



Solid Waste Management Report

URBAN DEVELOPMENT PLAN
FOR SAHIWAL DIVISION



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Important Components of the Plan

- Implementation of Primary and Secondary Waste Collection Systems
- Comprehensive Analysis of Capital and Operational Costs related to proposed waste management strategies to ensure financial sustainability
- To bolster the waste management infrastructure and operational capacity, the Acquisition of New Resources and Additional Human Resources are essential.
- Establishing a robust monitoring and evaluation framework to continuously assess and enhance the effectiveness of Solid Waste Management (SWM) operations.
- Establishment of a controlled dumping site specifically within the districts of Sahiwal Division, ensuring responsible and environmentally friendly waste disposal practices.

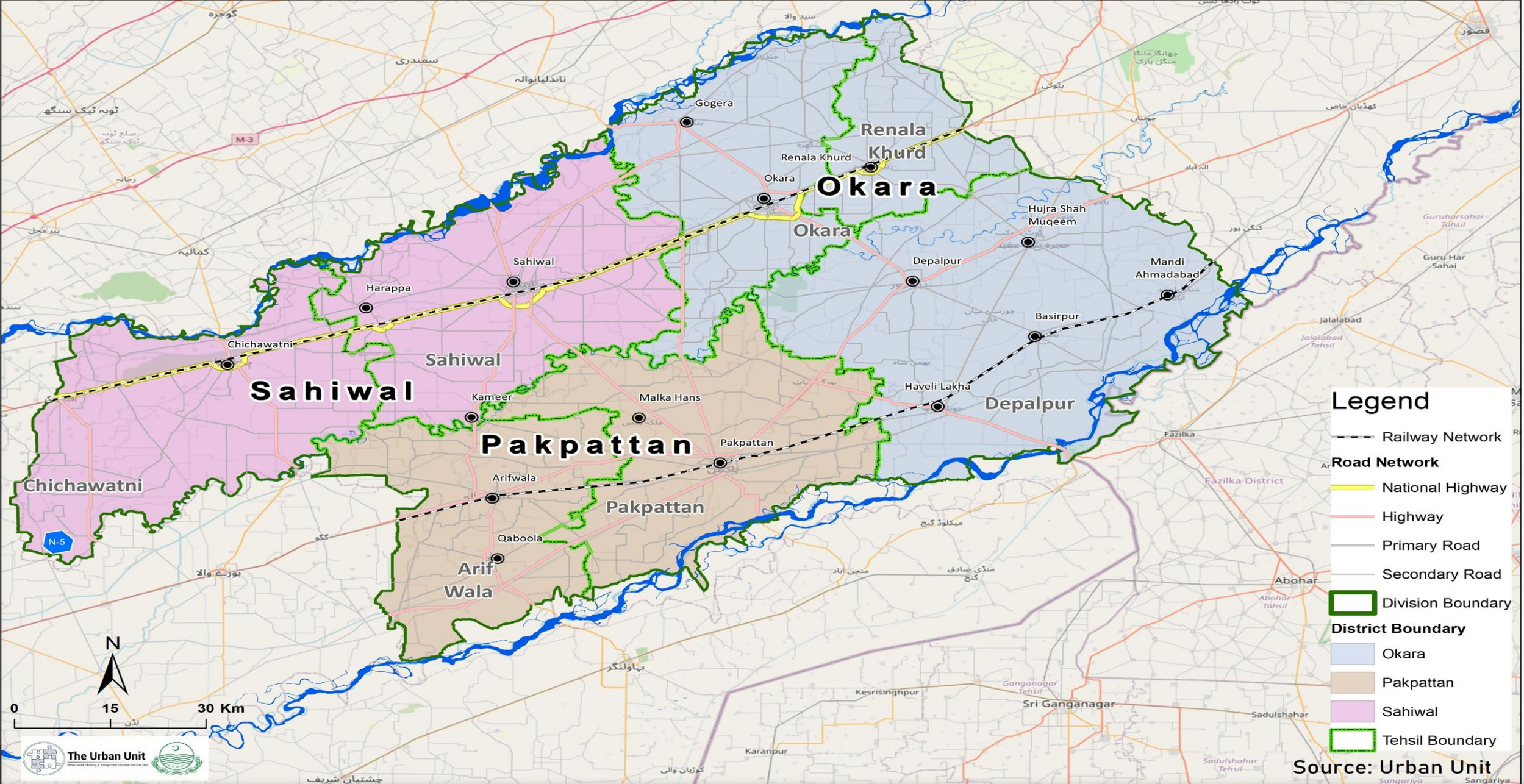
Magnitude/Complexity of the waste management Problem



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- The growth of Waste Generation per capita at a rate of 1.5%p.a
- Rapid Urban Population Growth that is increased to 2.46
- Environmental threats could include pollution, degradation, and harm to ecosystems, emphasizing the urgency for effective waste management solutions.
- Current practices pose risks to human health adding a critical aspect
- The compounding effect of both increasing waste generation and urban population growth implies a multifaceted challenge
- Sustainability Considerations



APPROACH AND METHODOLOGY



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➤ Current SWM Situational Analysis

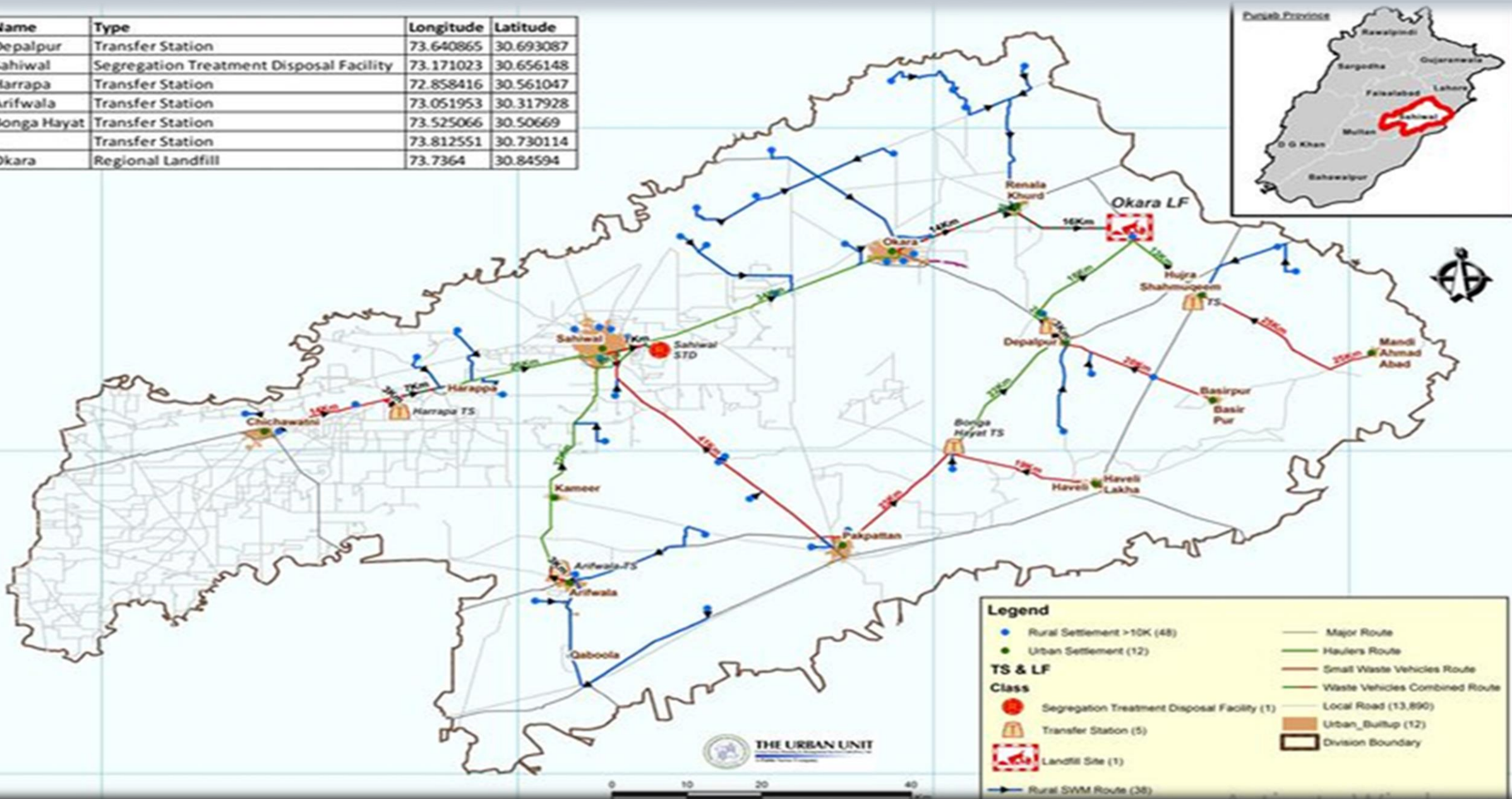
➤ Proposed Municipal Solid Waste Collection & Haulage Model including MRF

1. Urban Areas of the Sahiwal Division – Sahiwal (TMA) & MCs of Okara, & Pakpattan
2. Rural Areas of the Sahiwal Divisions

Districts and Tehsils of Sahiwal Division		
Sahiwal District	Okara District	Pakpattan District
Sahiwal Tehsil	Okara Tehsil	Pakpattan Tehsil
Chichawatni Tehsil	Renala Khurd Tehsil	Arifwala Tehsil
	Depalpur Tehsil	

Land Use Area Of Sahiwal Division

Sr#	Name	Type	Longitude	Latitude
1	Depalpur	Transfer Station	73.640865	30.693087
2	Sahiwal	Segregation Treatment Disposal Facility	73.171023	30.656148
3	Harrapa	Transfer Station	72.858416	30.561047
4	Arifwala	Transfer Station	73.051953	30.317928
5	Bonga Hayat	Transfer Station	73.525066	30.50669
6		Transfer Station	73.812551	30.730114
7	Okara	Regional Landfill	73.7364	30.84594



Current Scenario of Sahiwal Division

- Sahiwal currently generates approximately 150 tons of municipal solid waste daily, totaling an estimated yearly generation of 55,200 tons.
- The calculations are based on rough estimates, assuming a waste generation rate of 0.45 kg per capita per day, which aligns with the national range of 0.283 to 0.612 kg/capita/day in Pakistan.
- Due to population growth and increased economic activity, Sahiwal's daily waste generation is projected to increase to about 200 tons per day (73,600 tons annually) by 2033, using a rate of 0.457 kg/capita/day.
- Further acceleration is anticipated, reaching approximately 265.63 tons daily (97,520 tons annually) by 2043, with an assumed waste generation rate of 0.531 kg/capita/day.
- The potential volume of municipal waste generated poses a significant challenge for Sahiwal, emphasizing the urgent need for a well-devised and implemented waste management plan to address this escalating issue.



Solid Waste Management Scenario in Sahiwal Division

- The Urban Population of the Sahiwal division exceeds 20 million (based on Projection from 2017).
- The current efficiency of the collection of Solid Waste is about 50% in Urban Areas and 30% in Rural, which can be increased to 90% if designed properly.
- Lack of Proper Landfill site available in the Sahiwal division
- The waste is either burned, dumped along the sides of roads, Railway lines/tracks, or buried illicitly in the vacant plots of the cities.



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Issues Observed During Field Visit

- Ineffective waste management policies, lack of proper regulations, or challenges in enforcement can contribute to the inefficiency of waste management practices.
- Poor urban planning and insufficient consideration for waste management needs in development plans can exacerbate waste-related issues.



- Limited financial resources, equipment, and manpower may impede the establishment and maintenance of a robust waste management system.



Issues Observed During Field Visit



- Inadequate infrastructure for waste collection, transportation, and disposal can hinder effective solid waste management.

- The absence of stringent measures and enforcement against illegal dumping may lead to the unauthorized disposal of waste in public areas, further complicating waste management efforts.



