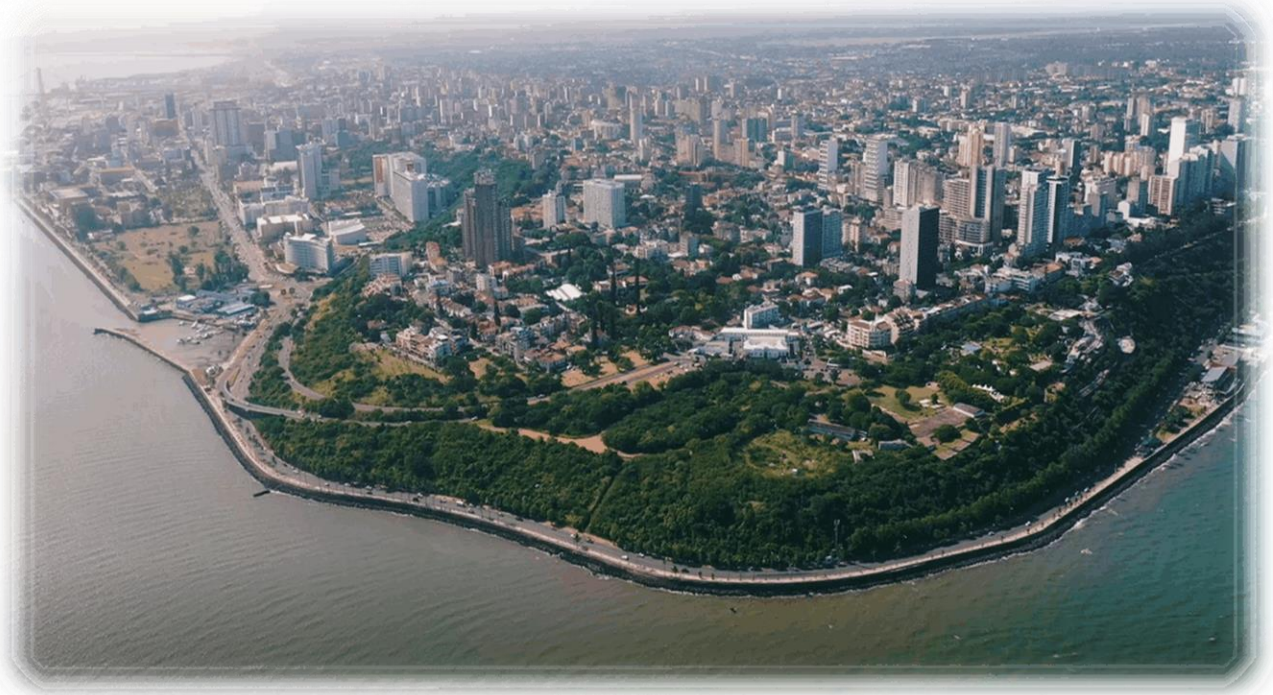
Capacity Development for Integrated Solid Waste Management in Maputo



JCCI International Seminar 2023

Silva Jacinto Magaia
(Councilor for Spatial Planning, Environment and Construction)

Layout

1. Contextualization
2. Project Operational Plan
3. Institutional Capacity Development: Outputs

1, 2 & 3

4. Pursuing Financial Sustainability
5. The Way Forward

1. Contextualization (1/16)

- Maputo
  - The Capital city of Mozambique
  - Located in the extreme south of the country
  - Population: approx. 1,2 Million (*)
  - Area: 348 sqkm
  - Ruling: Elected Local Government

(*) It grows up to around **2 Million** on working days, during business hours.

1. Contextualization (2/16)

- Maputo
  - Spread land occupancy, with very low density.
  - More than 70% of the population live in informal settlements.
  - Local economy is also predominantly informal.

1. Contextualization (3/16)

- Maputo

1. Contextualization (4/16)

- Maputo

1. Contextualization (5/16)

- Maputo

1. Contextualization (6/16)

- Current Mandate is guided by a 5 years Municipal Development Plan (MDP 2019 – 2023) comprising 5 Pillars.
- Strategic Goal # 48: Increase (by ...%) the coverage, quality and sustainability of garbage collection and disposal services, while preventing environmental hazards from SWM activities.

1. Contextualization (7/16)

- SWM Organisational Model in Maputo City is outsourced as follows:

- 46 Small and Micro companies ensuring primary collection of domestic waste.
- 4 companies ensuring secondary collection and final disposal.
- Several providers ensuring door-to-door collection and final disposal of waste generated by large producers.

- A City Department ensuring overall supervision and certification of payment orders.
- A Contractor based in the damp site, ensuring clearance of access roads, spreading and compaction of fills.

1. Contextualization (8/16)

- Funds for this outsourced model come partially from 2 main revennue sources, namelly:

- A Cleaning Tax charged to all domestic and non-domestic entities connected to the City' electricity grid.
- Licencing and operating Taxes charged to all private service providers practicing door-to-door collection of waste generated by large producers.

1. Contextualization (9/16)

In average, the city generates around 1,500 tones of waste per day, which are all damped in a single site located near the Maputo International Airport.

Following a fatal disaster ocurred in February 2018, the City was summoned to close the damp site and create safer disposal sites.

1. Contextualization (10/16)

Following the event, the city is receiving assistance from the Ministry of Environment of Japan aiming at creating **safer conditions** for the continuing use of the damp site until a new **Sanitary Landfill** is built and operational.

1. Contextualization (11/16)

Improving the safety of the damp site using the Fukuoka Method

1. Contextualization (12/16)

Improving the safety of the damp site using the Fukuoka Method

1. Contextualization (13/16)

Improving the safety of the damp site using the Fukuoka Method

1. Contextualization (14/16)

- Apart from the aforementioned assistance, the Government of Japan is providing technical and financial support to the city of Maputo, aiming at enhancing its capacity to respond to the multiple challenges in the field of SWM.
- Among several specific projects, the city, together with JICA, is implementing an innovative Project aiming at improving Solid Waste Management and related operations.

1. Contextualization (15/16)

- The Project is guided by the Master Plan of Solid Waste Management, approved in December 2018, based on which JICA developed an evollutive set of Guidelines to assist its implementation.

6. Planificação e Monitoria

A planificação e monitoria do PD necessitam ter em conta a tecnologia apropriada, os recursos humanos devidamente qualificados. A participação (quer do munícipe quer do sector privado na GRSU) e, sobretudo, a disponibilidade dos recursos financeiros necessários para a cobertura de custos.

Figura 13: Abordagem em Pentágono para 3Rs e GRS Sustentável na Cidade de Maputo

Fonte: Equipa de Peritos da JICA

Cada abordagem contém os aspectos descritos nos subcapítulos abaixo:

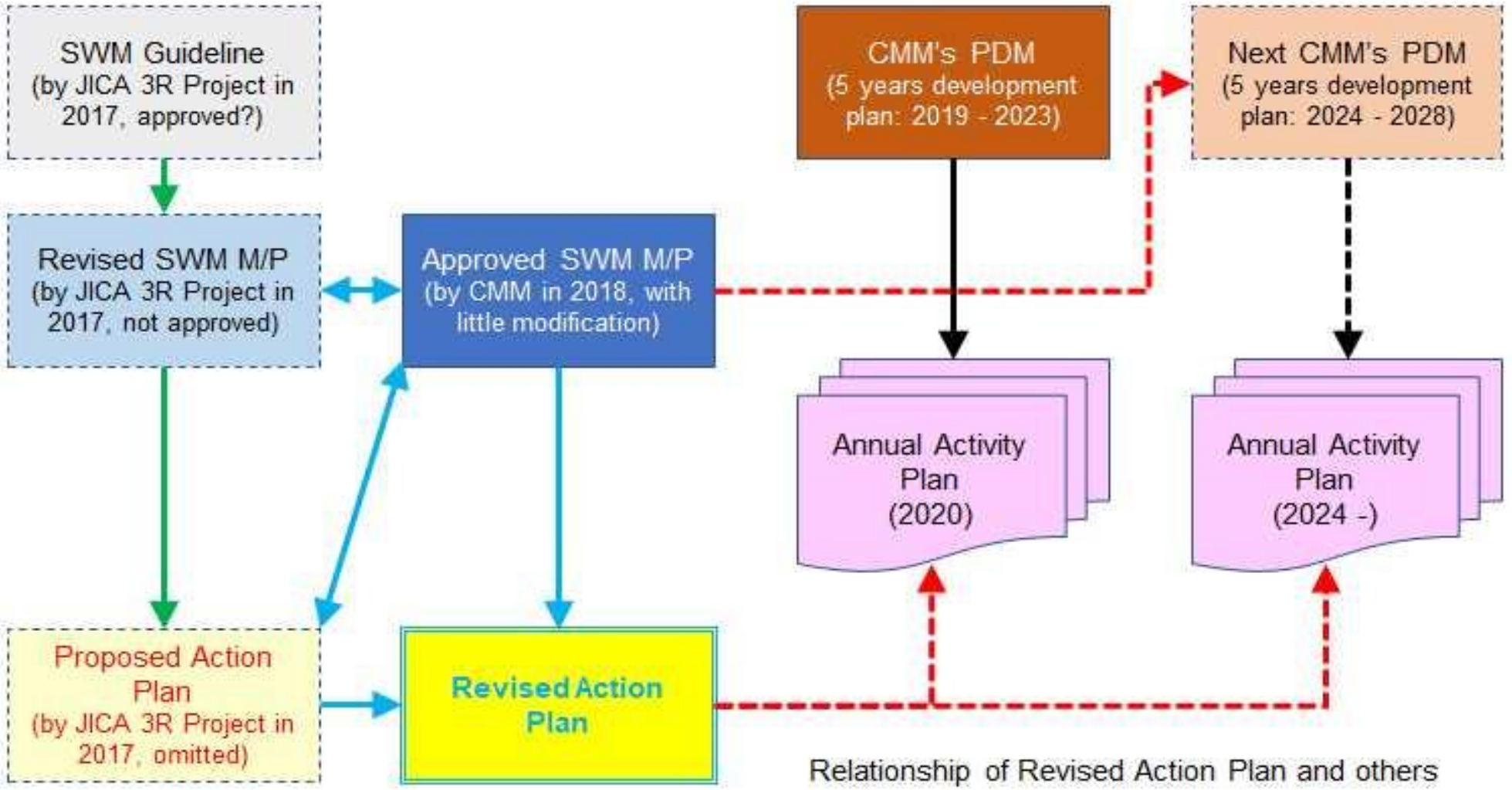
6.1 Recursos Humanos Capacitados

Apesar de notáveis progressos referidos anteriormente na capacitação de RH para a salubridade, persiste a necessidade de um reforço institucional na actual estrutura organizacional da DMSC para a implementação das suas operações de GRS, de forma eficiente. Esta abordagem vai incluir a definição clara dos papéis e responsabilidades nos diferentes níveis na DMSC e a relação estreita com outras unidades orgânicas do CMM. Vai também incluir um plano de desenvolvimento de recursos humanos para a melhoria das capacidades técnicas, tanto dos funcionários individuais como da própria DMSC.

