.01336423	0.01062427	0.02033935
22	Paper & Printing	0.00704613	0.00934308	0.00702274	0.00704434	0.00380240	0.00821426	0.00661527	0.01170062	0.00709531	1.07940527	0.00567991	0.01112773
23	Wood Products	0.00930511	0.01241500	0.01002607	0.01533888	0.00259622	0.01254725	0.00624996	0.01089113	0.01531566	0.12336842	1.10660531	0.01987914
24	Other Manufacturing	0.10223275	0.08410742	0.10297542	0.11965853	0.02781975	0.05792519	0.07287834	0.06567488	0.06852893	0.15438886	0.07230555	1.14288968
25	Construction	0.08341003	0 12865439	0.10428322	0.08164274	0.02467040	0.06029153	0.06684311	0.09022196	0.07581413	0.08517291	0.05322908	0.08747213
26	Electricity	0.09560565	0.06369185	0.06195800	0.05285548	0.01417034	0.05659382	0.05272076	0.07388770	0.09478466	0.06600031	0.04467086	0.06635833
20	Gos	0.00606142	0.00307103	0.001/3000	0.00505010	0.00122257	0.00314505	0.00217281	0.00274473	0.00210077	0.000000000	0.00215022	0.00441046
27	Water supply	0.00090142	0.00377087	0.00402902	0.00303019	0.00123237	0.00314303	0.00217281	0.002/44/3	0.00219077	0.00230437	0.00213923	0.00441040
20	Transment Services	0.00774611	0.00492913	0.00443918	0.00412214	0.00183323	0.00309011	0.00230073	0.00333717	0.00334332	0.00328304	0.00202333	0.00317921
29	Transport Services	0.09074433	0.08034887	0.07727033	0.08013222	0.03/389/3	0.08210220	0.03091293	0.08233801	0.00244043	0.0/12442/	0.00000881	0.09212031
30	Storage & warehousing	0.00258009	0.00180864	0.00169/2/	0.001/8821	0.0006//38	0.00139306	0.00100016	0.0014/108	0.00128801	0.0014/286	0.0012/53/	0.00395460
31	Communication	0.01303415	0.01310633	0.01117/062	0.01191061	0.00826670	0.01236892	0.00899092	0.0123/460	0.00946332	0.010/6380	0.00921241	0.01437290
32	Trade	0.19618427	0.20521098	0.17976321	0.20795175	0.07472763	0.16136579	0.11554578	0.18744882	0.13092736	0.16793714	0.15896757	0.19983640
33	Hotels & Restaurant	0.00347964	0.00479975	0.00366248	0.00370476	0.00220889	0.00364524	0.00338592	0.00387082	0.00320765	0.00388951	0.00296016	0.00408721
34	Financial Services	0.05228203	0.10199376	0.07109634	0.06970682	0.03080857	0.06281405	0.07246418	0.07218214	0.06337567	0.08151798	0.05628749	0.07301525
35	Real estate, ownership of dwelling & professional services	0.08806677	0.06628348	0.05927659	0.06203572	0.06678990	0.10077363	0.06708615	0.09051701	0.05697214	0.04902591	0.03954762	0.07632049
36	Other Services	0.01480885	0.00843502	0.00884971	0.00856377	0.01201977	0.01016454	0.00559423	0.00802243	0.00664912	0.00818576	0.00871140	0.01271400
37	Public administration. & defence	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Waste								1		I	1		
Treatment	Incineration	-0.01187533	0.00436678	0.03451931	0.01638671	0.00092289	0.01029964	0.00317365	0.00164205	-0.07892536	-0.00808901	0.00114494	-0.00065710
	Composting	0.00194695	0.00182134	0.00795528	0.00581290	0.00041200	0.00135765	0.00005694	-0.00441322	-0.03326320	-0.01535194	0.00060155	0.00056319