Sahiwal (Sahiwal), Punjab, Pakistan
Plot 50, Fateh Sher Colony, Sahiwal
Lat 30.680262°
Long 73.108501°
17/01/24 01:37 PM GMT +05:00



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Existing Resources Tehsil wise

	Name	Sahiwal	Chichawatni	Okara	Renala Khurd	Depalpur	Pakpattan	Arifwala
	Sanitary Workers	460	120	416	45	60	270	180
Collection	Hand Carts	100	-	09	-	-	55	-
	Loader Rickshaw	-	-	-	-	-	-	-
	Containers (10 cu.m)	-	-	-	-	-	04	-
	compactor (0.8 cu.m)	03	-	-	-	-	-	-
	Mini dumper	-	-	8	01	-	-	-
Transportation	Tractor Trolley	16	-	24	4	9	03	5
	Loader	03	-	3	01	-	02	-
	Sucker Machine		-	-	-	01	-	01
	Arm Roll	6	--	-	01	-	-	-
	Compactor 13m3	-	-	-	-	-	-	-
	Container carrier	60	-	-	-	-	01	01
	M.S	02	-	-	-	-	-	-
	Drivers	117	08	80	03	03	04	08
	Dewatering Set	20	-	-	-	-	-	-
	Jetting Machine	02	-	-	-	01	-	01

Resources Delivered by PCICIIP to Sahiwal Tehsil

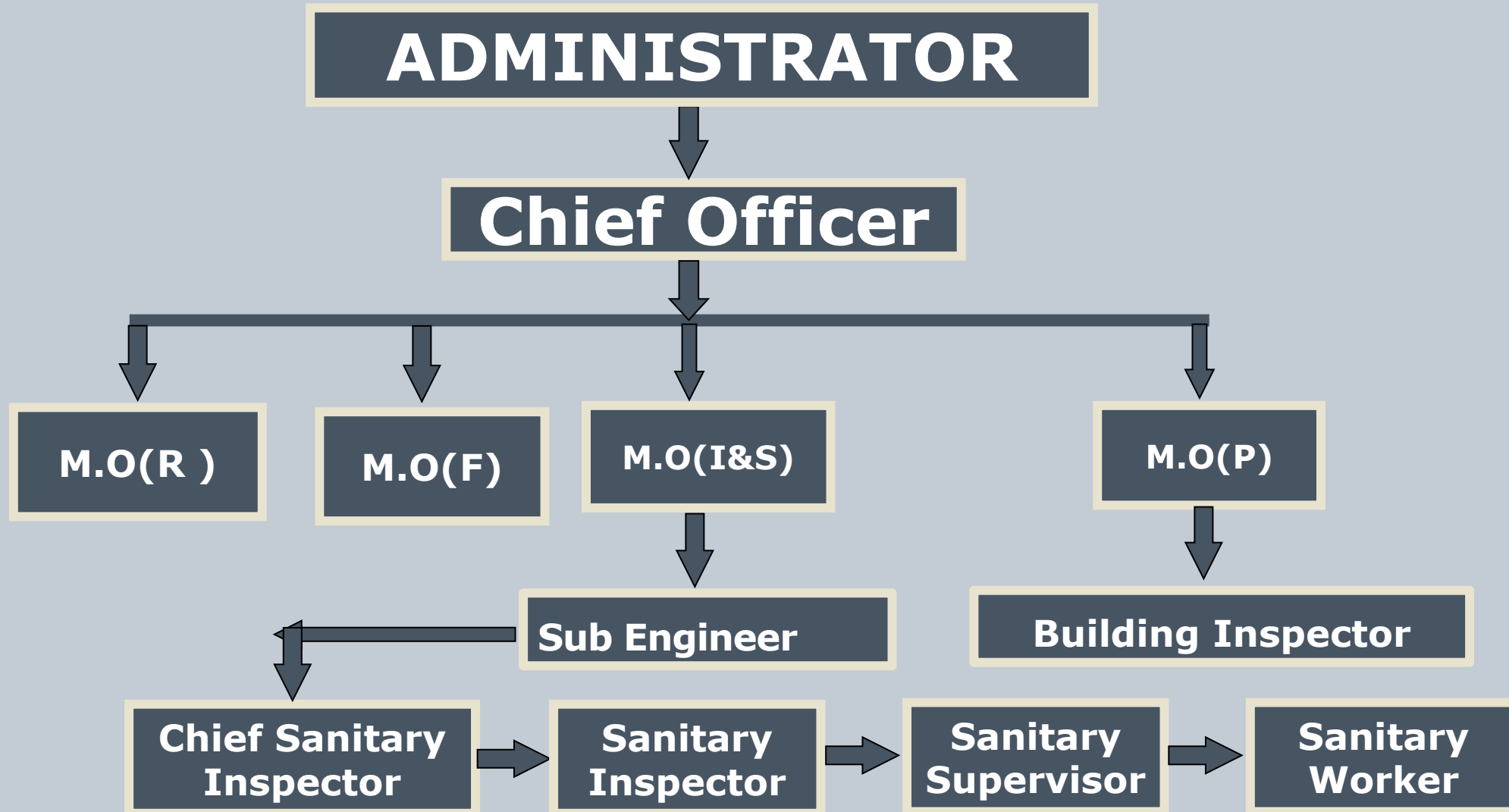
Sr. No.	Name	Sahiwal	Sr. No.	Name	Sahiwal
1	Wheel Excavator Crane	01	14	Wheel Excavator Crane	1
2	Mini Tipper	12	15	Mini Tipper	12
3	Truck Mounted Suction Unit	01	16	Truck Mounted Suction Unit	1
4	Garbage Container	600	17	Truck Mounted Jetting Unit	1
6	Garbage Compactor 8.0 M3	4	18	Truck Mounted Road Washer	2
7	Dump Truck	2	19	Mane Hole De- Silting Machine	1
8	Hand Cart	300	20	Water Truck with Spray System	1
9	Mobile Workshop	1	21	Combine Suction/Jetting/Flushing/ Unit	1
10	Mobile Container Washer	2	22	Garbage Compactor 11M3	2
11	Winch Machine	1	23	Mobile Crane	1
12	Hydraulic elevated platform Truck	1	24	Chain Arm Role Truck	7
13	Truck mounted Vacuum Sweeper	1			