6.2 Tecnologia Apropriada

A remoção imediata dos resíduos sólidos municipais das fontes de produção constitui o serviço fundamental da GRS de forma a assegurar a higiene pública. Portanto, o Subcapítulo 6.3 irá discutir a adequação, o custo e a forma eficiente do sistema de recolha e transporte de resíduos.

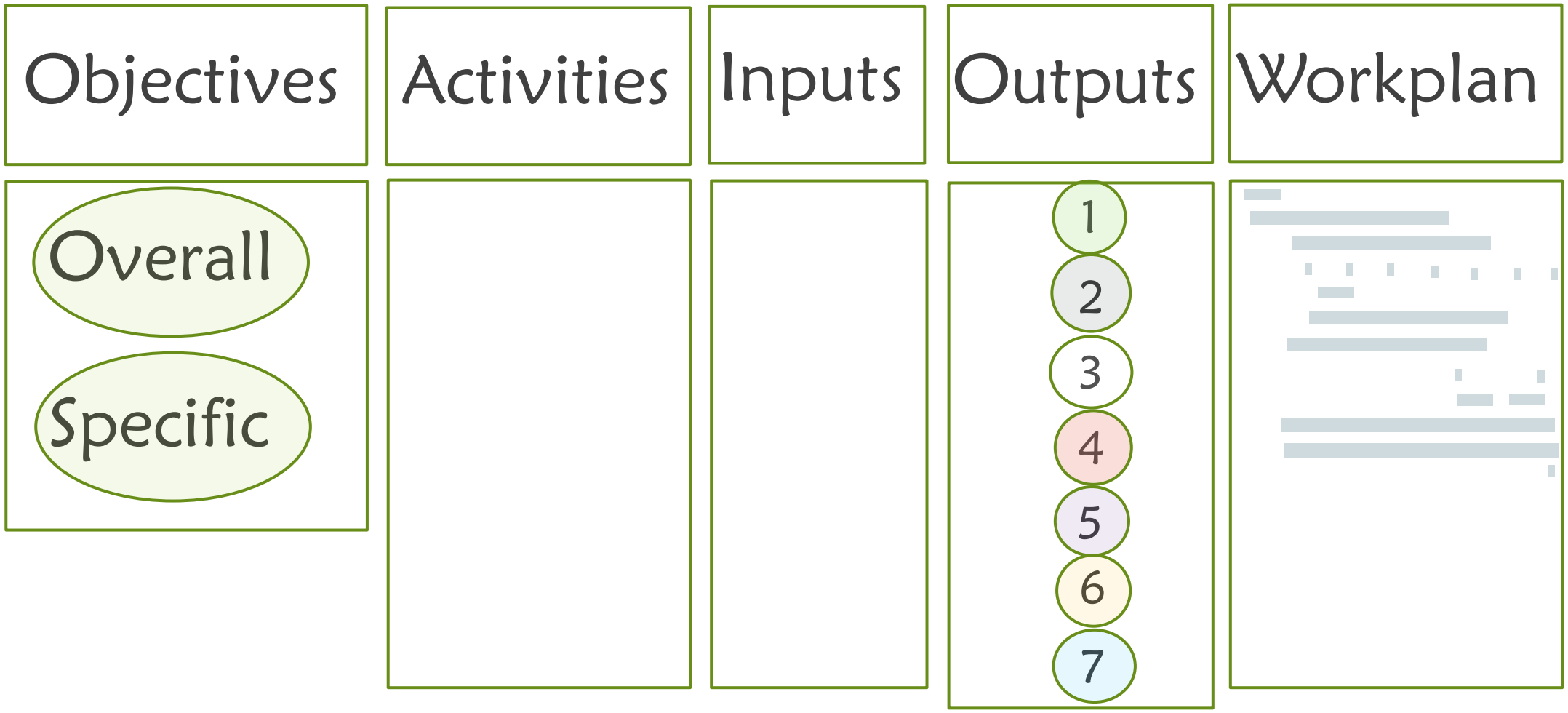
1. Contextualization (16/16)



Relationship of Revised Action Plan and others

2. Project Operational Plan (1/8)

- Framework



2. Project Operational Plan (2/8)

- Technical Data
  - Title: Capacity Development for Sustainable and Integrated Solid Waste Management in Maputo
  - Duration: November 2019 – October 2023
  - Implementing partners: Maputo City Council + JICA
  - Beneficiaries: Citizens of Maputo + Municipal staff
  - Geographic scope: City of Maputo, Mozambique

2. Project Operational Plan (3/8)

- Overall Objective

> Establish a sustainable and integrated SWM service in Maputo City, and ensure documentation of the activities.

- Key Performance Indicators:

- 1. Ratio of SW collection raised from x% to y%
- 2. Volume of recycled SW increased from K% to L%
- 3. Maputo SWM Model disseminated Nationwide and globally.

2. Project Operational Plan (4/8)

- Specific Goal

Enhance the capacity of implementing a sustainable and integrated SWM service in Maputo city, based on the Master Plan of SWM, and contribute to the production of the Maputo Model.

- Key Performance Indicators:

- 1. Progress of Project implementation evolves from 15% in the beggining to 67% at the end.
- 2. Geographic coverage of SW collection service increased from 89% in the beggining to 92% at the end of the Project.

2. Project Operational Plan (5/8)

Enhance the capacity of implementing a sustainable and integrated SWM service in Maputo city, based on the Master Plan of SWM, and contribute to the production of the Maputo Model.

- Key Performance Indicators:

- 3. Volume of recyclabe materials recovered raised from 0 in the beggining to 100 kg/month at the end of the Project.
- 4. Ranking of organizational service capacity increased from 2,2 in the beggining to 3,5 at the end.
- 5. Ranking of individuals performance increased from 2,8 in the beggining to 4 at the end of the Project.

2. Project Operational Plan (6/8)

Enhance the capacity of implementing a sustainable and integrated SWM service in Maputo city, based on the Master Plan of SWM, and contribute to the production of the Maputo Model.

- Key Performance Indicators:

- 6. Degree of community satisfaction and participation with/in SWM activities improved from 70% (Satisfaction) and 82% (participation) in the beggining, to 80% and 90% at the end of the Project, irrespectively.
- 7. A Rule enforcing segregated disposal of Solid Waste approved, including review of Municipal by-Laws rulling SWM.

2. Project Operational Plan (7/8)

- Outputs

1. Enhanced **institutional capacity** for SWM and Monitoring, based on the Master Plan.

2. Enhanced capacity of **supervision of SWM outsorced services**, particularly collection, trasportation and final disposal.

3. Enhanced capacity to **minimize the quantity of waste** disposed off, through maximization of the 5R (**R**ethink; **R**efuse; **R**educe; **R**euse; **R**ecycle), including mainstreaming of segregated disposal.

2. Project Operational Plan (8/8)

- Outputs

4. Municipal staff and partners equiped with knowledge, tools and skills for adequate management of Sanitary Landfills.

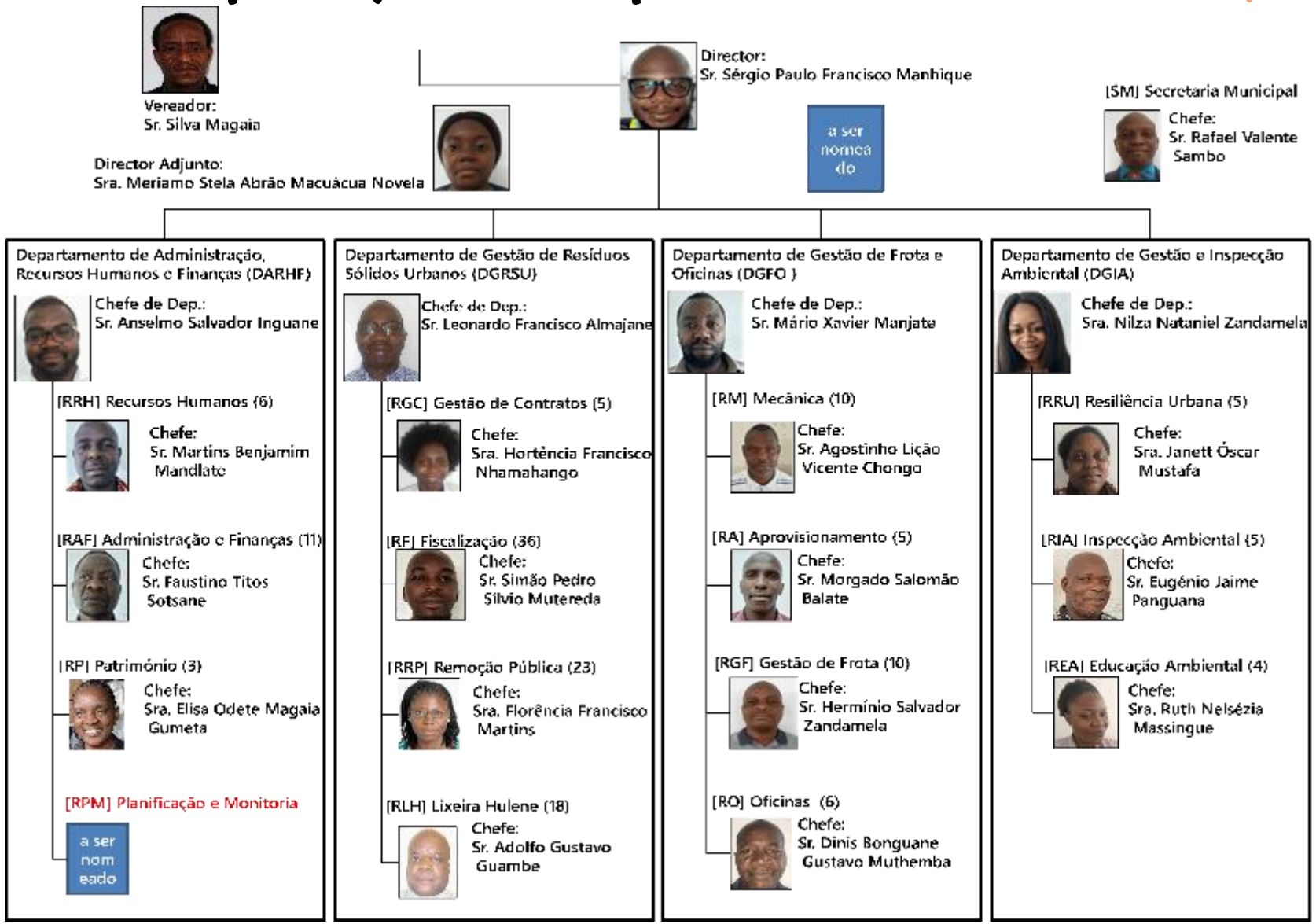
5. Enhanced capacity of institutional SWM systems, particularly human resources management and financial sustainability.