-	Landfill	0.07560042	0.05455164	0.16754780	0.15866175	0.00907896	0.25804785	0.04346547	0.06282558	-0.57135645	-0.01329366	0.03487371	0.02429522
	MRF	0.08961643	0.09333170	0 38437013	0 28349948	0.02043221	0.25971633	0.05832641	-0 13520923	-1 39720557	-0.02838291	0.04266929	0.02797622
Waste			2.07000110	5.55.57015	5120517710	5102015221	0.207/1000	0.000002011	0.10020720	1.09,20001	0.02050271	2.0.200727	0.02/2/022
Types	Dry MSW	0 14988695	0 02422653	0.26501358	0 10974085	0.00544601	0.07722082	0.02645779	0.04133074	-0.35290913	-0.00941168	0.00437832	-0.01442087
Types	Wet MSW	0.01186359	0.01100814	0.04847473	0.035/203/	0.00251046	0.00827270	0.00034600	-0.02680154	-0.20268600	-0.09354556	0.00366551	0.003/2176
├	Inort MSW	0.12077070	0.02067022	0.11704090	0.08720222	0.00231040	0.06150644	0.01267552	0.02007134	1 10170101	0.00000000	0.00500551	0.00343170
	HIGH WIGW	0.120//8/9	0.0390/823	0.11/04989	0.06/30223	0.003/9493	0.00139044	0.0130/333	-0.03091//9	-1.101/8121	-0.00320281	0.01030312	0.02408091
	Diama di sal Waste	0.15586489	0.0/494/85	0.1304/330	0.21199114	0.01108830	0.4//0/433	0.0/304136	0.15414945	-0.29483031	0.034/3433	0.00081438	0.042/8494
<b>├</b> ───	Biomedical Waste	0.00002903	0.00002185	0.00001954	0.00002045	0.00002201	0.00003321	0.00002211	0.00002983	0.00001878	0.00001616	0.00001303	0.00002515
	Plastic Waste	0.01063908	0.00409889	0.03335943	0.01988590	0.00538408	-0.09477600	-0.00852130	-0.21285552	-0.12856288	-0.01370803	-0.00608686	-0.00433037

L	eontief Inverse of Rajasthan's WSUT Matrix												
	L.	25	26	27	28	29	30	31	32	33	34	35	36
												Real estate, ownership	
						Transport	Storage &			Hotels &	Financial	of dwelling &	Other
S No.	Product X Product	Construction	Electricity	Gas	Water supply	Services	warehousing	Communication	Trade	Restaurant	Services	professional services	Services
1	Agriculture	0.00943481	0.01486658	0.00600022	0.02060435	0.01215215	0.00816902	0.01092884	0.01396451	0.16273472	0.00839621	0.00342462	0.00903528
2	Livestock	0.00229710	0.00472769	0.00168732	0.00175197	0.00379133	0.00148436	0.00873204	0.00403180	0.22424371	0.00829492	0.00184989	0.00701502
3	Forestry and Logging	0.03696768	0.01363527	0.00806554	0.00916033	0.02013062	0.00993248	0.01209862	0.00575191	0.00755381	0.00412593	0.00483247	0.00400361
4	Fishing & Aquaculture	0.00027319	0.00022997	0.00023707	0.00022961	0.00019674	0.00016832	0.00024991	0.00111059	0.00254524	0.00015131	0.00008245	0.00016572
5	Coal & Lignite	0.04297172	0.13266679	0.03735919	0.02503906	0.01526019	0.01273917	0.01229178	0.00831668	0.00833362	0.01165898	0.00656046	0.00885904
6	Mining of Petroleum & Natural Gas	0.04959657	0.14521493	0.36144954	0.09267144	0.12814048	0.09156697	0.05867248	0.05578037	0.02894207	0.02165942	0.02645793	0.03501373
7	Iron Ore	0.01119639	0.00517283	0.01482075	0.00826072	0.00264048	0.00268454	0.00272277	0.00207222	0.00174721	0.00121464	0.00123371	0.00200144
8	Non-ferrous metal ores	0.00924608	0.00487013	0.01139510	0.00668168	0.00265429	0.00272120	0.00306946	0.00326981	0.00215310	0.00135192	0.00124321	0.00208622