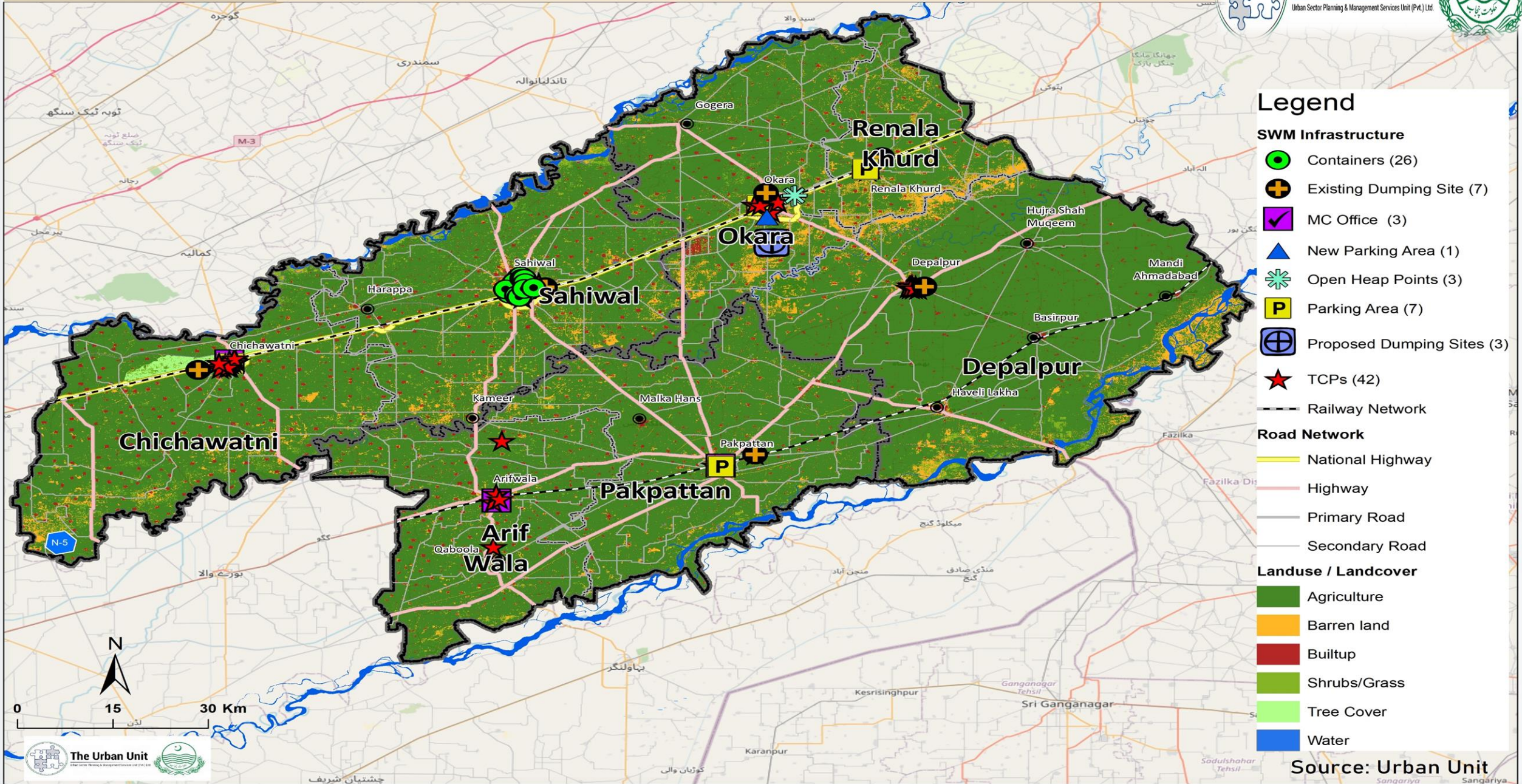


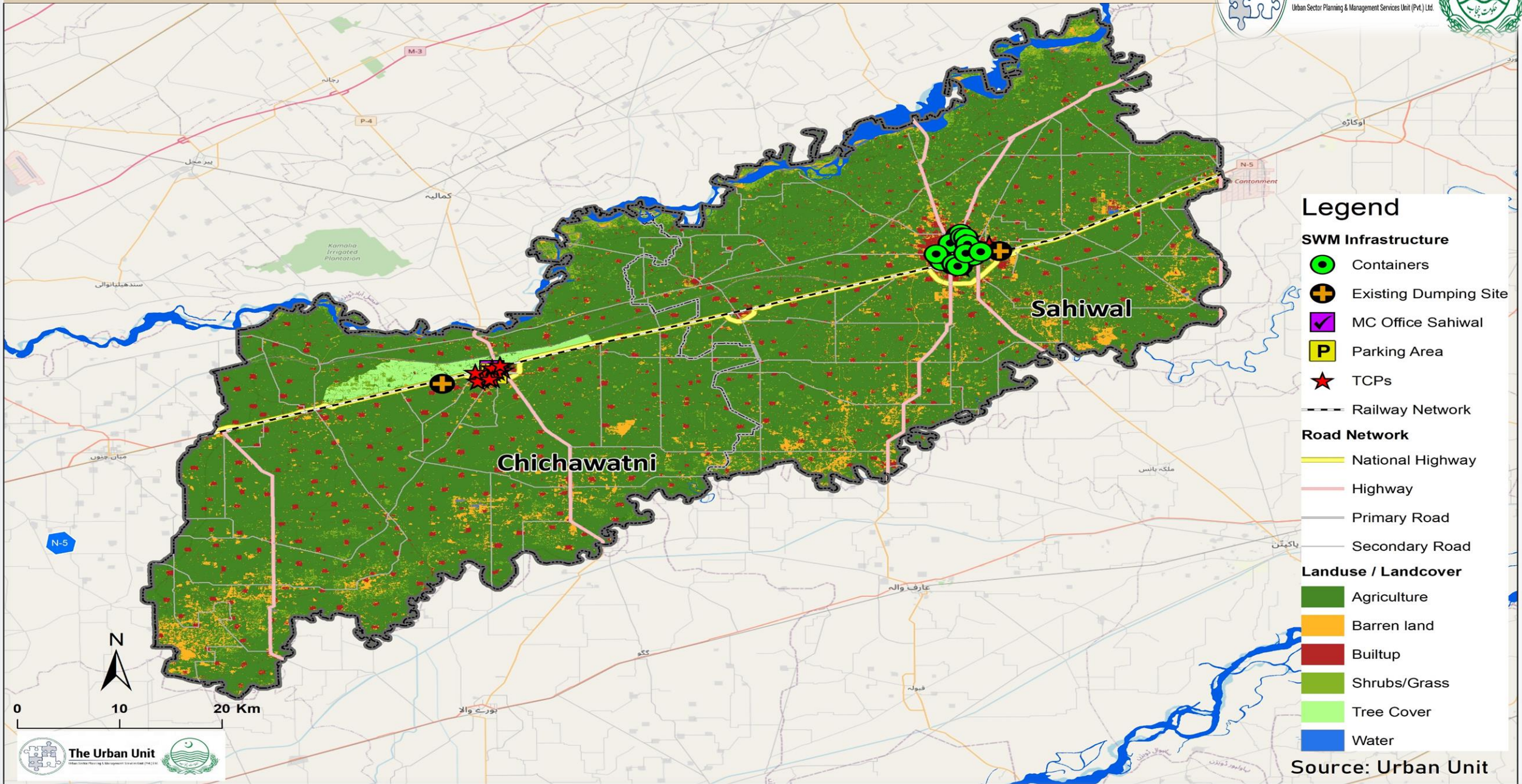
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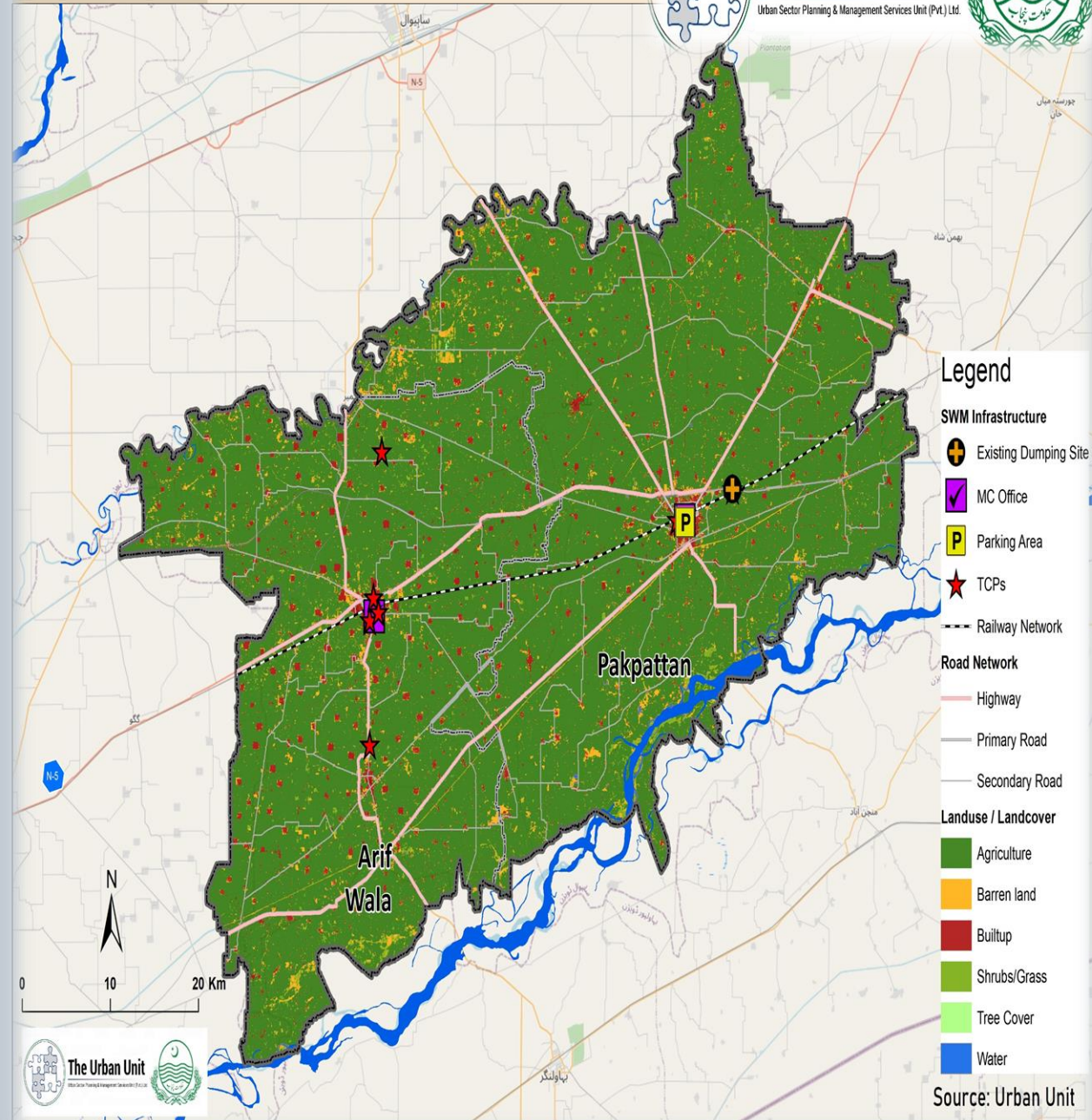
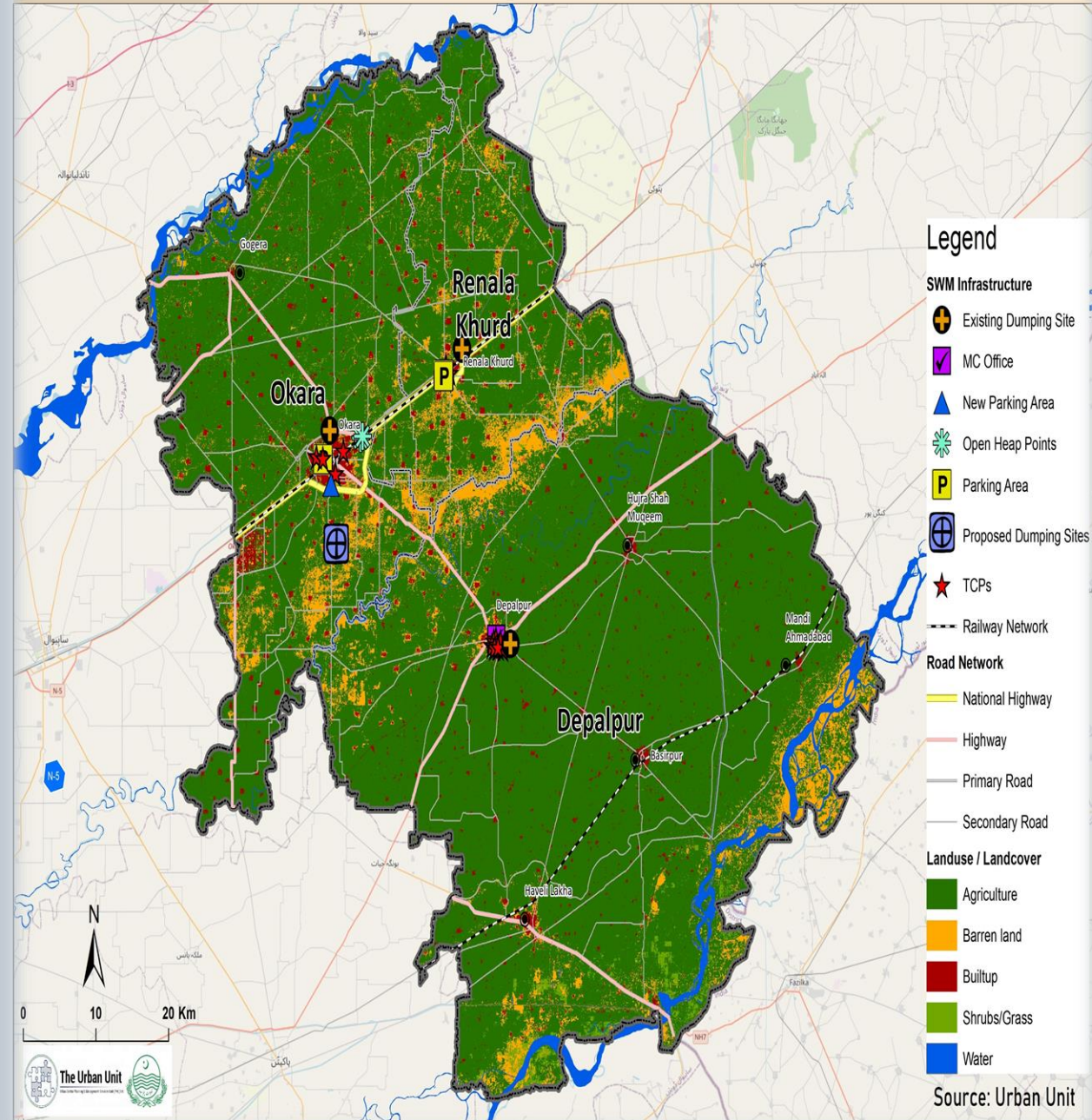


Waste Management Organizational Hierarchy









STD Facility in Sahiwal city



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- The project, approved in 2017, is managed by the Local Government and Community Development Department and The Urban Unit, Punjab.
- The plant can Treat approximately 120 tones of Municipal solid waste per day at optimal capacity.
- The 25-acre plant includes sorting and composting facilities, a windrow pad, leachate pond, weighbridge, vehicle workshop, administrative and sanitary worker rooms, machinery and vehicle parking areas, watchtowers, and a vehicle tire wash ramp.
- Currently SWM sector of Urban Unit is engaged in Plant operation and is successfully operating plant in one shift.
- Approximately 35-40 tons of MSW is being treated on regular basis.

Operations of Sahiwal Facility



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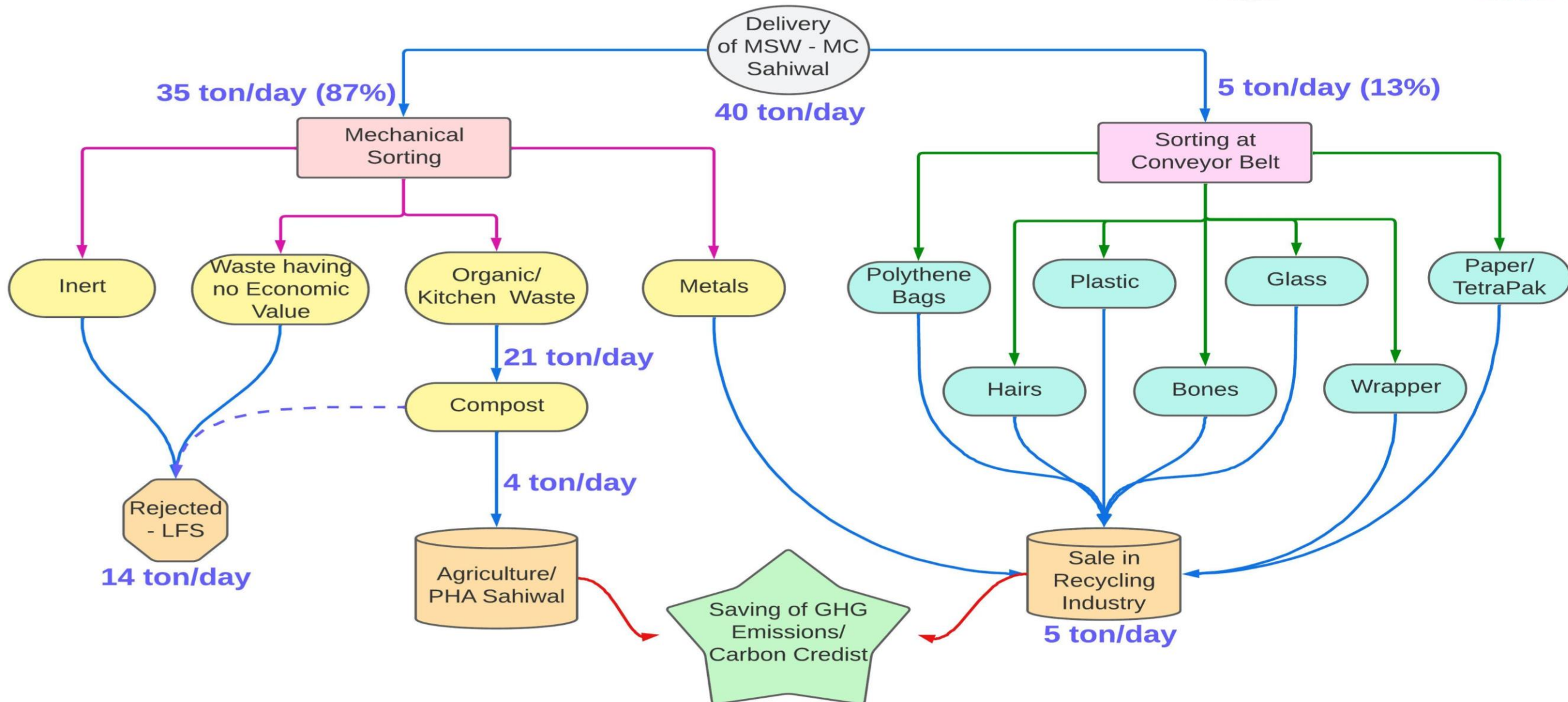


STD Facility in Sahiwal city



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Proposed Interventions



Proposed Interventions key Area's



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- Enhanced Resources and Workforce Allocation for better Integrated SWM
- Restructuring the operating model to enhance efficiency and effectiveness within the SWM system.
- Procuring adequate Personal Protective Equipment (PPEs) to ensure the safety and well-being of the workforce.
- Creating controlled dumpsites and strategically located transfer stations for streamlined waste management operations.
- Ensuring the deployment of monitoring, evaluation, and command & control within the SWM framework.
- Incorporating a modern attendance system based on biometric and Android technology to streamline workforce management.
- Developing a systematic approach to monitor and address citizen complaints related to waste management issues.
- Launching comprehensive capacity-building training programs for the SWM workforce.
- Developing an advanced Segregation, Treatment, and Disposal (STD) Facility to address waste management needs in remaining districts i.e. Okara and Pakpattan.