6. Enhanced community environmental awareness, with focus on Solid Waste reduction and adequate disposal.

7. Lessons learned properly documented as The Maputo Model

3. Institutional Capacity Development – O. 1, 2 & 4 (1/24)

Current Municipal SWM Department Organizational Structure



3. Institutional Capacity Development – O. 1, 2 & 4 (2/24)

Department Organizational Reforms

Proposed approach:

Strengthening contract management, planning & monitoring functions.

1. Enhance the capacity of Contract Management Section
   Contract management for private service providers has already become the major task of DSMAS, i.e., primary collection service contracts (46 MEs), secondary collection service contracts (6 districts), and Hulene dump site operation contract, which account for 90% of DSMAS operating expenses.
2. Re-establishment of Proof of Service Section (PoS)
   Responsible for the management and operation of the PoS system, which is an important management tool for non-domestic waste producers (including the collection of Cleaning Taxes).

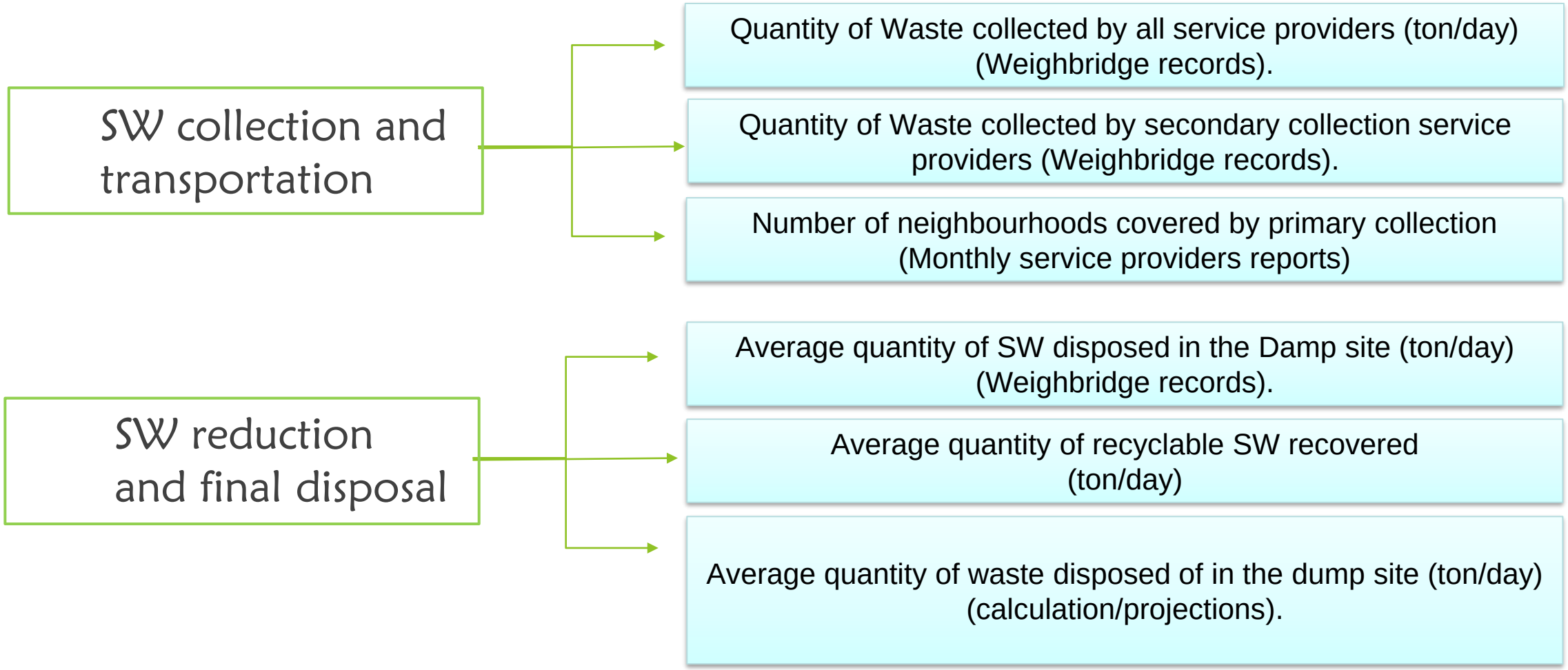
3. Institutional Capacity Development – O. 1, 2 & 4 (3/24)

- Department Organizational Reforms

3. **Create a Planning and Monitoring Section**
   Responsible for preparation, monitoring and implementation of the SWM Master Plan and Annual Work Plans, including information and data management within the SW Municipal Department.
4. **Enhance the capacity of Environmental Awareness Section**
   Responsible for coordination and liaison with partners in the promotion of SW reduction, reuse and recycling initiatives, including environmental education and awareness activities.
5. **Optimize the Department of Fleet Management and Workshops-auto**
   Waste collection, transportation and final disposal site operations increasingly outsourced, including maintenance of heavy equipment and vehicles currently owned by the SW Municipal Department.

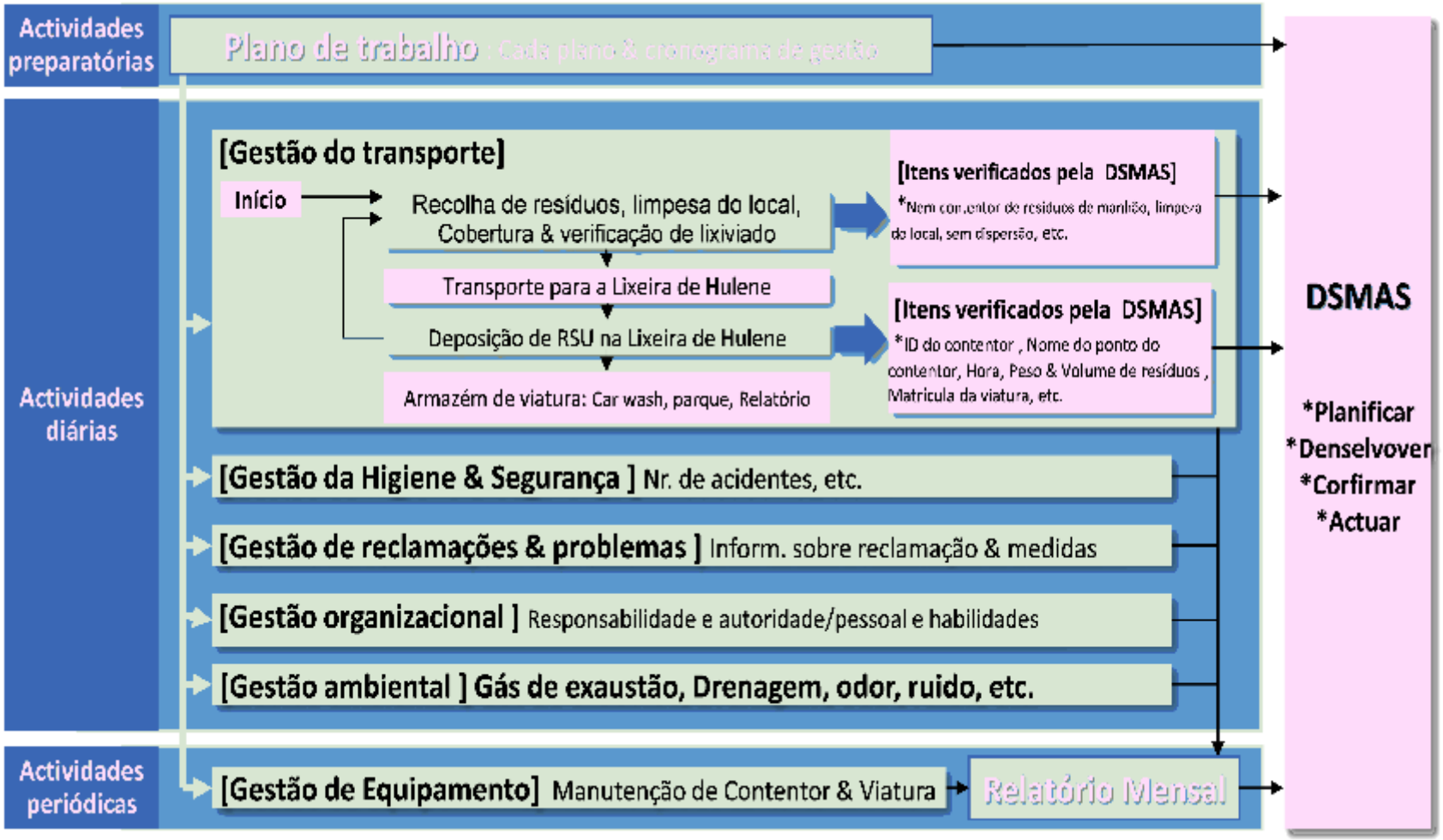
3. Institutional Capacity Development – O. 1, 2 & 4 (4/24)