9	Other Mining	0.03284047	0.01152486	0.01369824	0.01494794	0.00701958	0.01069690	0.00836593	0.00693632	0.00685128	0.00333667	0.00373722	0.00474492
10	Food & Beverages	0.00375682	0.00359202	0.00295320	0.00425762	0.00261462	0.00246966	0.00440782	0.00851274	0.05861246	0.00296848	0.00137939	0.00308760
11	Textile & Apparel	0.00921340	0.00807896	0.00522464	0.00558396	0.01028493	0.03041984	0.00689965	0.01167186	0.00523825	0.00258795	0.00327601	0.00613274
12	Manufacture of leather and related products	0.00033365	0.00030445	0.00021651	0.00015611	0.00013359	0.00018321	0.00016231	0.00061188	0.00012869	0.00006640	0.00006545	0.00008538
13	Basic Metals & Metal Products	0.22897403	0.10334521	0.31286398	0.17232122	0.05046605	0.05157471	0.05023139	0.03518173	0.03084200	0.02232834	0.02317655	0.03762281
14	Electric & Electronic Equipment	0.03209813	0.04537973	0.04983282	0.01832217	0.01524812	0.01220585	0.03332438	0.01243654	0.00642706	0.00910834	0.00616121	0.00929273
15	Manufacture of machinery and equipments n.e.c.	0.01973077	0.01201813	0.02526578	0.01256909	0.02899205	0.01156767	0.00979077	0.01291550	0.00718744	0.00460772	0.00442869	0.00460291
16	Manufacture of Transport	0.05546309	0.01391022	0.02702251	0.01309656	0.01204311	0.01140930	0.00839232	0.01194941	0.00580086	0.00432748	0.00620294	0.00845524
17	Manufacture of coke and refined petroleum products	0.04329356	0.15500556	0.09936350	0.09394440	0.13927401	0.09483185	0.05832598	0.05737751	0.02478651	0.02147578	0.02734998	0.03565384
	Manufacture of chemical and chemical products												
	except pharmaceuticals, medicinal and botanical												
18	products	0.06875844	0.02900444	0.03367138	0.08620829	0.03204999	0.07385149	0.04692943	0.03960098	0.04468083	0.01275111	0.01650372	0.02134123
	Manufacture of pharmaceutical; medicinal chemicals												
19	and botanical products	0.00258080	0.00197086	0.00181340	0.00209581	0.00211184	0.00184768	0.00439901	0.00158623	0.00573486	0.00160960	0.01156265	0.01605022
20	Manufacture of rubber & plastic products	0.06059353	0.00882864	0.01164882	0.02617576	0.02673454	0.05141184	0.01598641	0.00924940	0.04610724	0.00587232	0.01134192	0.01381106
21	Manufacture of other non-metallic mineral products	0.11031363	0.03236593	0.01156931	0.02260546	0.01172911	0.01841867	0.00914587	0.00410999	0.00781629	0.00517124	0.00703991	0.00539314
22	Paper & Printing	0.00623618	0.01028945	0.01921409	0.00510008	0.01539365	0.01264847	0.08658809	0.00931589	0.00590914	0.01581677	0.01809564	0.01306070
23	Wood Products	0.03134125	0.00843504	0.01557140	0.00892271	0.00667397	0.01022639	0.01560522	0.01318549	0.00535141	0.00405210	0.00570698	0.00454815
24	Other Manufacturing	0.04349632	0.04182094	0.04859424	0.03914210	0.03614089	0.03559541	0.05532604	0.02127784	0.04344047	0.02489766	0.01787344	0.03622060
25	Construction	1.04457299	0.04247859	0.08771150	0.19994678	0.09447676	0.16380042	0.07150103	0.02207266	0.06009576	0.02869485	0.05935042	0.03954883