Solid Waste Management Proposed Model



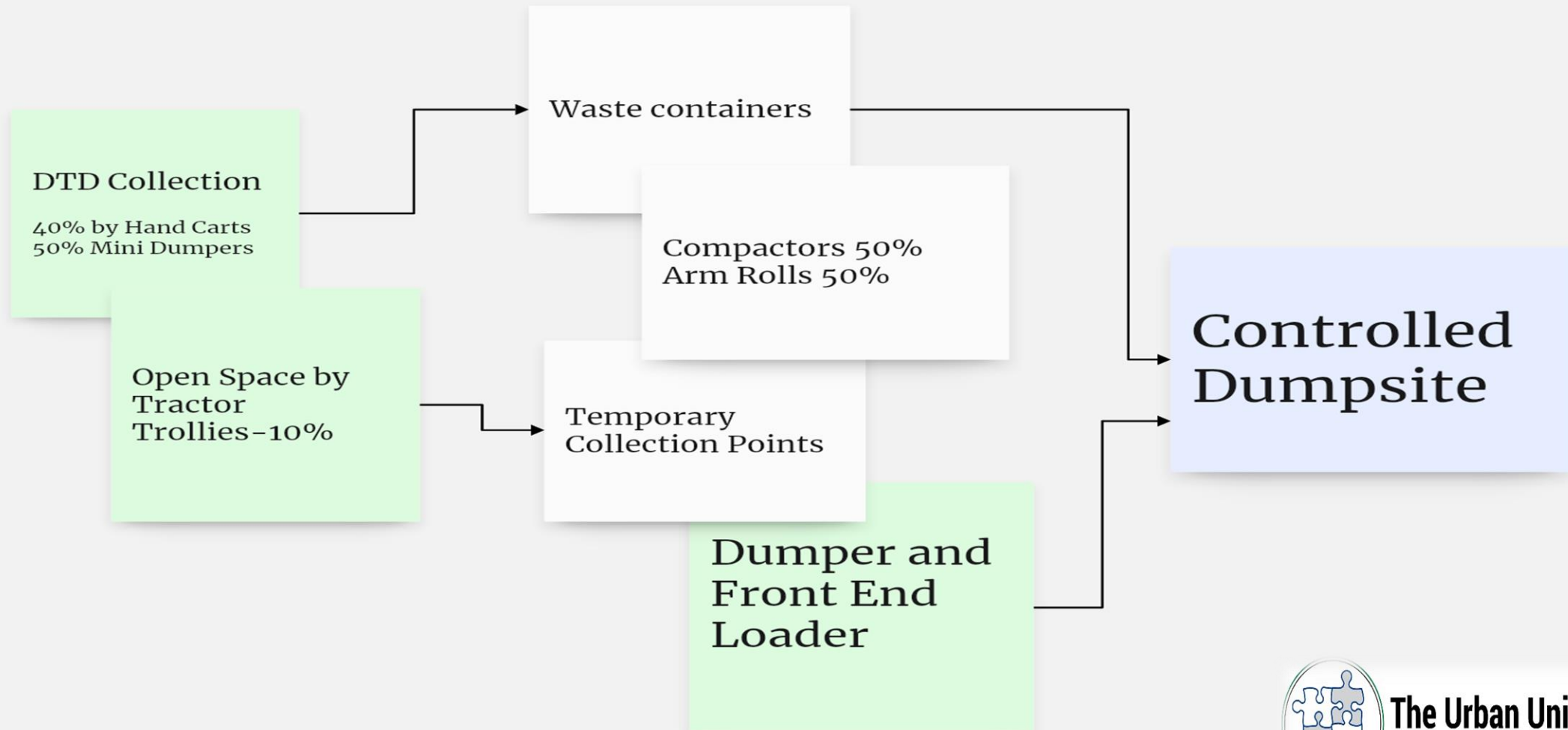
Primary Collection



Secondary Collection



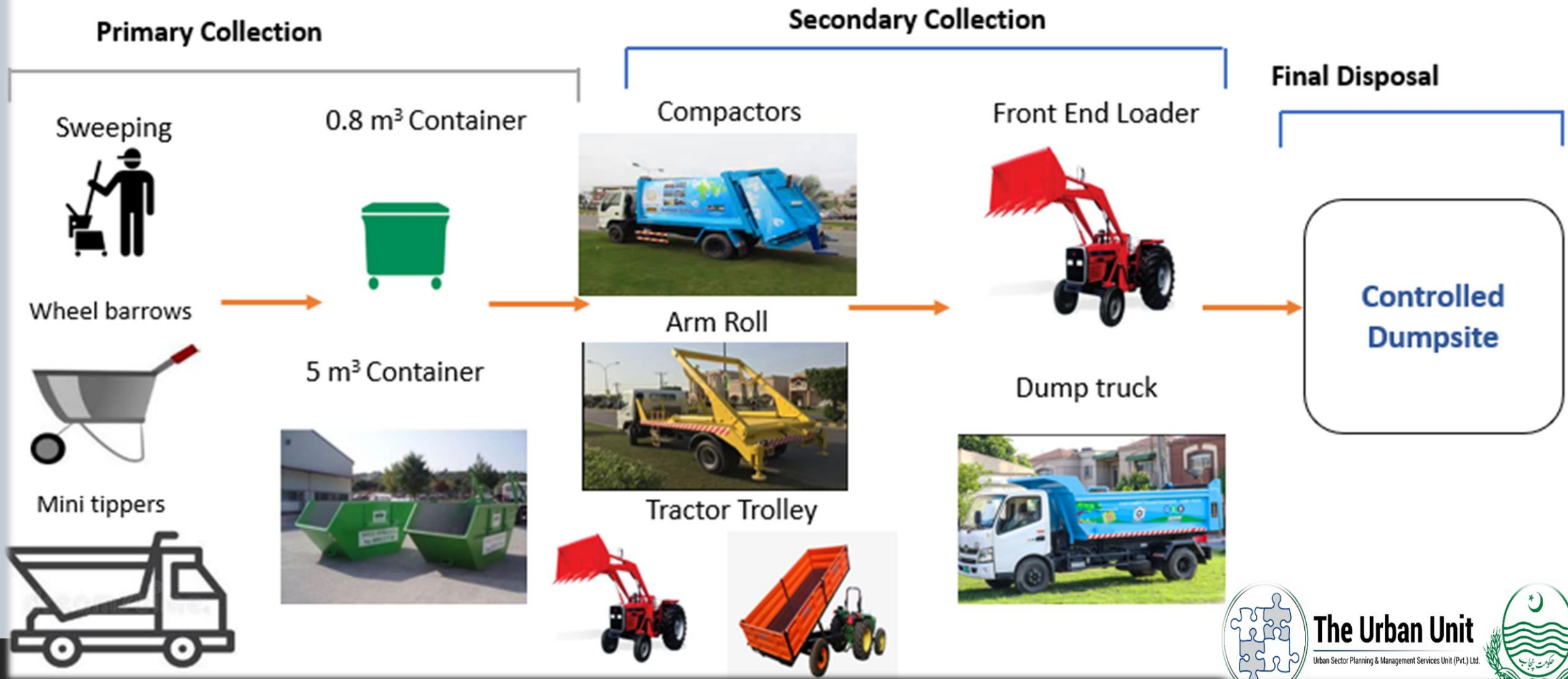
Final Disposal



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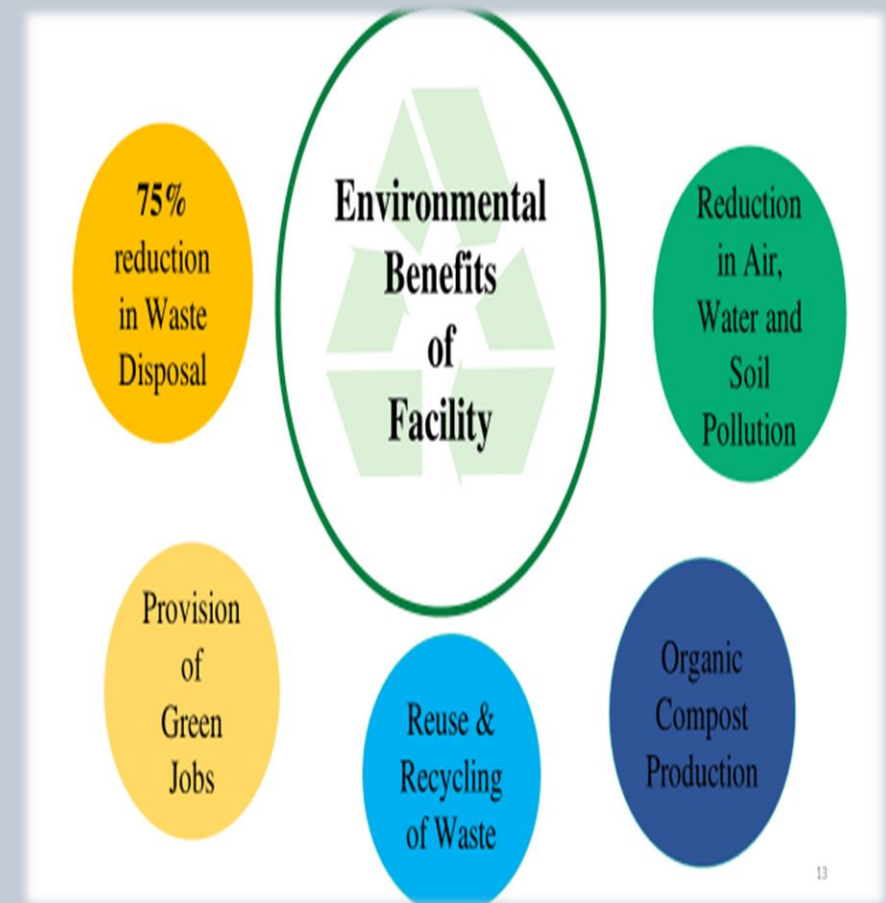
Machinery Allocation Waste Collection and transportation



STD Facility – A Proposed Solution for Other Districts

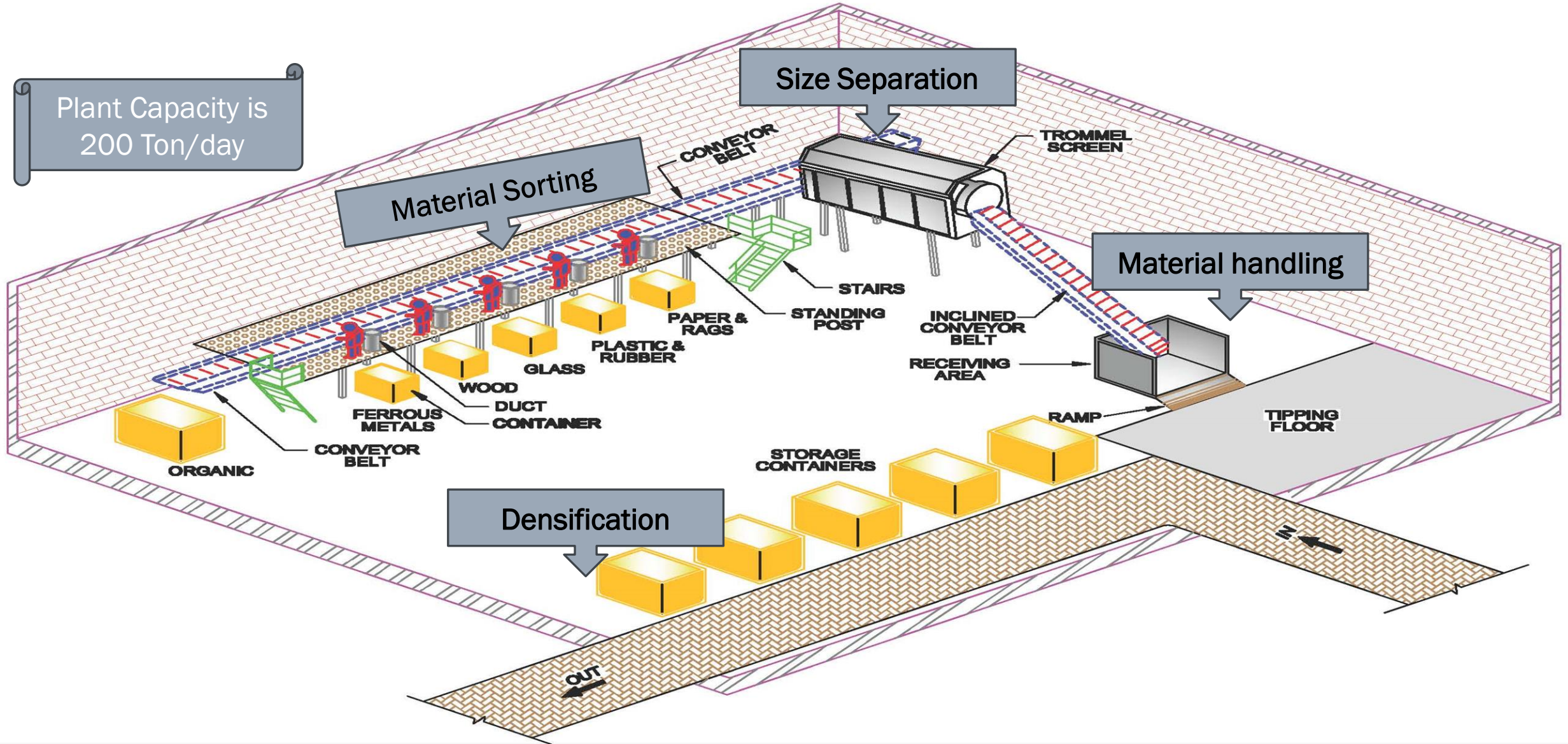
The term STD, introduced by the Urban Unit, stands for Segregation, Treatment, and Disposal of Municipal Solid Waste, for the district of Okara and Pakpattan