- Capacity for data collection and analysis



3. Institutional Capacity Development – O. 1, 2 & 4 (5/24)

- Capacity for data collection and analysis



3. Institutional Capacity Development – O. 1, 2 & 4 (6/24)

- Capacity for data collection and analysis

MZN 2,320

Track scale data		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total	
	12m3	38	47	45	44	37	40	36	47	44	39	48	42	47	33	44	50	43	42	47	44	43	43	41	41	50	44	41	42	43	30	1,274	MZN 2,955,298
AKT 596 MC	12m3	22	24	22	23	19	19	17	23	20	21	24	20	22	19	19	23	22	22	22	22	20	23	21	21	24	20	21	17	19	14	625	
AJW 921 MC	12m3	16	23	23	21	18	21	19	24	24	18	24	22	25	14	24	27	21	20	25	22	23	20	20	20	26	24	20	25	24	16	649	
	6m3	4	6	5	5	5	3	5	4	6	4	4	5	4	2	4	5	5	3	5	5	4	4	5	6	5	5	5	5	6	5	139	
AJE 856 MC	6m3	4	6	5	5	5	3	5	4	6	4	4	5	4	2	4	5	5	3	5	5	4	4	5	4	2	2	0	1	0	0	111	
AFJ 383 MC	6m3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	5	4	6	5	28	
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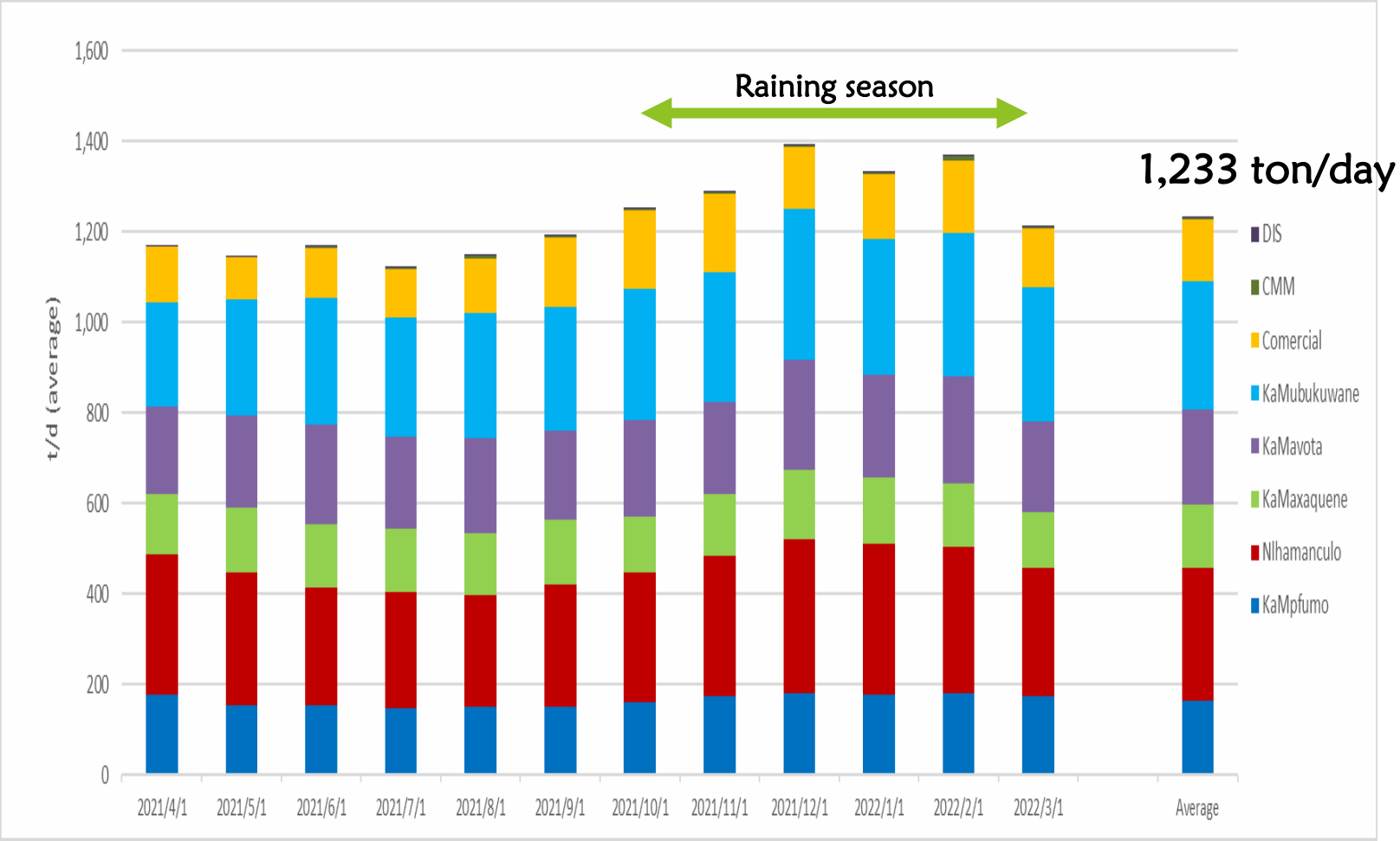
RGC(Papel Dato)		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total	
Ruta2+Ruta3	12m3	38	47	45	44	37	40	36	48	44	39	48	42	47	50	44	50	43	45	47	44	42	43	41	41	50	44	41	42	44	43	1,309	MZN 3,036,487
Ruta2 trip	12m3	19	24	24	21	18	20	18	22	21	19	26	20	23	25	23	26	22	22	22	22	20	21	21	22	26	24	20	25	22	20	658	
Ruta3 trip	12m3	19	23	21	23	19	20	18	26	23	20	22	22	24	25	21	24	21	23	25	22	22	22	20	19	24	20	21	17	22	23	651	
Ruta1 trip	6m3	4	6	5	5	5	3	5	3	5	4	4	5	4	4	4	5	5	3	5	5	4	4	5	6	5	5	5	5	7	8	143	
container	6m3	24	37	34	31	34	19	30	18	39	30	27	31	24	27	28	33	37	20	34	33	32	28	30	36	30	30	32	28	37	41	914	MZN 1,060,103
penalização		0	3	0	4	4	5	6	6	3	4	4	4	0	0	3	0	0	0	0	3	2	0	0	0	7	4	0	0	0	4	66	(MZN 330,000)
																																	MZN 3,766,590

Montly Report CA		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total	
	12m3	38	47	46	44	37	39	36	48	44	39	48	42	47	46	45	51	43	44	47	43	41	41	43	41	44	44	41	42	43	46	1,300	MZN 3,015,610
AKT-596 trip	12m3	19	23	22	23	19	19	18	25	23	20	22	20	24	25	22	25	21	23	25	21	21	21	22	19	22	20	21	17	21	23	646	
AJW-921 trip	12m3	19	24	24	21	18	20	18	23	21	19	26	22	23	21	23	26	22	21	22	22	20	20	21	22	22	24	20	25	22	23	654	
container AJE-856	6m3	28	38	34	33	34	21	35	21	41	27	21	30	27	27	29	34	35	23	36	36	28	33	27	39	34	35	34	33	42	48	963	MZN 1,116,936
																																	MZN 4,132,546

3. Institutional Capacity Development – O. 1, 2 & 4 (7/24)

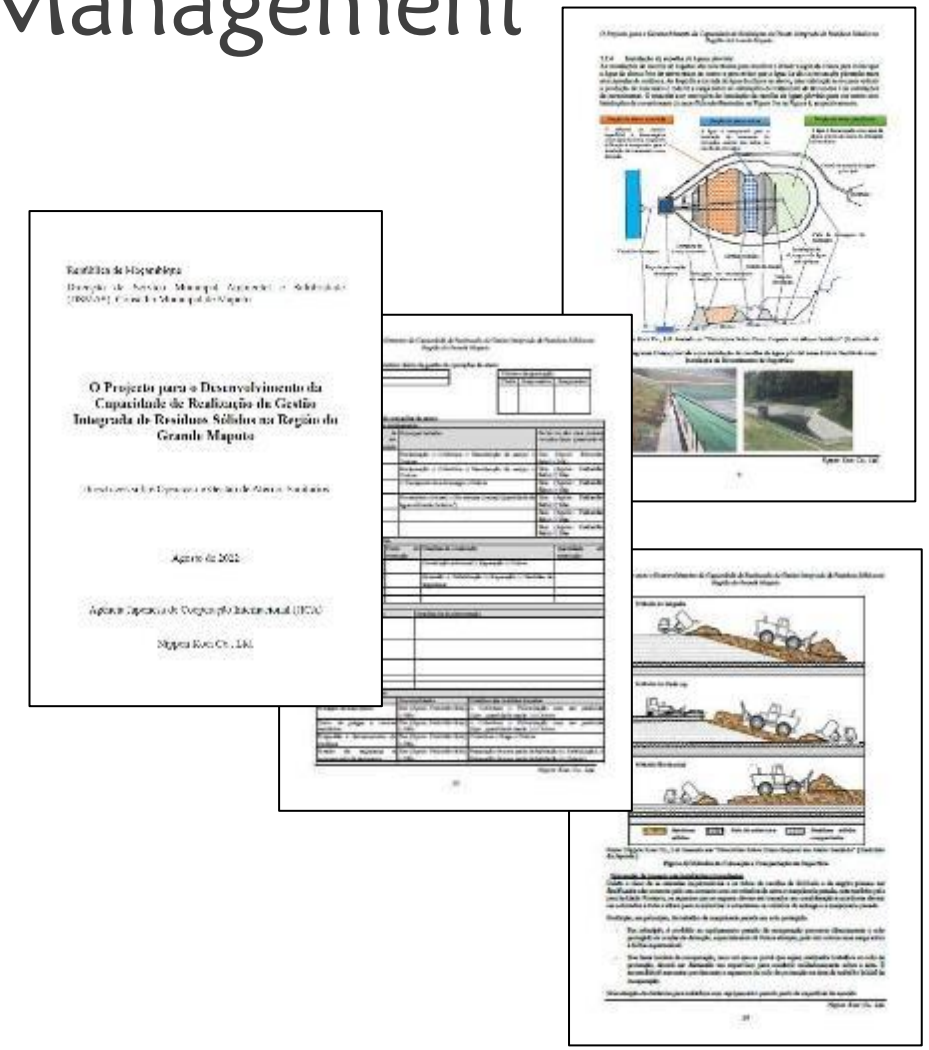
- Capacity for data collection and analysis