26	Electricity	0.09177643	1.02251664	0.03429118	0.03701730	0.04654763	0.02825626	0.02755111	0.01453009	0.02396736	0.06962569	0.02279335	0.02878866
27	Gas	0.00211090	0.00206737	1.00235586	0.00156318	0.01147445	0.00236538	0.00321210	0.00086563	0.00302205	0.00087048	0.00064459	0.00081092
28	Water supply	0.01080052	0.00490266	0.00367951	1.00951065	0.01338067	0.00398404	0.00460732	0.00122641	0.00288279	0.01237410	0.00257112	0.00171121
29	Transport Services	0.06282518	0.06140800	0.06831166	0.05219227	1.07907858	0.15659435	0.06343011	0.03335671	0.05542680	0.04768705	0.03229536	0.02578093
30	Storage & warehousing	0.00132238	0.00120049	0.00204617	0.00092909	0.00353261	1.01915046	0.00113640	0.00481232	0.00111009	0.00049996	0.00188154	0.00052050
31	Communication	0.01078301	0.01156236	0.01136068	0.01025150	0.08562827	0.01624616	1.04930191	0.00807192	0.03231102	0.04101466	0.03593464	0.07492746
32	Trade	0.14694656	0.11626672	0.14887416	0.10238797	0.08269505	0.08309829	0.07669855	1.05294362	0.11186436	0.02945669	0.03118911	0.04135154
33	Hotels & Restaurant	0.00297960	0.00389972	0.00335990	0.00334451	0.01388688	0.00325854	0.03600507	0.00162660	1.00326420	0.03512390	0.00678868	0.02940137
34	Financial Services	0.04759335	0.05924225	0.05871070	0.05406721	0.07135567	0.03043112	0.08871402	0.02776009	0.03917767	1.02447316	0.04222534	0.05343687
	Real estate, ownership of dwelling & professional												
35	services	0.11643878	0.09608950	0.07493598	0.06344718	0.11199801	0.06576153	0.23489658	0.02907057	0.07941666	0.09667501	1.06299177	0.09157279
36	Other Services	0.00779687	0.01172501	0.01372993	0.02729135	0.01817255	0.01492209	0.06575552	0.00549418	0.01447510	0.00887475	0.01361414	1.02981573
37	Public administration. & defence	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Waste													
Treatment	Incineration	-0.00150601	-0.00102461	-0.00110790	-0.00030997	0.00157557	0.07082763	0.00088472	0.00098844	0.02599161	0.00096177	0.00061958	0.00088256
	Composting	-0.00066846	-0.00009540	0.00071913	0.00032465	0.00099911	0.11562798	0.00055583	0.00069935	0.04208349	0.00136112	0.00025530	0.00118430
	Landfill	0.00642166	0.00257291	0.02403049	0.02162755	0.01322537	0.37933883	0.01270068	0.01239718	0.14147765	0.00739746	0.00460310	0.00928015
	MRF	-0.01183021	-0.00205255	0.03710701	0.02329865	0.02137573	0.54466315	0.01931547	0.01768787	0.20077483	0.01170217	0.00601526	0.01330241
Waste													
Types	Dry MSW	-0.00823226	-0.00795104	-0.02031646	-0.00729210	0.00899266	0.13958750	0.00400259	0.00497236	0.05243004	0.00232184	0.00161192	0.00196602
	Wet MSW	-0.00407321	-0.00058133	0.00438192	0.00197824	0.00608796	0.70456799	0.00338688	0.00426141	0.25643172	0.00829386	0.00155562	0.00721639
	Inert MSW	-0.01511606	-0.00695976	0.02897190	0.01235625	0.00560338	0.12887247	0.00583331	0.00558041	0.04796877	0.00272310	0.00122050	0.00443331
	Hazardous Waste	0.02923088	0.01353969	0.04191034	0.04155605	0.01605780	0.09770070	0.01938940	0.01771382	0.04153514	0.00645916	0.00707087	0.01063090