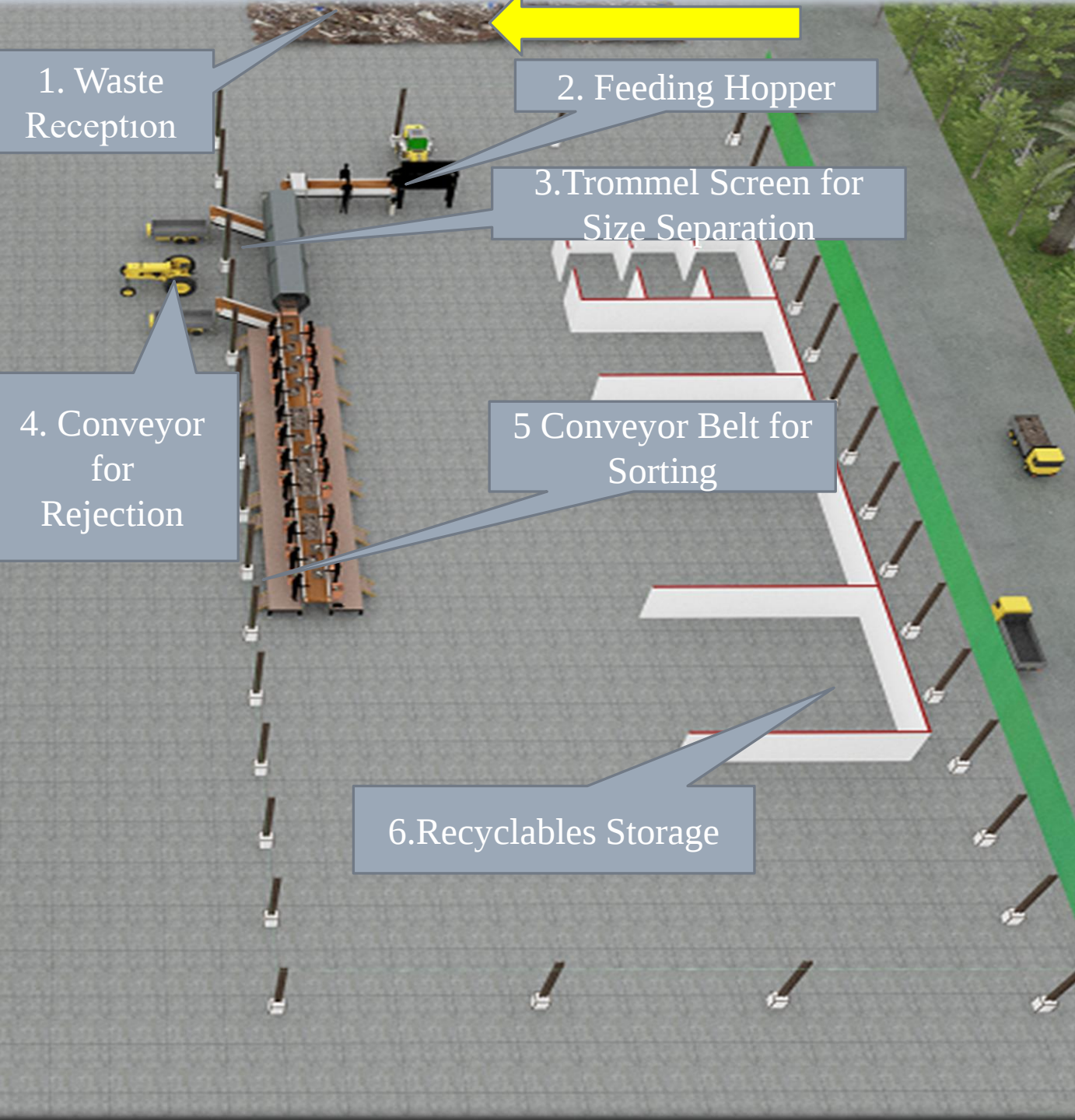
- Segregation Implementing a Material Sorting Facility to recover recyclables (such as Plastic, Paper, Glass, ferrous Metals, Non-Ferrous Metals, Tetra Pack, cardboard, etc.) and combustibles for the creation of Refused Derived Fuels (RDF).
- Treatment Generating compost from organic/putrescible waste. Producing RDF for use as a fuel source.
- Disposal Ensuring the safe disposal of residual inert waste using a scientific approach.





Schematic of Material Sorting Facility





1 Segregation

- Heavy Stones, Ceramic, Soil
- Metals
- Dust Particles < 6mm
- Organic Waste < 60 mm
- Recyclables (Glass, Plastic, Paper, Metals etc)
- RDF



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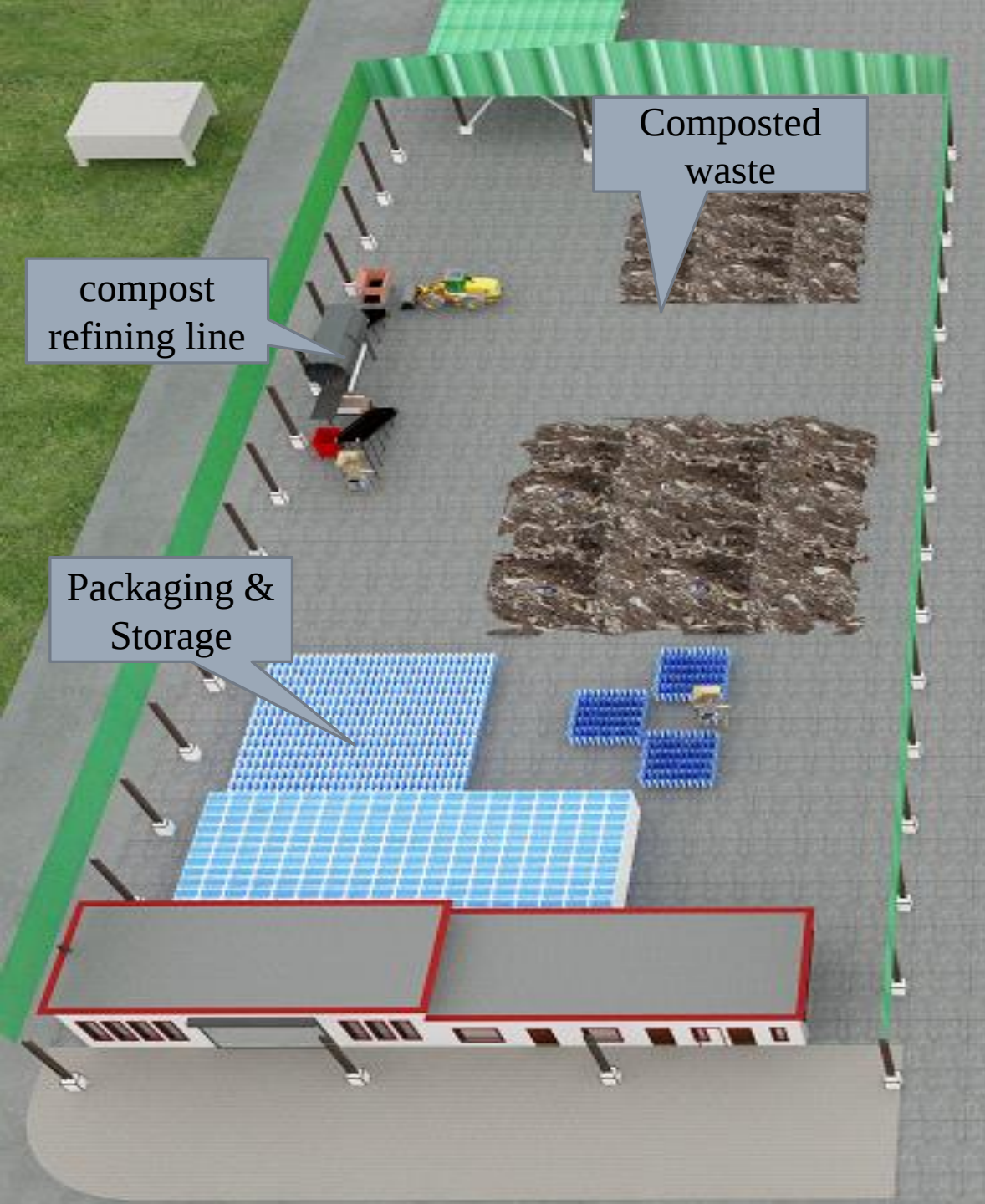


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2 Windrow Pads Area for Composting (40 days)





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3 Compost Refinement & Packing

Capacity Building for SWM

- Methods to Enhance Capacity (Training, Consultation, Information and Resource Repositories)
- A Strategic Framework for Strengthening Capacity
- Assessment of Capacity
- Planning and Scheduling Capacity-Building Activities, including Information, Education, and Communication (IEC) Execution of Capacity-Building Activities
- Oversight and Evaluation Continuous Enhancement