3. Institutional Capacity Development – O. 1, 2 & 4 (8/24)

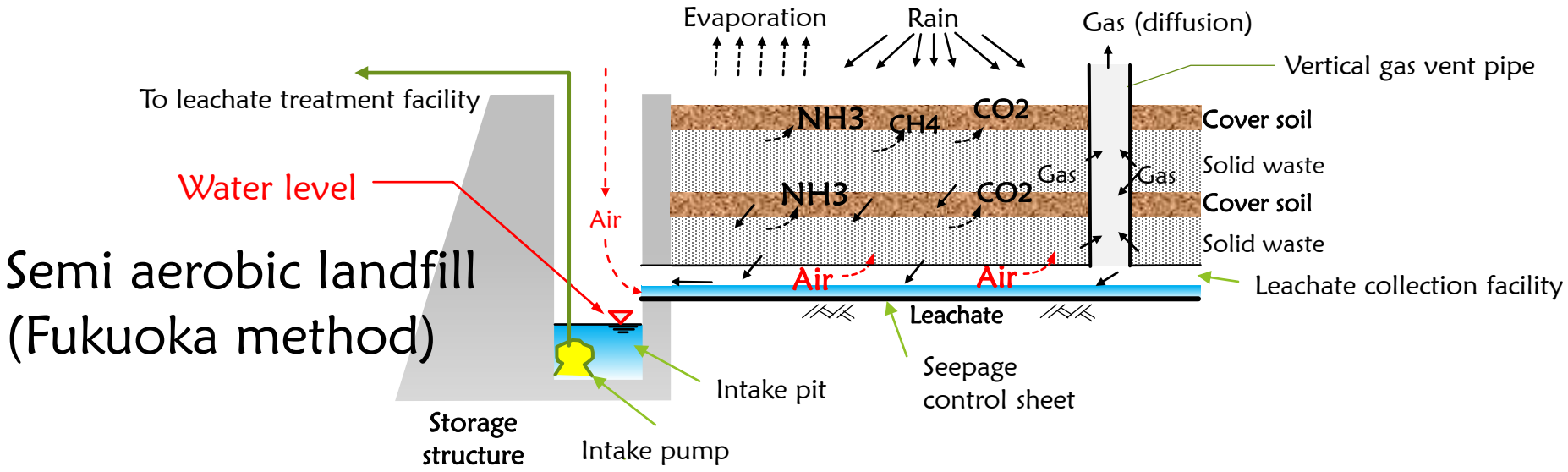
- Training on Sanitary Landfill Management

1. Management of Landfill for Municipal Solid Waste
2. Functions and Facilities of Landfills
    1. Landfill Structure
    2. Main Facilities
    3. Administrative Facilities
    4. Related Facilities
3. Management of Landfills
    1. Transport Control Management
    2. Landfill Operation Management
    3. Facility Management
    4. Environmental Management
    5. Safety Management
4. Site management after landfilling completion
5. Management Record Forms

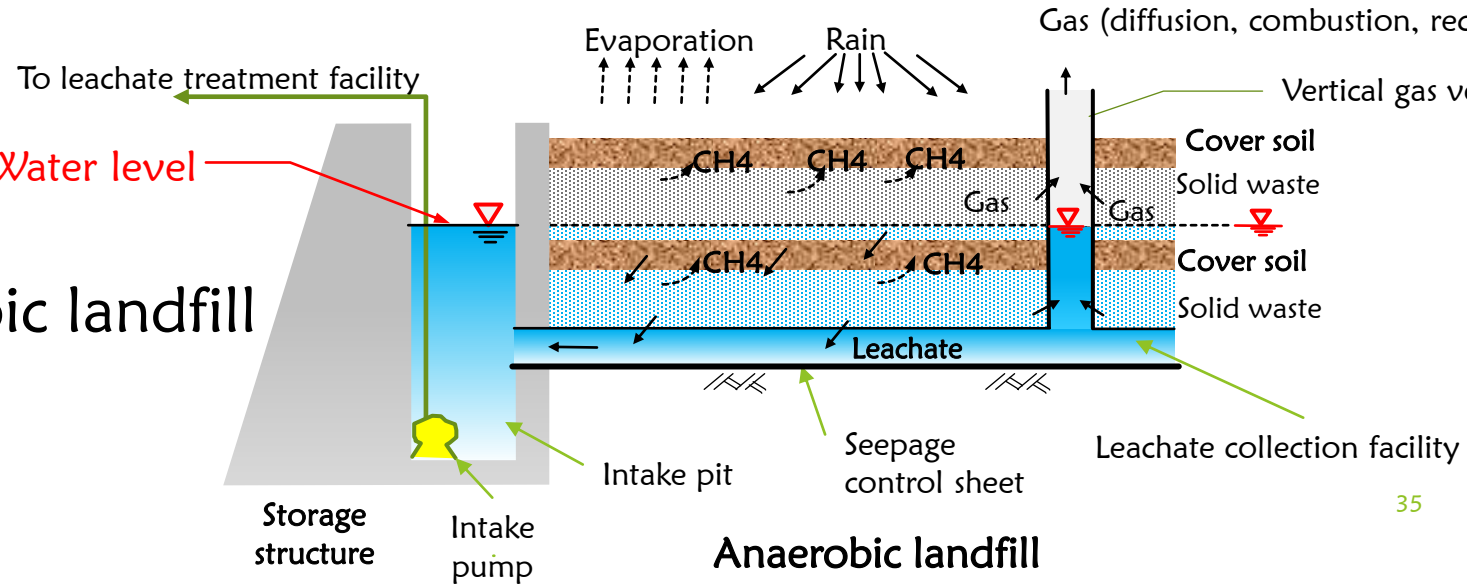


3. Institutional Capacity Development – O. 1, 2 & 4 (9/24)

Landfill Structure



Semi aerobic landfill
(Fukuoka method)

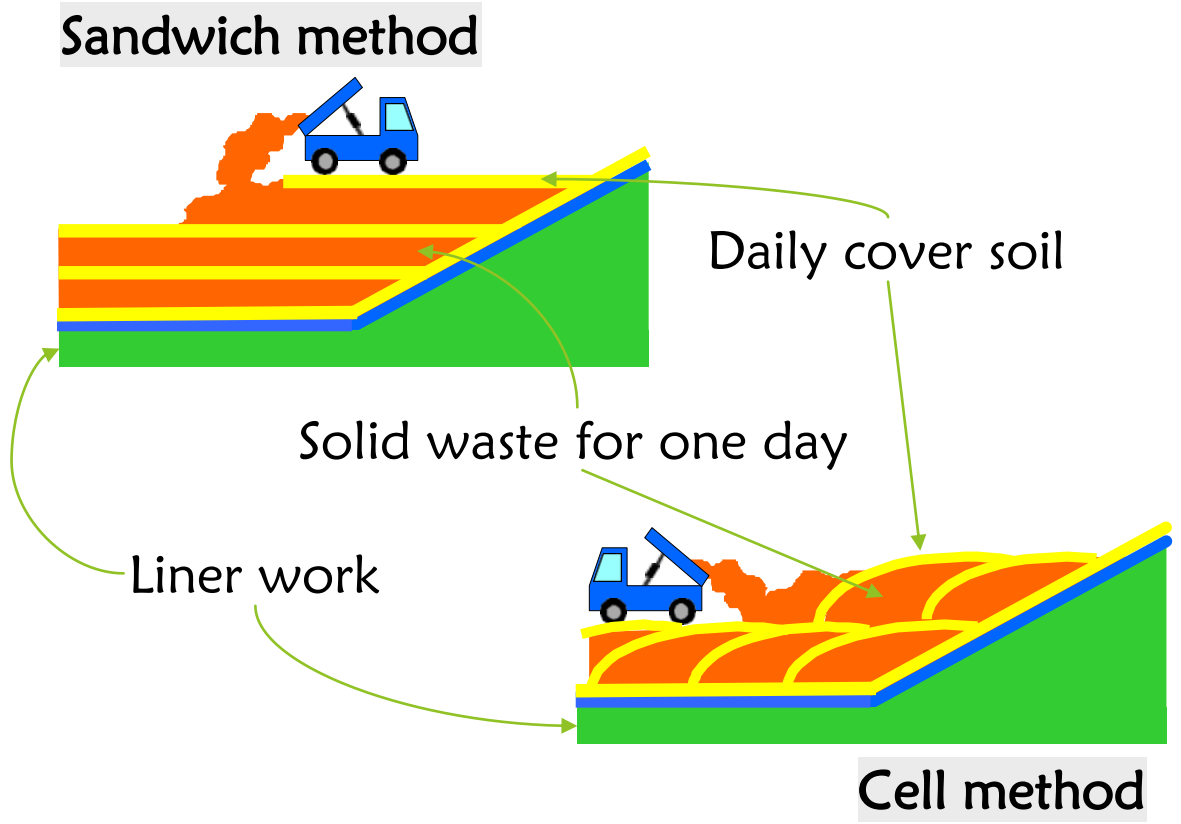


Anaerobic landfill

3. Institutional Capacity Development – O. 1, 2 & 4 (10/24)

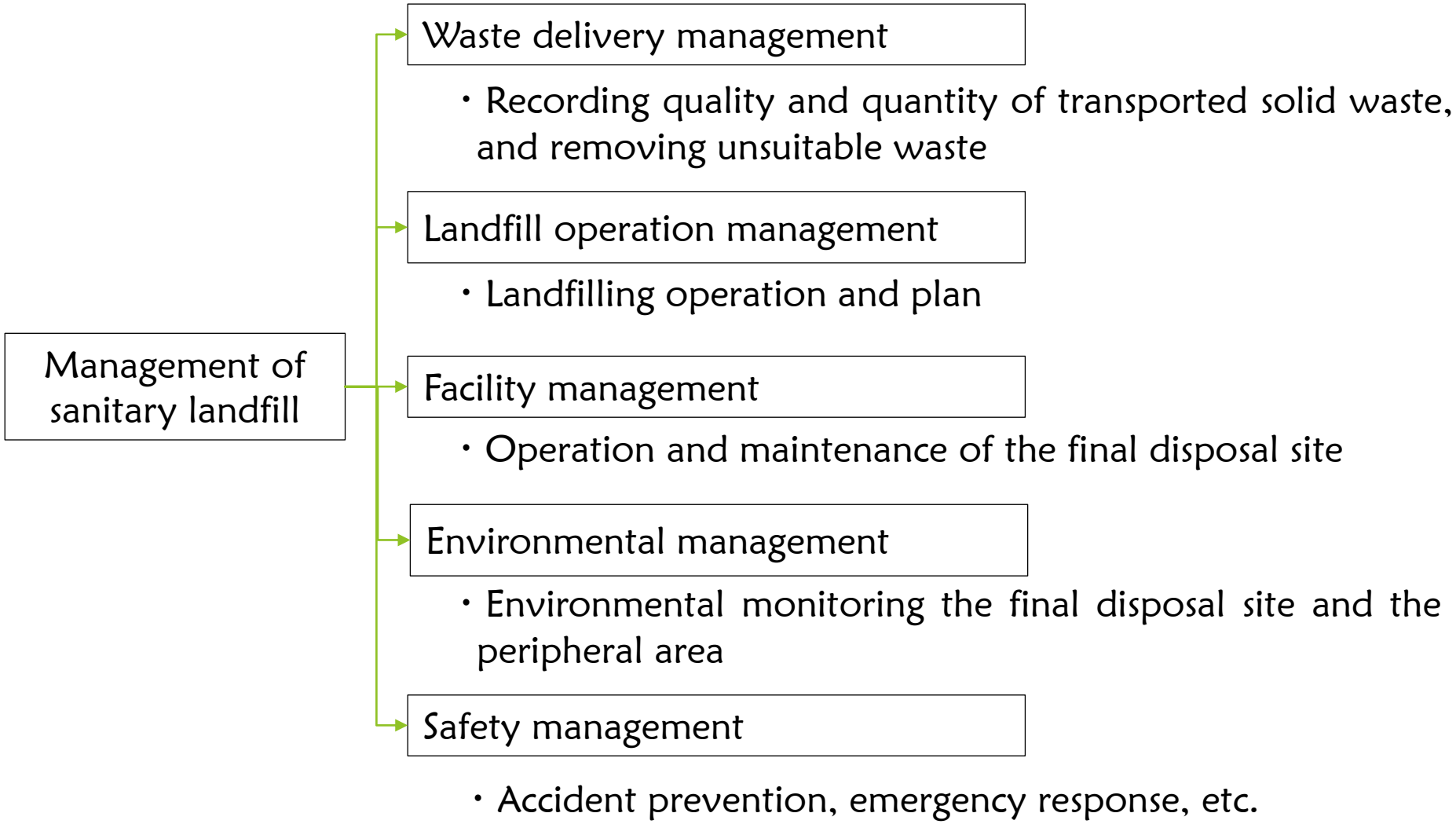
- Training on Sanitary Landfill Management