	Biomedical Waste	0.00003838	0.00003167	0.00002470	0.00002091	0.00003691	0.00002167	0.00007742	0.00000958	0.00002618	0.00003186	0.00035036	0.00003018
	Plastic Waste	-0.00943075	0.00132112	0.00577632	-0.00367847	0.00039707	0.03970767	0.00076709	-0.00076473	0.01193590	0.00159270	-0.00031604	0.00037262

Leontief In	verse of Rajasthan's WSUT Matrix											
		37	38	39	40	41	42	43	44	45	46	47
		Public										
		administration. &								Hazardous	Biomedical	
S No.	Product X Product	defence	Incineration	Composting	Landfill	MRF	Dry MSW	Wet MSW	Inert MSW	Waste	Waste	Plastic Waste
1	Agriculture	0.06511695	0.00014560	0.00005402	0.00010671	0.00028937	0.00023375	0.00016984	0.00023981	0.00020428	0.00014032	0.00028937
2	Livestock	0.05536478	0.00005257	0.00001908	0.00004292	0.00010198	0.00008369	0.00006200	0.00008589	0.00007447	0.00005127	0.00010198
3	Forestry and Logging	0.00271003	0.00020374	0.00007623	0.00024147	0.00060526	0.00048229	0.00034864	0.00050381	0.00043579	0.00020886	0.00060526
4	Fishing & Aquaculture	0.00082736	0.00000374	0.00000131	0.00000234	0.00000671	0.00000543	0.00000392	0.00000553	0.00000467	0.00000355	0.00000671
5	Coal & Lignite	0.00367310	0.00045146	0.00016371	0.00026888	0.00116010	0.00088797	0.00060127	0.00091814	0.00074494	0.00042669	0.00116010
6	Mining of Petroleum & Natural Gas	0.01097786	0.00098918	0.00038143	0.00071628	0.00198611	0.00159973	0.00116048	0.00164167	0.00139458	0.00095215	0.00198611
7	Iron Ore	0.00071291	0.00014353	0.00005522	0.00006513	0.00023467	0.00018752	0.00013330	0.00018968	0.00015569	0.00013289	0.00023467
8	Non-ferrous metal ores	0.00074037	0.00012285	0.00004699	0.00005651	0.00020049	0.00016042	0.00011420	0.00016228	0.00013341	0.00011385	0.00020049
9	Other Mining	0.00206448	0.00026261	0.00008124	0.00018548	0.00054099	0.00043290	0.00030817	0.00044458	0.00037538	0.00025215	0.00054099
10	Food & Beverages	0.04121782	0.00005721	0.00001847	0.00003429	0.00009705	0.00007895	0.00005707	0.00008025	0.00006781	0.00005410	0.00009705
11	Textile & Apparel	0.00226856	0.00012983	0.00004653	0.00009139	0.00024120	0.00019628	0.00014339	0.00020071	0.00017141	0.00012461	0.00024120
12	Manufacture of leather and related products	0.00050697	0.00000311	0.00000114	0.00000218	0.00000680	0.00000539	0.00000382	0.00000554	0.00000465	0.00000298	0.00000680
12	Basic Metals & Metal Products	0.01313411	0.00289238	0.00111304	0.00131142	0.00474493	0.00378946	0.00269188	0.00383374	0.00314548	0.00267786	0.00474493
13	Electric & Electronic Equipment	0.00420260	0.00049371	0.00019209	0.00022042	0.00084675	0.00067086	0.00207188	0.00068017	0.00055498	0.00045663	0.00084675
15	Manufacture of machinery and equipments n e c	0.00346996	0.00530296	0.00218302	0.00019102	0.00396446	0.00327170	0.00232443	0.00304374	0.00220665	0.00460933	0.00396446
16	Manufacture of Transport	0.00799753	0.00039832	0.00014688	0.00031514	0.00090965	0.00072403	0.00051787	0.00074732	0.00063271	0.00038703	0.00090965