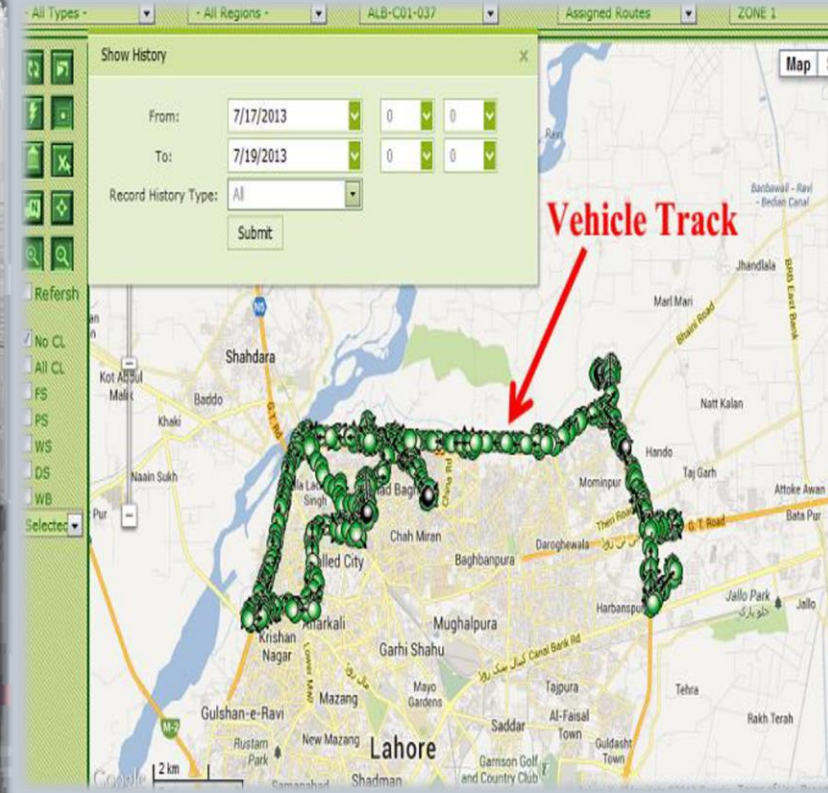
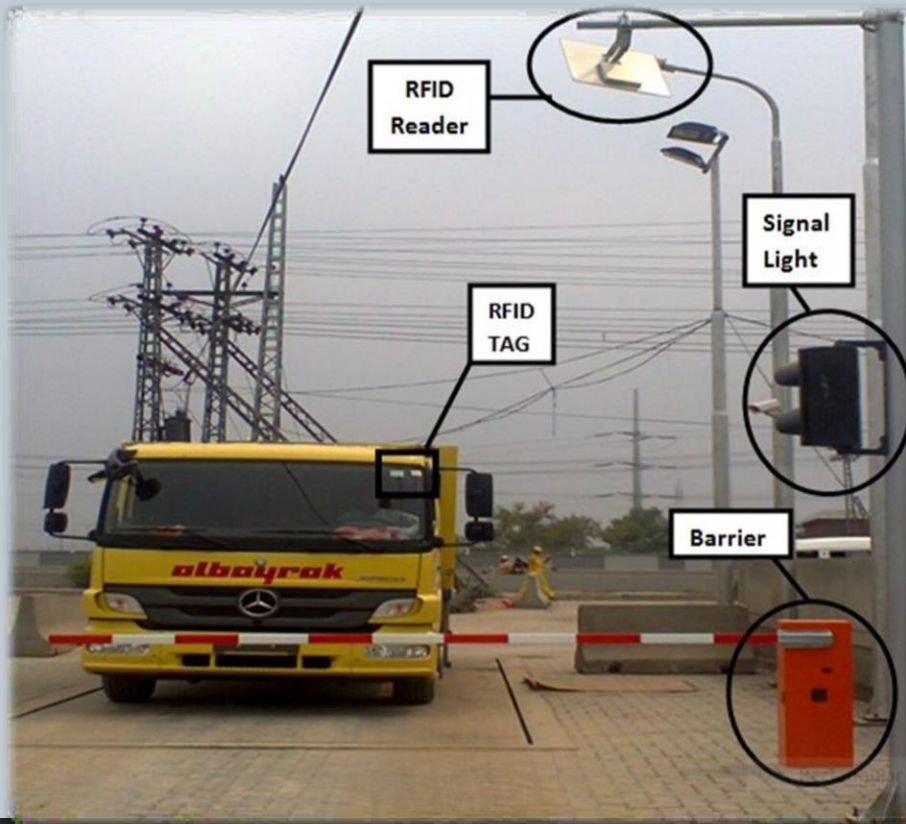
Monitoring and Evaluation System In SWM

➤ Vehicle Trip Counting System (VTCS)

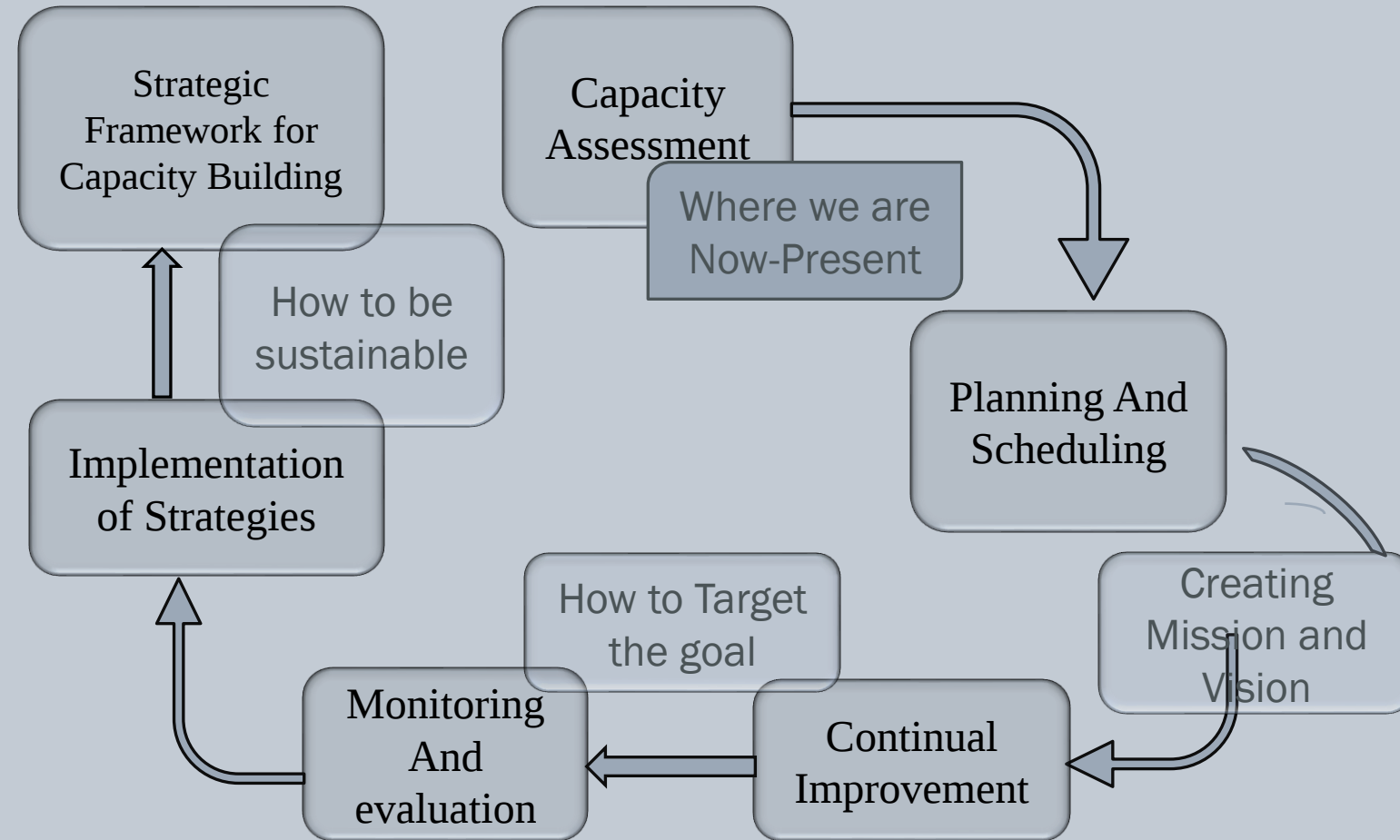
➤ Vehicle Tracking & Management System (VTMS)