Landfilling Method



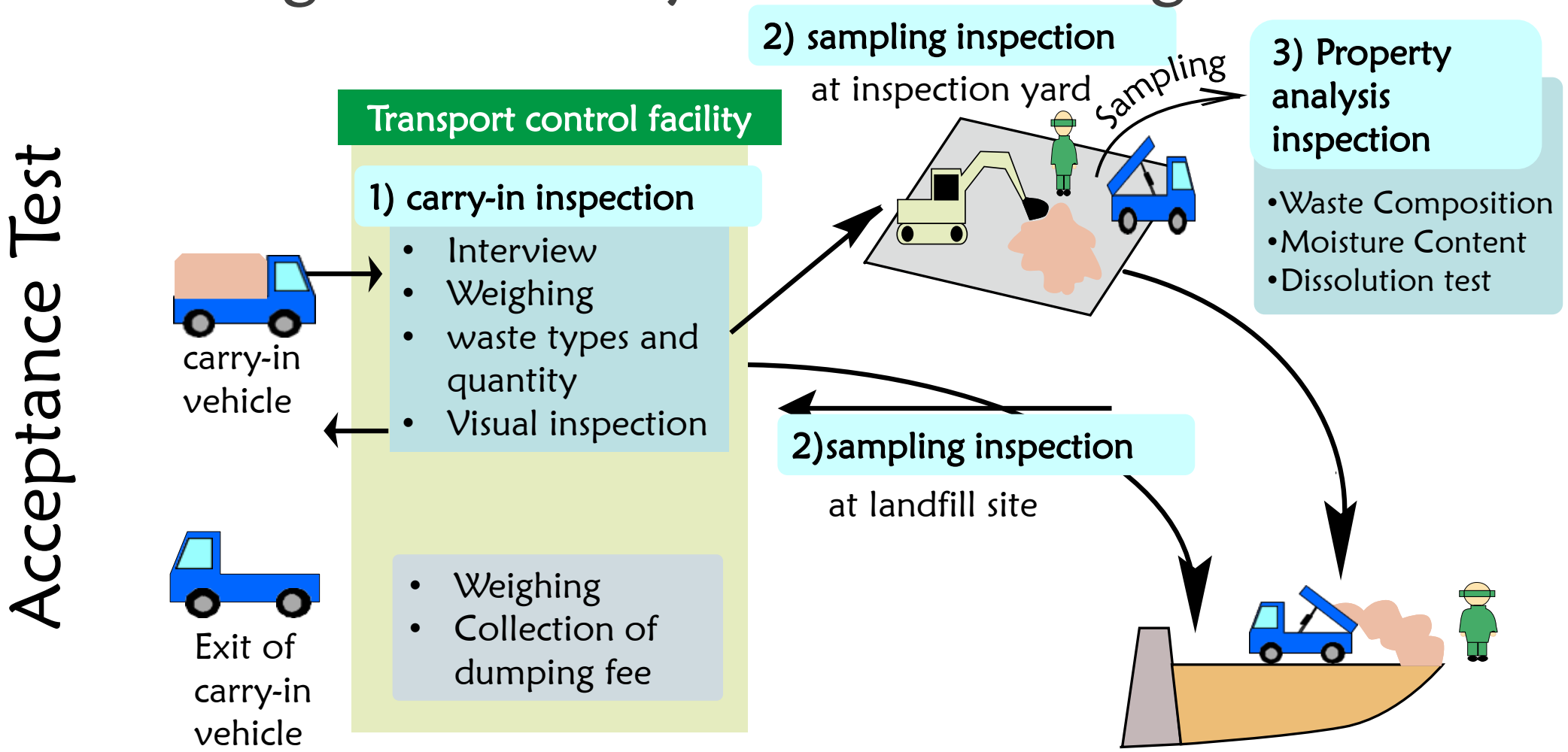
The cell method is better in terms of environmental and safety management.

3. Institutional Capacity Development – O. 1, 2 & 4 (11/24)



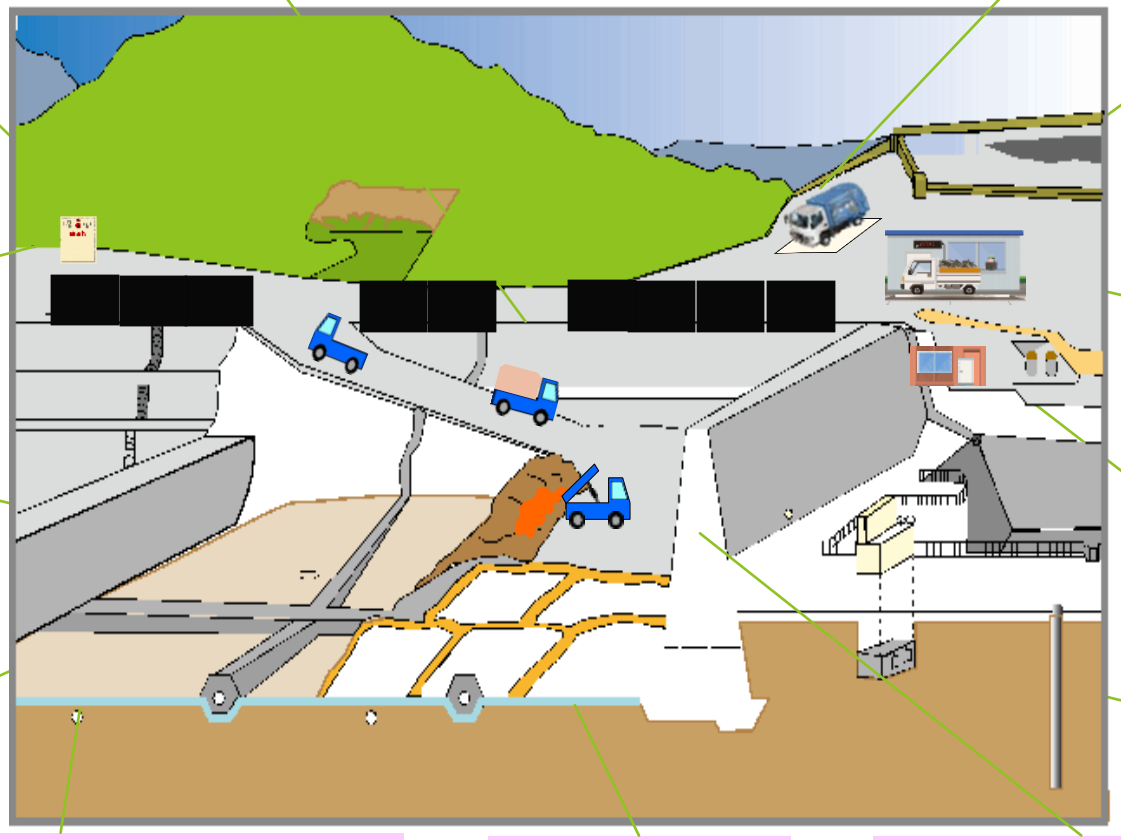
3. Institutional Capacity Development – O. 1, 2 & 4 (12/24)

- Training on Sanitary Landfill Management



3. Institutional Capacity Development – O. 1, 2 & 4 (13/24)

Facilities in Sanitary Landfills



Rainwater Collection Facility

Vehicle Wash Facility

Littering Prevention Equipment

Transport Control facility

Fire Protection Equipment

Road Equipment

Landfill Gas Treatment Facility

Leachate Treatment Facility.