10	Manufacture of coke and refined petroleum products	0.01049734	0.00090152	0.00037853	0.00072278	0.00196667	0.00072403	0.00114858	0.00162714	0.00138722	0.00033703	0.00090903
17	Manufacture of chemical and chemical products excent	0.01049754	0.00070132	0.00037033	0.00072270	0.00170007	0.00137000	0.00114050	0.00102/14	0.00130722	0.00007727	0.00170007
18	pharmaceuticals medicinal and botanical products	0.01158090	0.00136694	0.00025148	0.00047462	0.00141890	0.00120458	0.00086099	0.00117925	0.00097902	0.00124586	0.00141890
10	Manufacture of pharmaceutical: medicinal chemicals and	0.01150050	0.00150074	0.00023140	0.00047402	0.00141090	0.00120450	0.00000077	0.00117925	0.00077902	0.00124500	0.00141090
19	hotanical products	0.00632877	0.00008084	0.00002565	0.00006629	0.00013549	0.00011440	0.00008680	0.00011671	0.00010325	0.00007887	0.00013549
20	Manufacture of rubber & plastic products	0.00052077	0.00042588	0.00015875	0.00039875	0.00013343	0.00081985	0.00059565	0.00084910	0.00073071	0.00042220	0.00013349
20	Manufacture of other non-metallic mineral products	0.00291189	0.00040718	0.00013075	0.00055586	0.00102022	0.000116805	0.00037505	0.00122749	0.00105428	0.00042220	0.00102022
22	Paper & Printing	0.00183765	0.00014363	0.00005623	0.00011388	0.00026815	0.00022085	0.00016480	0.00022622	0.00019628	0.00013959	0.00026815
22	Wood Products	0.00245258	0.00015969	0.00005432	0.00017700	0.00020019	0.00022039	0.00026491	0.00038650	0.00033195	0.00015999	0.00020019
25	Other Manufacturing	0.00245250	0.00083587	0.00031817	0.00041600	0.00130694	0.000057055	0.00020491	0.00107073	0.00039193	0.00077890	0.00040709
25	Construction	0.02109461	0.00329002	0.00104978	0.00517918	0.00130094	0.001000005	0.00727558	0.01073202	0.00031158	0.00354635	0.01201540
25	Electricity	0.01310030	0.000327002	0.00104978	0.000517518	0.01271340	0.01018550	0.00727338	0.00347517	0.00273033	0.000334033	0.01251340
20	Gas	0.00051165	0.0006480	0.00023132	0.00004575	0.00434823	0.000220040	0.00207427	0.00047517	0.00273033	0.0006232	0.00434823
27	Water supply	0.01245275	0.00000480	0.00002913	0.00004031	0.00010308	0.00008820	0.00000733	0.00008970	0.00007811	0.00000232	0.00010508
20	Transport Services	0.01245575	0.00009300	0.00003931	0.00009407	0.00022731	0.00581858	0.00013377	0.00019082	0.00010303	0.00009555	0.00022731
29	Storage & warshousing	0.00156551	0.00012780	0.00203755	0.00300189	0.00081303	0.000381858	0.00439308	0.000393809	0.000331717	0.00403044	0.00081303
21	Communication	0.00150551	0.00002470	0.00001032	0.00001821	0.00004437	0.00003003	0.00002737	0.00003744	0.00003229	0.00002382	0.00004437
31	Trade	0.00709812	0.00164506	0.00024707	0.00033098	0.00101383	0.00080302	0.00007193	0.00088211	0.00078890	0.00039384	0.00101383
32	I rade	0.04169296	0.00164396	0.00061122	0.00104416	0.00319///	0.00233719	0.00183010	0.00261692	0.00219434	0.00136430	0.00319777
33	Financial Seminar	0.000660512	0.00010013	0.00000100	0.00014349	0.00027810	0.00023032	0.00018233	0.00024148	0.00021343	0.00010500	0.00027810