➤ Android Based Attendance System

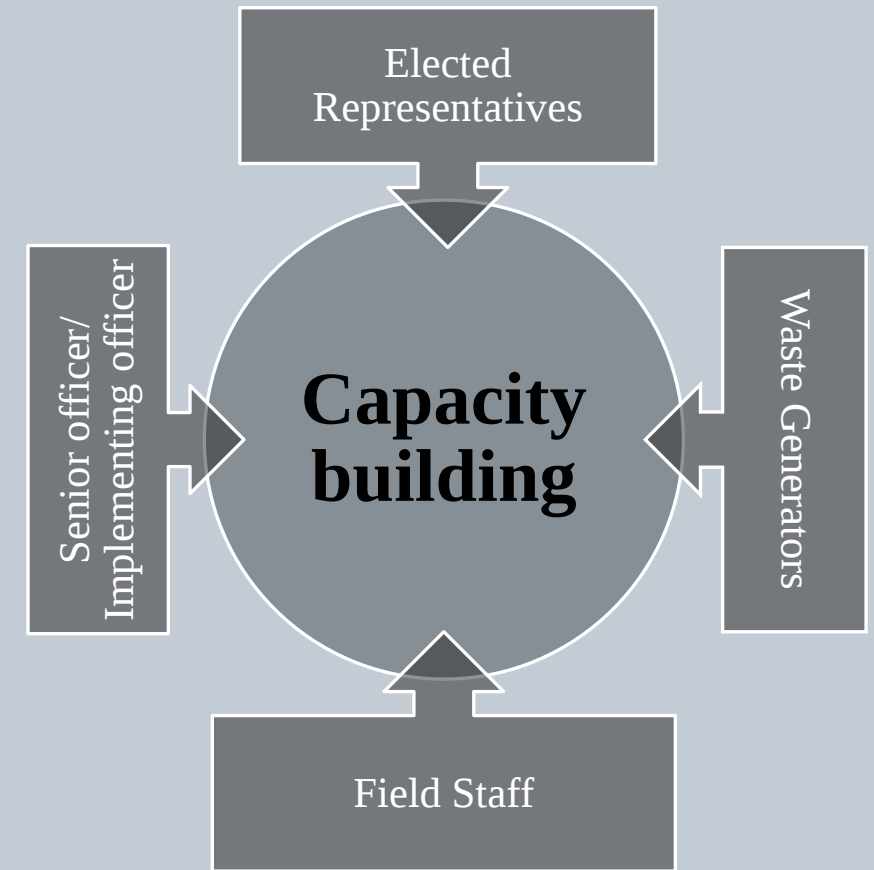
➤ Complaint Redress System



Strategic Framework for Capacity Building

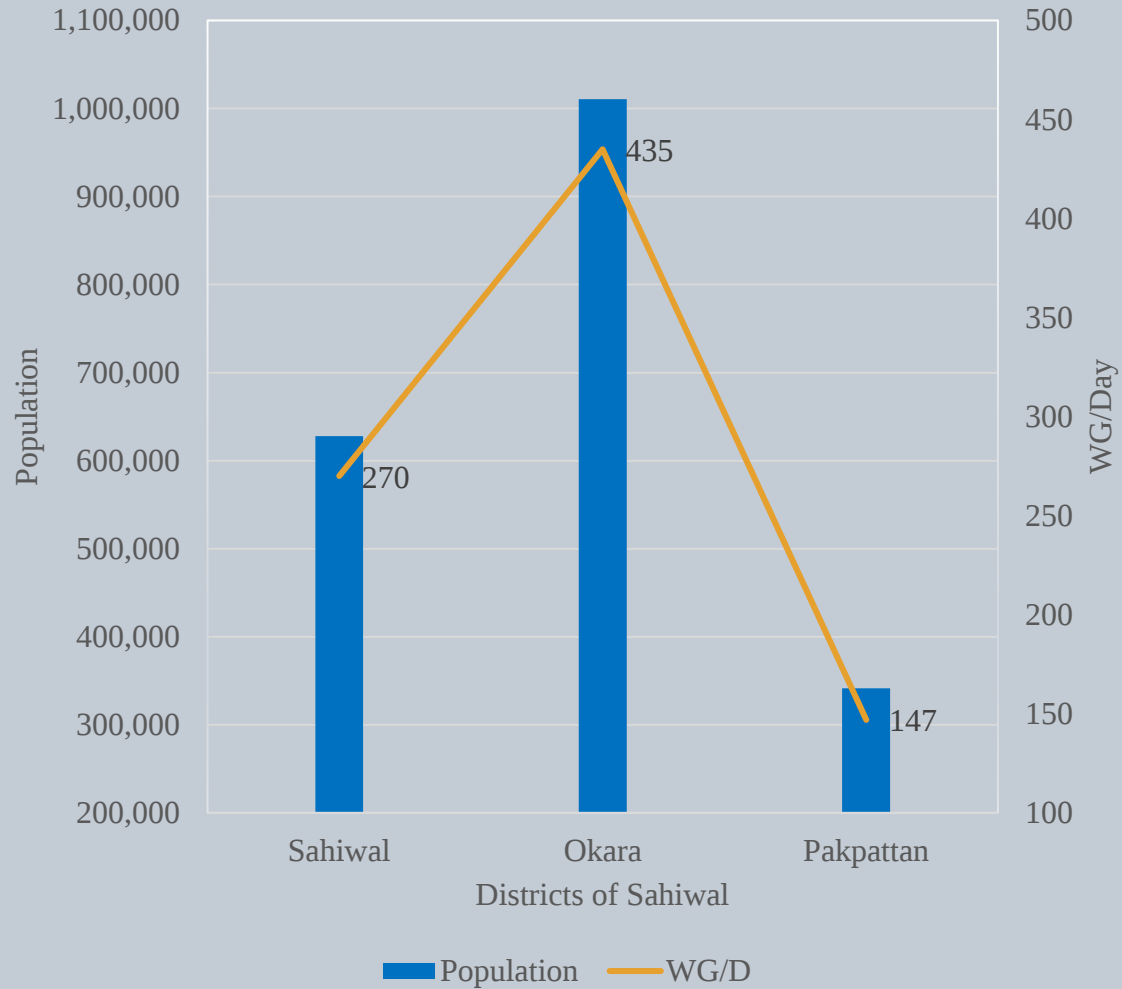


Key Stakeholders

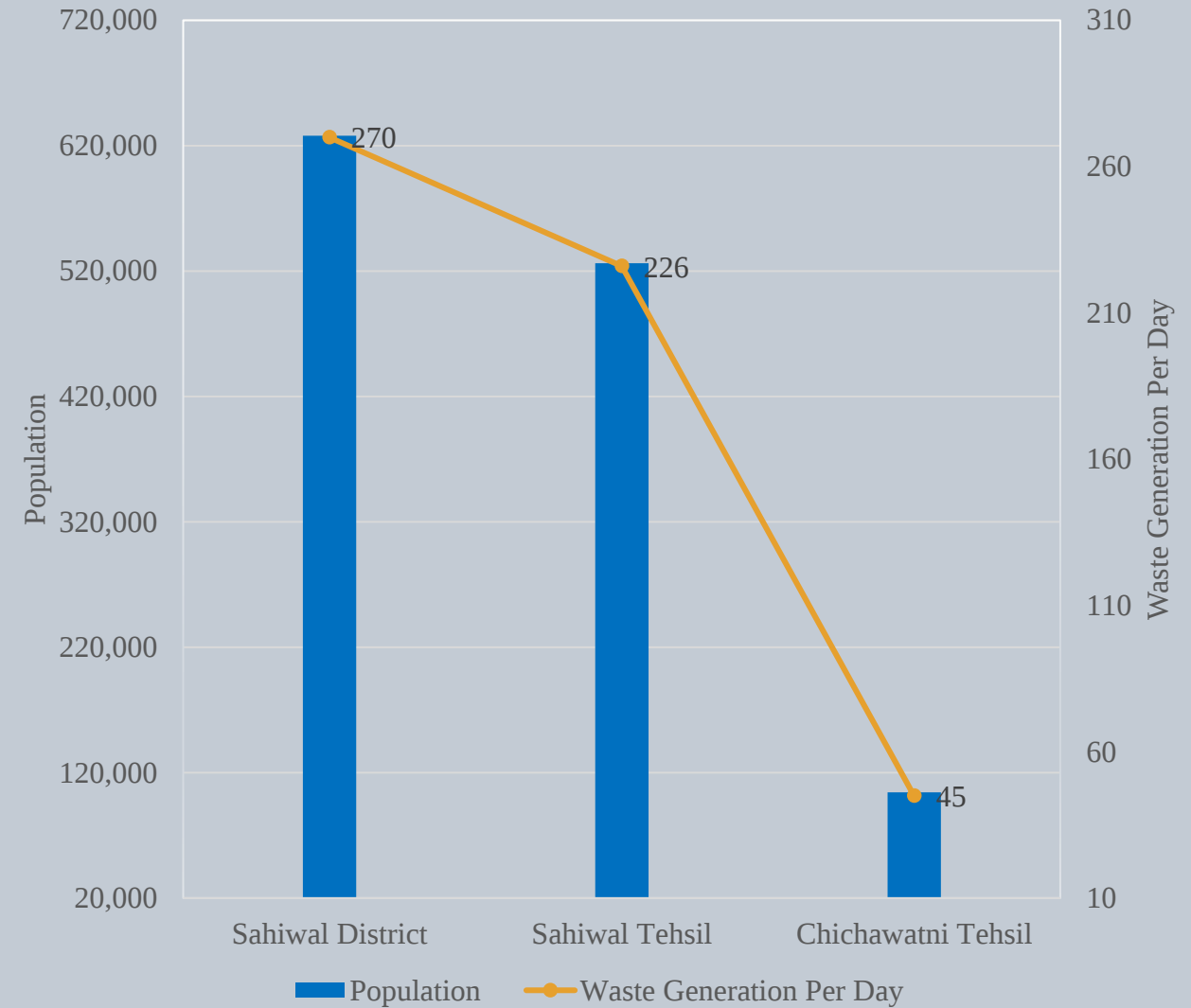


Sahiwal Population vs Waste Generation

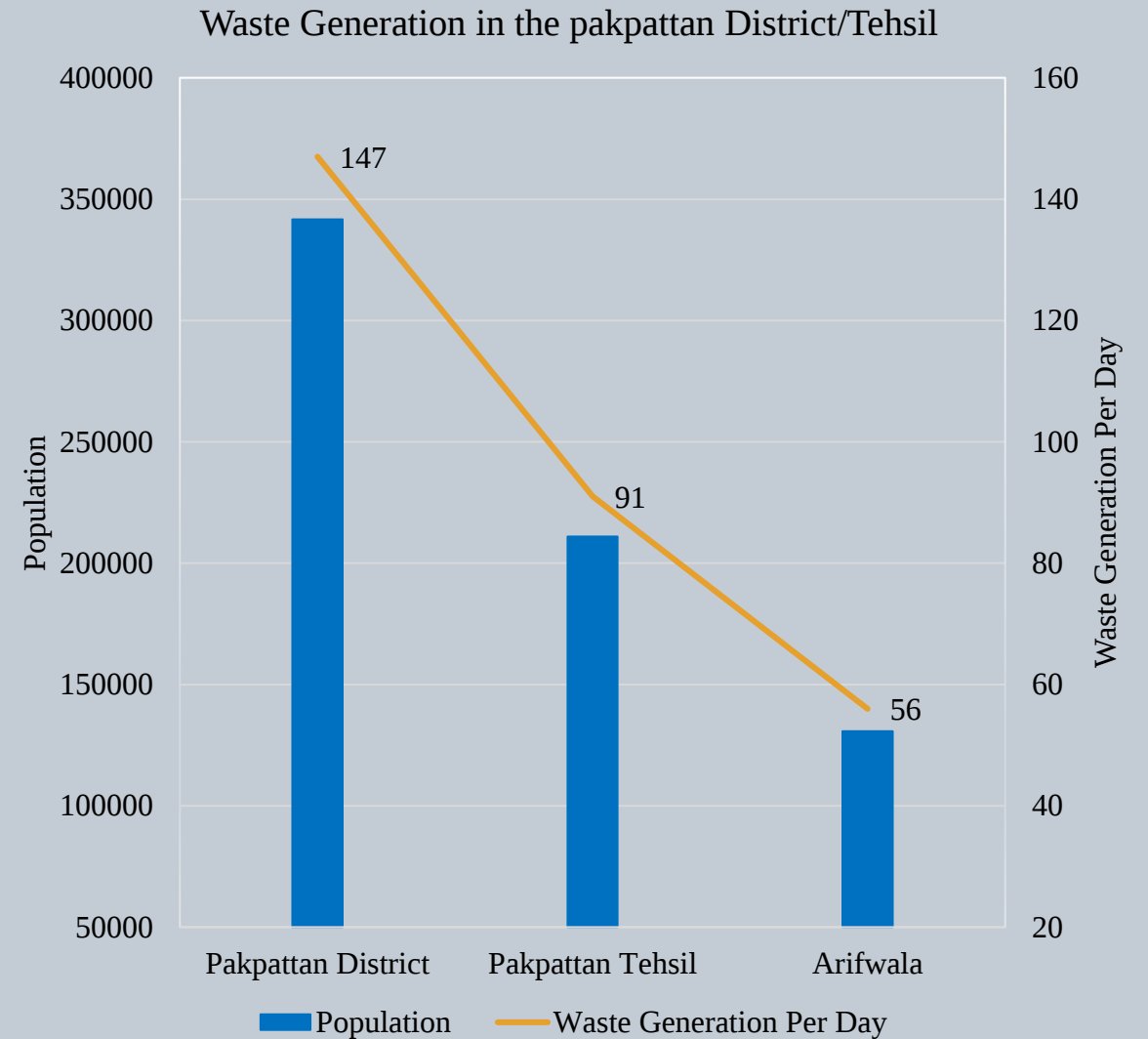
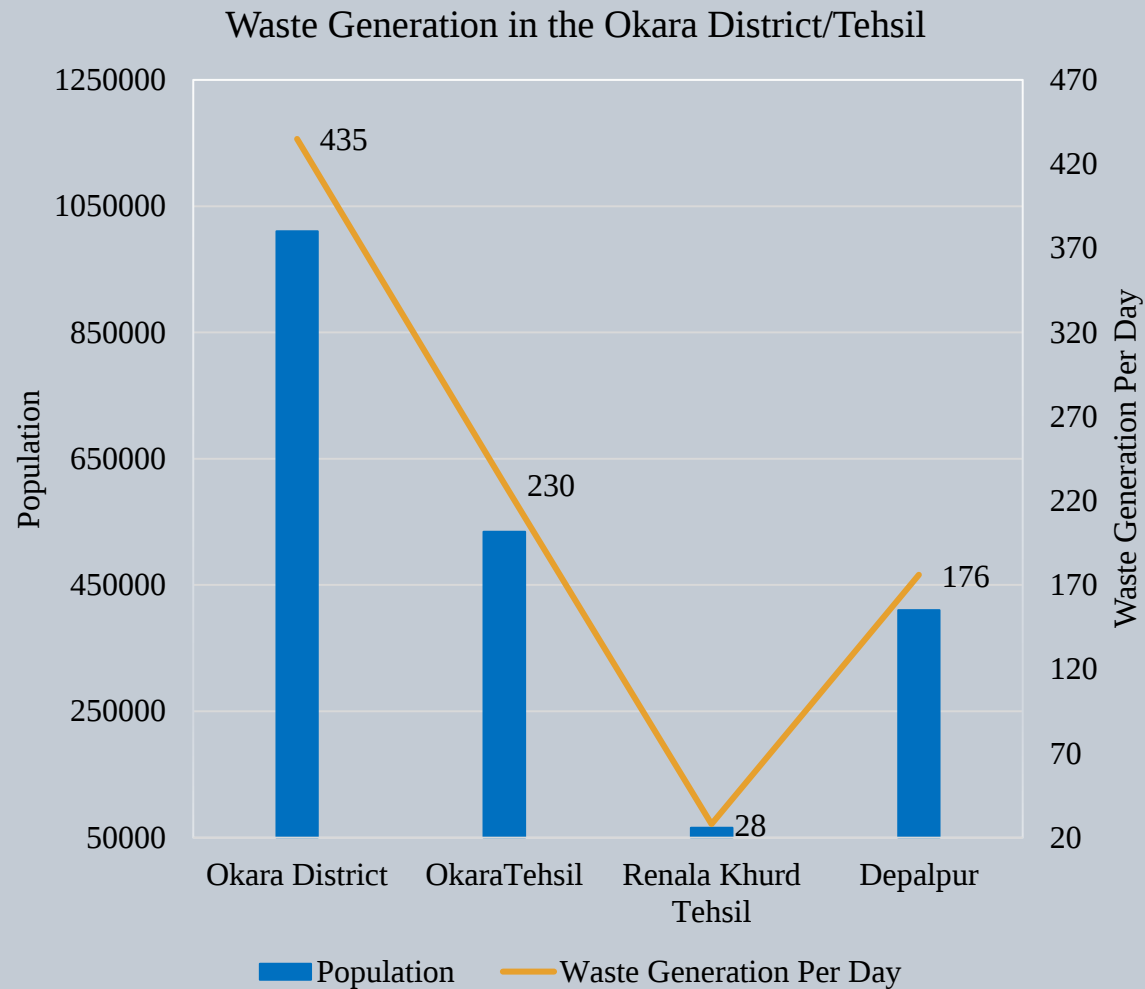
Sahiwal Division population vs Waste Generation



Waste Generation in the Sahiwal District/Tehsil



District Wise Population vs Waste Generation



Proposed Resources In Sahiwal



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❑ Container Based Collection and Door to Door

Waste Category	Resources	Sahiwal	Chichawatni	Okara	Renala Khurd	Depalpur	Pakpattan	Arifwala	Total
CBC	Compactor 7cum	0	0	0	0	0	0	0	0
	Compactor 13cum	4	0	4	0	3	0	0	8
	Chain Arm Roll 5cum	4	2	4	1	3	2	2	10
	T Loader (4*4)	1	0	1	0	1	0	0	2
	Container 0.8cum	256	0	260	0	200	104	0	620
	Container 5cum	23	9	23	6	18	9	12	56
	Handcarts	195	39	223	27	171	88	54	505
	Drivers	9	2	9	1	7	2	2	20
	Helpers	12		12	1	9	2	2	26
	Workers	585	116	668	82	513	264	163	1516
DtD	Compactor 25cum	0	0	0	0	0	0	0	0
	Compactor 13cum	0	0	0	0	0	0	0	0
	Compactor 7cum	3	1	3	0	3	1	1	8
	Mini Dumper 1cum	10	2	10	1	8	2	2	22
	Mini Dumper 2.5cum	5	1	5	1	4	3	2	13
	Drivers	18	4	18	2	15	6	5	43
	Helpers	7	1	7	1	5	3	2	16