Leachate Collection facility

Environmental Monitoring Facility

Groundwater Collection Facility

Liner Facility

Storage Structure

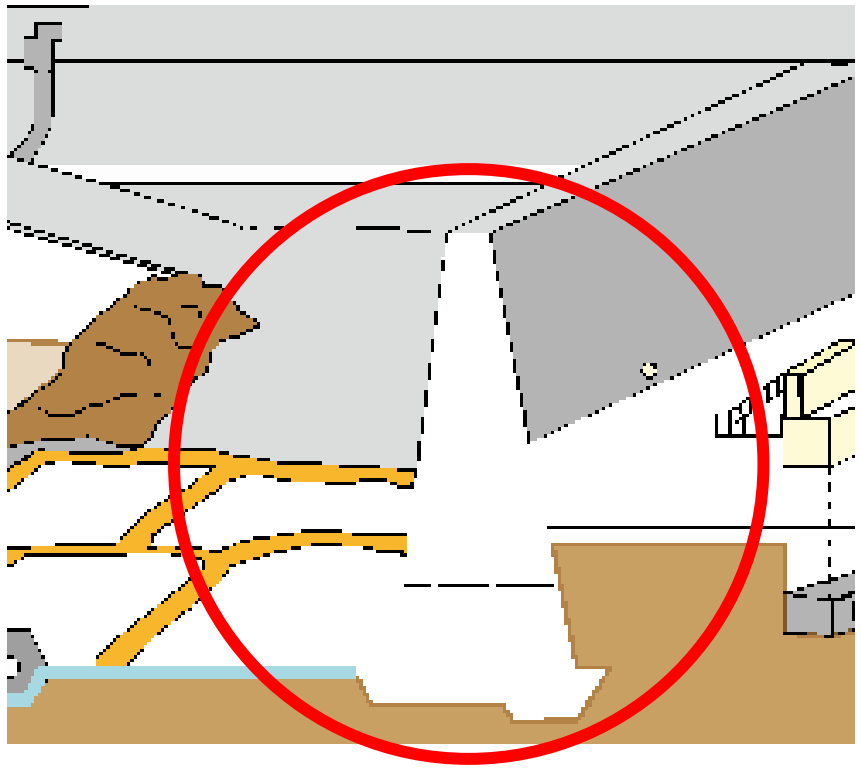
Main facilities

Control facilities

Related facilities

3. Institutional Capacity Development – O. 1, 2 & 4 (14/24)

Storage Structure

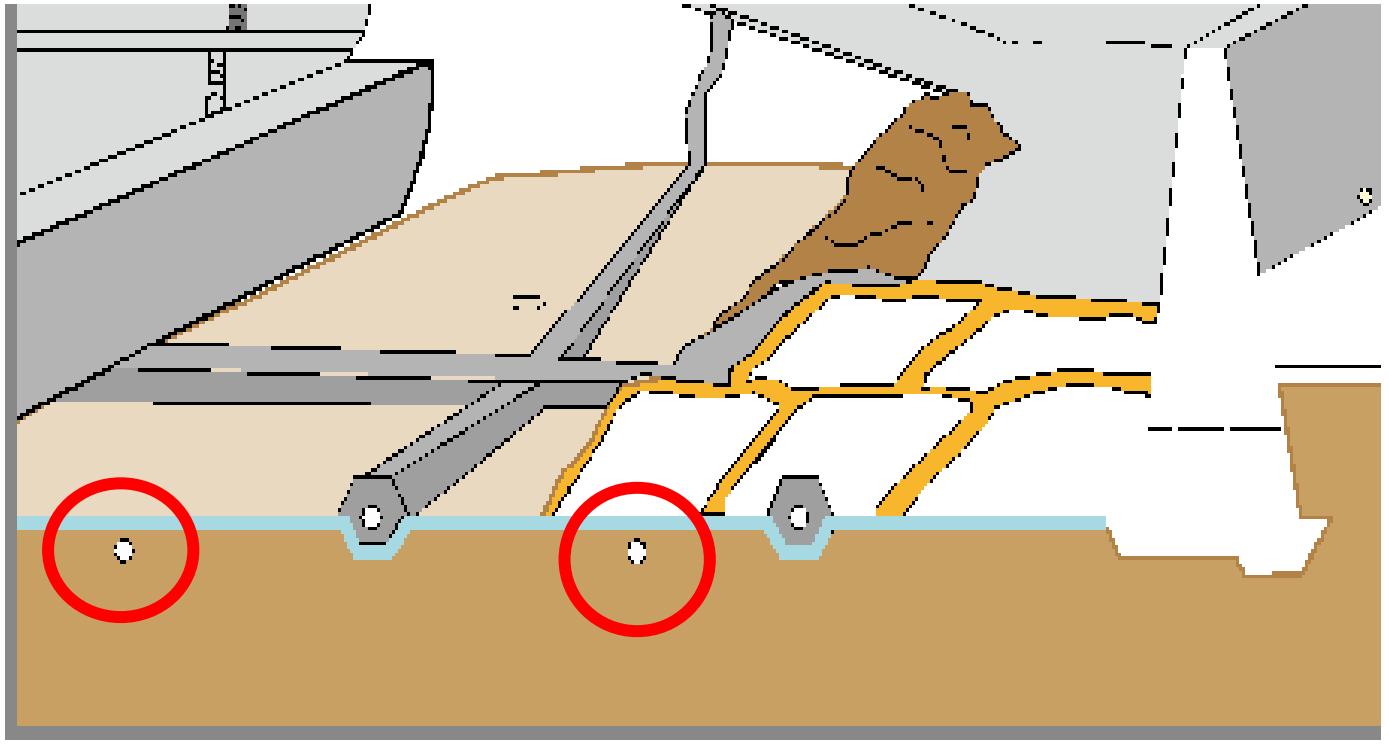


The facility for retaining solid waste safely, to prevent the effluence of solid waste and leachate outside.

3. Institutional Capacity Development – O. 1, 2 & 4 (15/24)

- Training on Sanitary Landfill Management

Groundwater Collection and Drainage Facilities

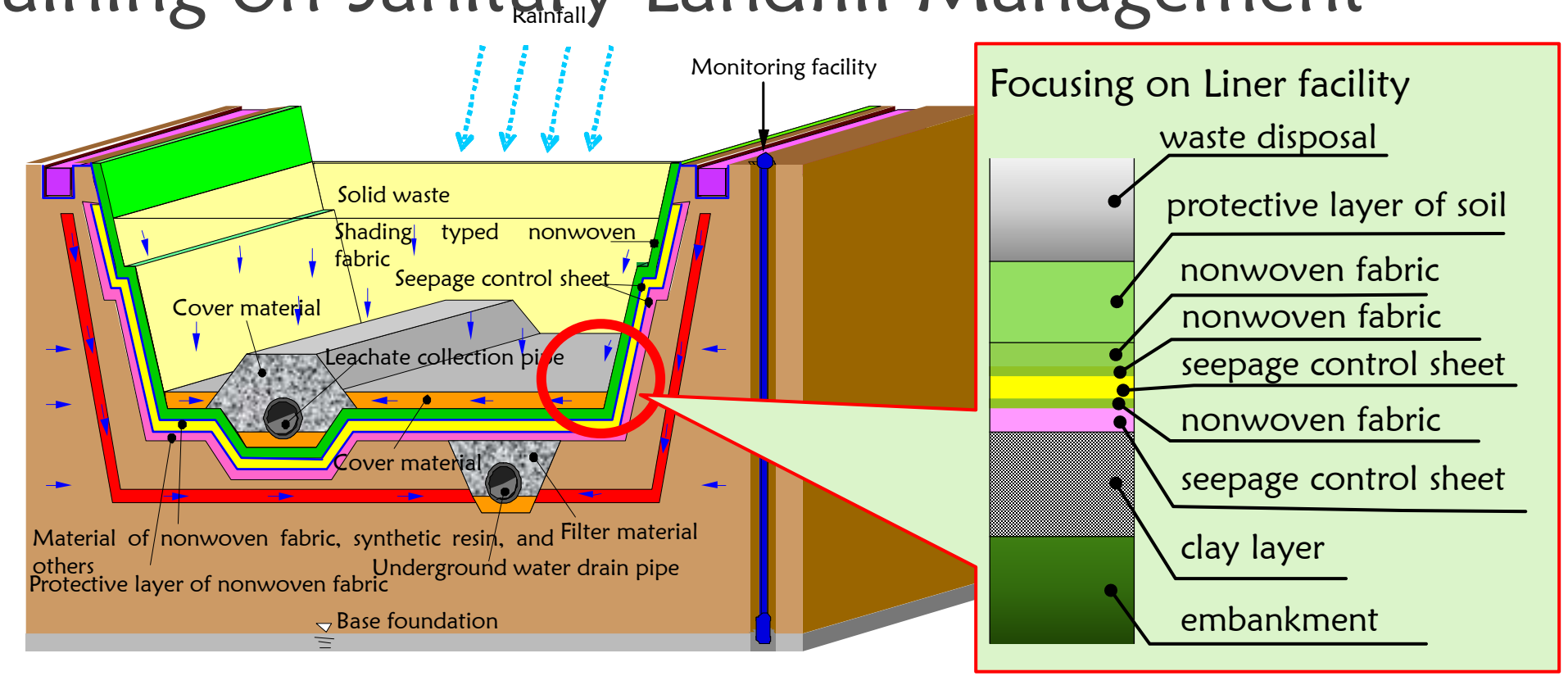


The facility for collecting and discharging underground water efficiently to prevent underground water from affecting the effects of seepage control work.