34	Pinancial Scivices	0.00900039	0.0008/413	0.00033767	0.00039203	0.0013/242	0.0012810/	0.00094103	0.00130820	0.001113/2	0.00083383	0.00137242
33	Real estate, ownership of dwelling & professional services	0.01423094	0.00123333	0.00046554	0.00114322	0.00282278	0.00228317	0.0010/330	0.00236120	0.00204038	0.00123840	0.00282278
30	Differ Services	0.00376332	0.00340484	0.00108210	0.0031/962	0.00330/94	0.004//6/0	0.003/3443	0.0048/123	0.00442332	0.00342014	0.00330794
3/ Wasta	Public administration. & defence	1.0000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000
waste Tractor and	Y	0.00062206	1.00504014	0.00006747	0.00000040	0.00160084	0 16906072	0.11006077	0.00021806	0.04902477	0.96966727	0.00160094
Treatment	Incineration	0.00062306	1.00504014	0.00006747	0.00000049	0.09160984	0.16806973	0.110069//	0.09031896	0.048934//	0.86866727	0.09160984
	Composting	0.0006/519	0.00183682	1.00001/41	0.00000349	0.04588782	0.0310/624	0.18155084	0.03324968	0.02451318	0.00158805	0.04588782
	Landilli	0.00048/31	0.03403583	0.00035054	1.00009689	0.4900/356	1.40255925	0.3/300995	0.012/1/64	0./3118/01	0.165119/3	0.4900/330
XV. A	NIKT	0.00906232	0.08815142	0.000/6436	0.00004993	2.20399243	1.49255835	0.83/53081	1.39093107	1.1//31340	0.07619701	2.20399243
waste	Der MSW	0.00242215	0.00076059	0.00051002	0.00000477	0.55042542	1 27292450	0.20027122	0 2000 1275	0.20401075	0.01067025	0 55042542
Types		0.00242315	0.022/6958	0.00051003	-0.000004/7	0.55043543	1.3/283439	0.2092/132	0.398843/5	0.29401975	0.0196/935	0.0043043
	wet IVIS W	0.00411422	0.01119246	0.00010606	0.00002129	0.27961303	0.18936006	1.10626259	0.20260375	0.149368/2	0.0096/665	0.27961303
	Inert MS W	0.00222/15	0.0/4//31/	0.00022440	-0.00003902	0.51501558	0.35449/07	0.199/6833	1.3/444827	0.2/508384	0.06462198	0.01001008
	nazardous waste	0.00003135	0.01250606	0.00030131	0.000213/5	0.2953/690	0.20015028	0.11240917	0.21409064	1.15/8/884	0.01083813	0.2953/690
	Diometrical waste	0.00000469	0.00000041	0.00000015	0.00000038	0.00000093	0.000000/5	0.00000055	0.000000/8	0.0000006/	1.00000041	1.1077221.6
1	Plastic waste	0.00104/51	0.00782254	0.00005782	-0.00004082	0.19//2216	0.1338/968	0.07511006	0.14323044	0.105596/5	0.000/333/	1.19//2216

# Annexure 8: Operational Material Recycling Facility Plant capacity as per SBM data

Plant Category	Designed Plant Capacity	Actual Output (TPD)	
Material Recovery Facility	5	2.5	
Material Recovery Facility	2.55	2.55	
Material Recovery Facility	66	3	
Material Recovery Facility	5	3 3	
Material Recovery Facility	5		
Material Recovery Facility	6	4	
Material Recovery Facility	15	4.5 10 12.5 13	
Material Recovery Facility	15		
Material Recovery Facility	15		
Material Recovery Facility	100		
Material Recovery Facility	95 50	50	
Material Recovery Facility	170	160	
Material Recovery Facility	r Facility 250 250		
Total	749.55	518.05	
Capacity Utilisation Factor	(Actual Output)/(Plant Capacity)	518.05/749.55 = 0.691	

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