Proposed Resources In Sahiwal

❑ Commercial & Industrial

Waste Category	Resources	Sahiwal	Chichawatni	Okara	Renala Khurd	Depalpur	Pakpattan	Arifwala	Total
Commercial	Chain Arm Roll 5cum	1	0	1	0	1	0	0	2
	Compactor 25cum	0	0	0	0	0	0	0	0
	Compactor 13cum	0	0	0	0	0	0	0	0
	Compactor 7cum	1	1	1	1	1	1	1	3
	Container 0.8cum	72	24	61	15	47	49	30	182
	Container 5cum	4	0	4	0	3	0	0	9
	Drivers	2	1	2	1	2	1	1	5
	Helpers	4	2	4	2	4	2	2	10
Industries	Compactor 13cum	0	0	0	0	0	0	0	0
	Compactor 25cum	0	0	0	0	0	0	0	0
	Compactor 7cum	0	0	0	0	0	0	0	0
	Container 0.8cum	0	0	0	0	0	0	0	0
	Container 5cum	-	-	0	0	0	0	0	0
	Drivers	-	-	-	-	-	-	-	0
	Helpers	-	-	-	-	-	-	-	0

Proposed Resources In Sahiwal

❑ Bulk, Temporary Collection Points, MS&W

Waste Category	Resources	Sahiwal	Chichawani	Okara	Renala Khurd	Depalpur	Pakpattan	Arifwala	Total
Bulk	Dumper 5cum	3	0	3	0	0	0	0	5
	Dumper 10cum	0	0	0	0	0	0	0	0
	T Loader (4*4)	1	1	1	1	1	1	1	3
	Excavator (Small)	0	0	0	0	0	0	0	1
	Trolleys	2	1	2	1	4	2	1	5
	Frond End Loader	0	0	0	0	0	0	0	1
	Drivers	6	2	6	2	6	3	2	16
	Helpers	3	0	3	0	0	0	0	5
TCPs	Dumper 25cum (MSW)	0	0	0	0	0	0	0	0
	Dumper 25cum (Bulk)	0	0	0	0	0	0	0	0
	Excavator (Large)	0	0	0	0	0	0	0	0
	Front End Loader	0	0	0	0	0	0	0	0
	Drivers	0	0	0	0	0	0	0	0
	Helpers	0	0	0	0	0	0	0	0
Mechanical Sweeping & Washing	Mech Sweeper 4m3	2	1	2	1	1	1	1	5
	Mech Sweeper 6m3	0	0	0	0	0	0	0	0
	Mech Washer 4500l	1	0	1	0	0	0	0	2
	Mech Washer 8000l	0	0	0	0	0	0	0	0
	Mech Sweeper with Washer 4m3	0	0	0	0	0	0	0	0
	Drivers	3	1	3	1	1	1	1	7
	Helpers	4	1	4	1	1	1	1	9

Proposed Resources In Sahiwal

□ Total Resources

Waste Category	Sahiwal	Chichawatni	Okara	Renala Khurd	Depalpur	Pakpattan	Arifwala	Total
Total Drivers	39	10	39	7	30	13	11	91
Total Helpers	29	4	30	5	19	8	7	67
Total Workers	585	116	668	82	513	264	163	1,516
Grand Total	653	130	736	94	563	285	182	1674

Cost Estimates Sahiwal District

Sahiwal		
	Amount in PKR	
Particulars	Per Month Cost	Per Annum Cost
Machinery Operational Cost	8,487,261	101,847,127
Equipment & Continer Cost	3,505,085	42,061,015
HR Manual work inc Jantorial	23,501,842	282,022,098
Total Operational Cost	35,494,187	425,930,240
Monitoring Cost 3%	1,419,767	17,037,209.60
Total Annual Cost	36,913,954	442,967,450
Annual Tonnage	6,780	81,360
Cost per ton	5,445	5,445
Population	526,220	526,220
House Hold	84,874	84,874
Cost per Person	70	842
Cost per Household	435	5,219

Chichawatni	Amount in PKR	
	Particulars	Per Month Cost
Machinery Operational Cost	1,051,684	12,620,204
Equipment & Continer Cost	569,463	6,833,554
HR Manual work inc Jantorial	4,697,177	56,366,127
Total Operational Cost	6,318,324	75,819,885
Monitoring Cost 3%	252,733	3,032,795.39
Total Annual Cost	6,571,057	78,852,680
Annual Tonnage	1,350	16,200
Cost per ton	4,867	4,867
Population	104,417	104,417
House Hold	16,841	16,841
Cost per Person	63	755
Cost per Household	390	4,682

Cost Estimates Okara District								
Okara			Renala Khurd			Depalpur		
Particulars	Amount in PKR		Particulars	Amount in PKR		Particulars	Amount in PKR	
Particulars	Per Month Cost	Per Annum Cost	Particulars	Per Month Cost	Per Annum Cost	Particulars	Per Month Cost	Per Annum Cost
Machinery Operational Cost	8,828,295	105,939,534	Machinery Operational Cost	736,933	8,843,196	Machinery Operational Cost	4,566,272	54,795,262
Equipment & Continer Cost	3,553,694	42,644,333	Equipment & Continer Cost	384,028	4,608,338	Equipment & Continer Cost	2,746,467	32,957,604
HR Manual work inc Jantorial	26,508,203	318,098,432	HR Manual work inc Jantorial	3,387,276	40,647,313	HR Manual work inc Jantorial	20,254,880	243,058,558
Total Operational Cost	38,890,192	466,682,299	Total Operational Cost	4,508,237	54,098,847	Total Operational Cost	27,567,619	330,811,423
Monitoring Cost 3%	1,555,608	18,667,291.96	Monitoring Cost 3%	180,329	2,163,953.87	Monitoring Cost 3%	1,102,705	13,232,456.94
Total Annual Cost	40,445,799	485,349,591	Total Annual Cost	4,688,567	56,262,801	Total Annual Cost	28,670,323	344,043,880
Annual Tonnage	6,900	82,800	Annual Tonnage	840	10,080	Annual Tonnage	5,280	63,360
Cost per ton	5,862	5,862	Cost per ton	5,582	5,582	Cost per ton	5,430	5,430
Population	534,368	534,368	Population	65,486	65,486	Population	410,222	410,222
House Hold	86,188	86,188	House Hold	10,562	10,562	House Hold	66,165	66,165
Cost per Person	76	908	Cost per Person	72	859	Cost per Person	70	839
Cost per Household	469	5,631	Cost per Household	444	5,327	Cost per Household	433	5,200

Cost Estimates Pakpattan District

Amount in PKR		
Pakpattan		
Particulars	Per Month Cost	Per Annum Cost
Machinery Operational Cost	1,291,031	15,492,374
Equipment & Continer Cost	1,578,869	18,946,424
HR Manual work inc Jantorial	10,258,281	123,099,372
Total Operational Cost	13,128,181	157,538,171
Monitoring Cost 3%	525,127	6,301,526.83
Total Annual Cost	13,653,308	163,839,698
Annual Tonnage	2,730	32,760
Cost per ton	5,001	5,001
Population	211,031	211,031
House Hold	34,037	34,037
Cost per Person	65	776
Cost per Household	401	4,814

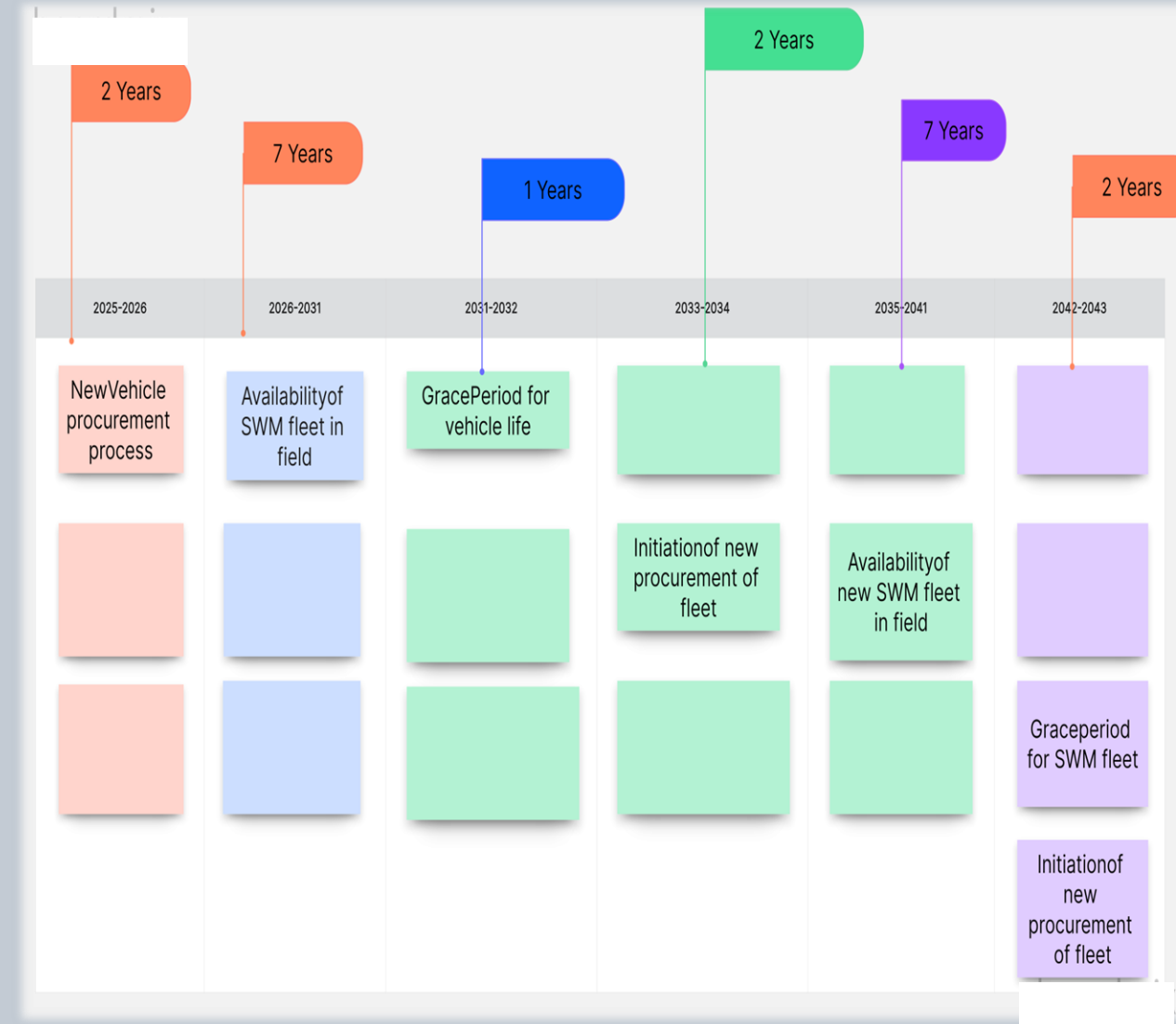
Amount in PKR		
Arifwala		
Particulars	Per Month Cost	Per Annum Cost
Machinery Operational Cost	1,214,573	14,574,875
Equipment & Continer Cost	715,607	8,587,281
HR Manual work inc Jantorial	6,539,848	78,478,170
Total Operational Cost	8,470,027	101,640,327
Monitoring Cost 3%	338,801	4,065,613.08
Total Annual Cost	8,808,828	105,705,940
Annual Tonnage	1,680	20,160
Cost per ton	5,243	5,243
Population	130,785	130,785
House Hold	21,094	21,094
Cost per Person	67	808
Cost per Household	418	5,011

Revenue Generation From SWM

- The income sources can include local taxes or charges associated with waste management services.
- FWMC ought to levy fines or issue challans for unauthorized dumping or burning of solid waste in public areas, aligning with the "polluter pays principle."
- Charges may be applied for services such as door-to-door collection and street sweeping of waste.
- Implementing source segregation in MSW involves retrieving scrap and recyclables from the waste stream and selling them in scrap markets.

Timeline and Way Forward

- Endorsement of Interventions for the Integrated Solid Waste Management (SWM) Plan
- Authorization for the Proposed Model for SWM Collection and Transportation
- Engagement of consultants for the intricate design of the SWM System and Controlled Dumpsite
- Allocation of Essential Funds
- Acquisition of Resources and Additional Human Resources through Procurement



- Sanctioning Interventions for the Integrated Solid Waste Management (SWM) Plan
- Authorization for the Proposed Model for SWM Collection and Transportation
- Formulation of Tender Documents
- Engaging consultants for the meticulous design of the SWM System
- Recruiting consultants for the comprehensive design of the STD Plant
- Allocation of Essential Funds



**Thank
You for
your Time**

Sahiwal Division



The Urban Unit
Urban Sector Planning & Management Services Unit (Pvt.) Ltd.