3. Institutional Capacity Development – O. 1, 2 & 4 (16/24)

- Training on Sanitary Landfill Management

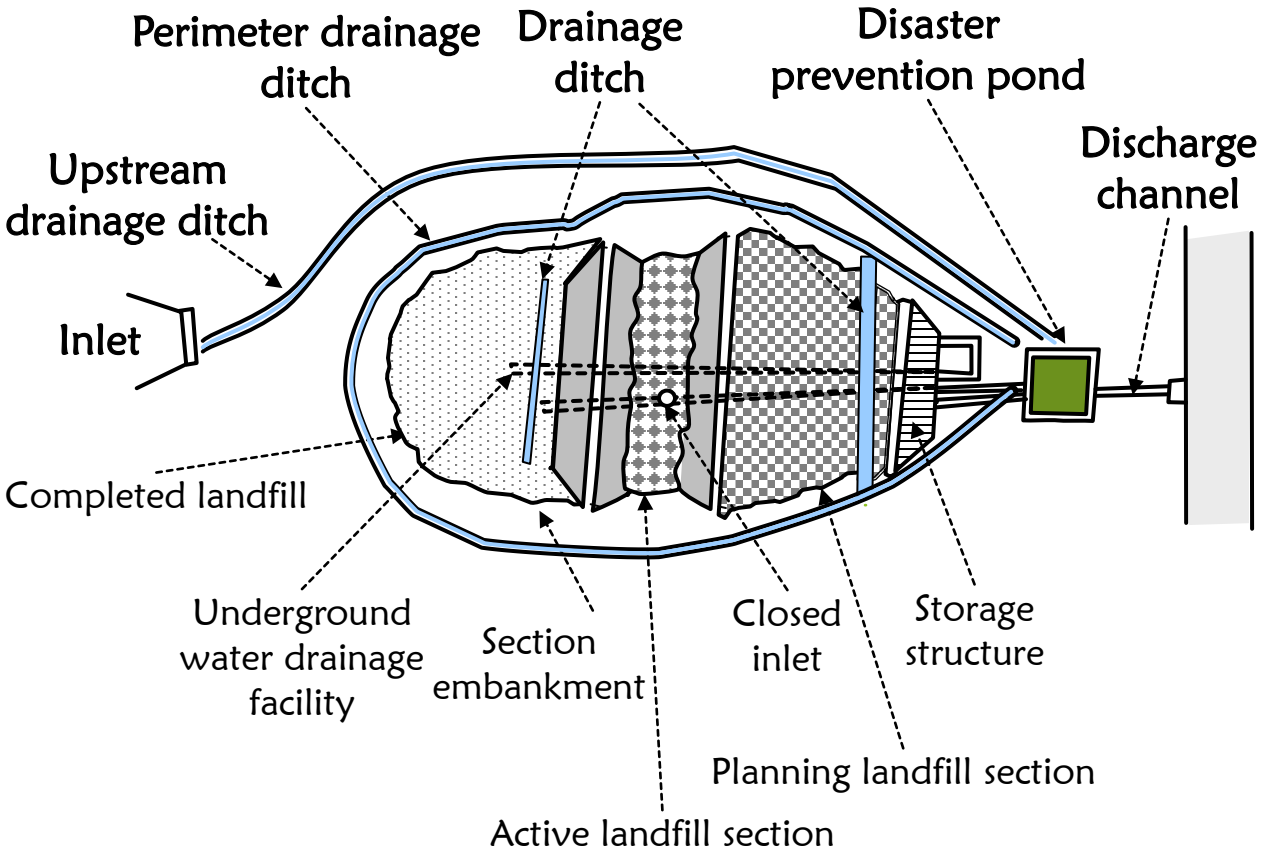
Liner Facility



The facility for cutting off the effluence of leachate outside the landfill to prevent environmental pollution of the peripheral area.

3. Institutional Capacity Development – O. 1, 2 & 4 (17/24)

Rainwater Collection Facility



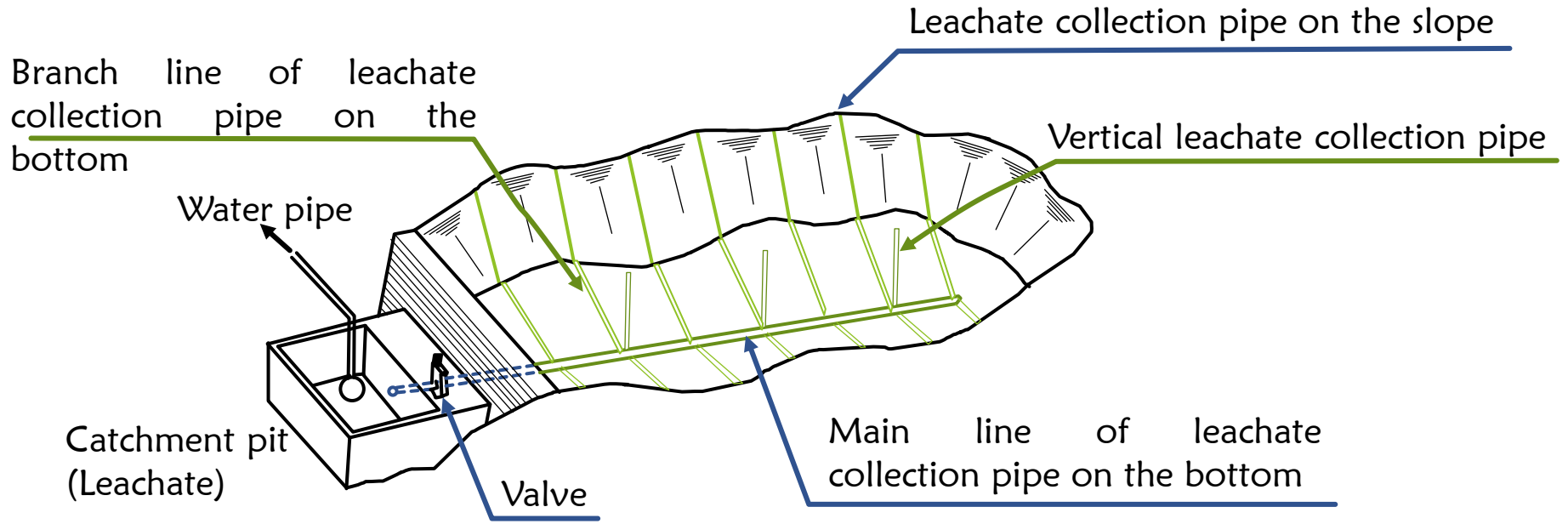
Drainage ditch

Disaster prevention pond

The facility for preventing rainwater from flowing into the landfill site, and to reduce the amount of leachate.

3. Institutional Capacity Development – O. 1, 2 & 4 (18/24)

Leachate Collection Facilities

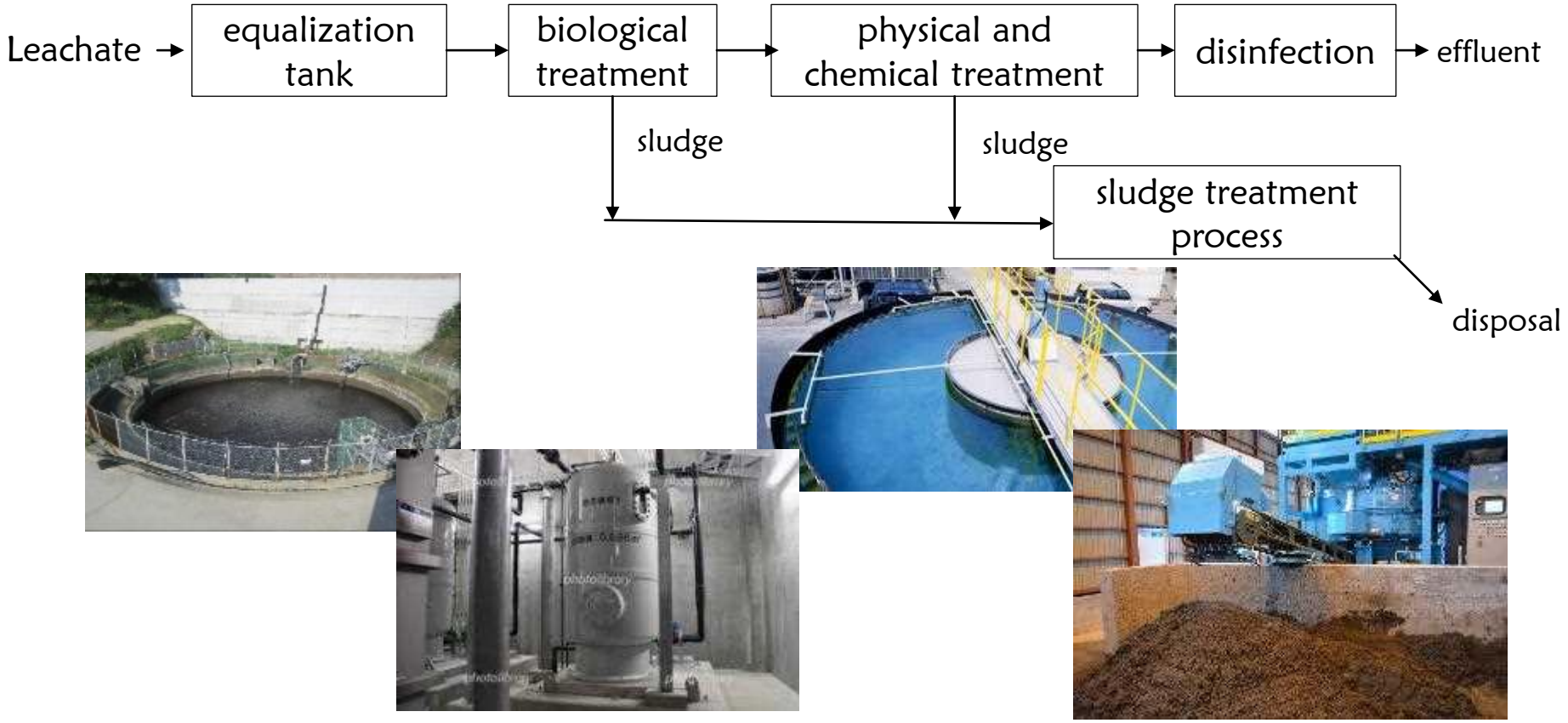





The facility for the collection and discharge of leachate, and intaking fresh air into the landfill (Fukuoka method).

3. Institutional Capacity Development – O. 1, 2 & 4 (19/24)

Leachate Treatment Facility

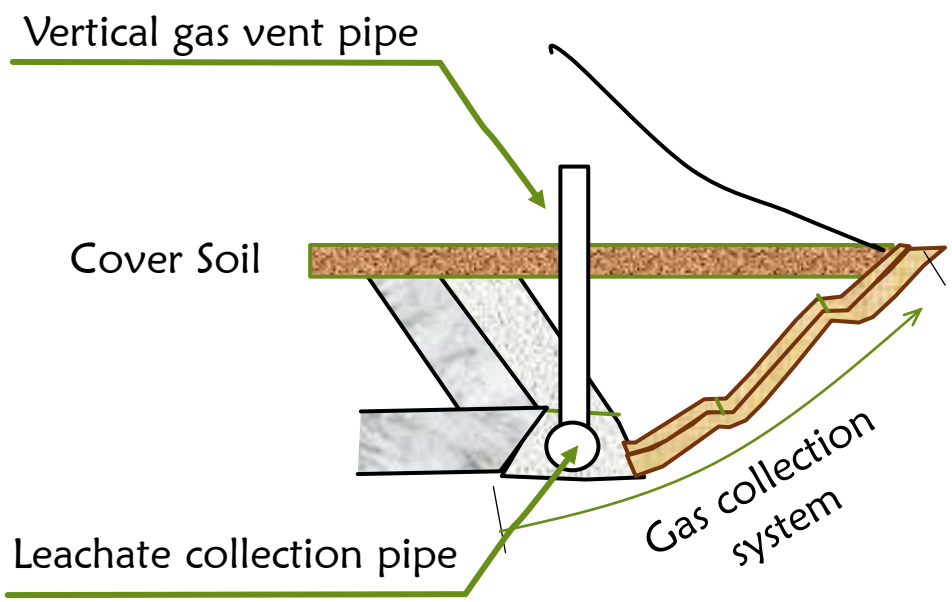


The facility for treating leachate to meet the designed effluent quality standards, and preventing leachate from contaminating public water infrastructure and/or underground water.

3. Institutional Capacity Development – O. 1, 2 & 4 (20/24)

- Training on Sanitary Landfill Management

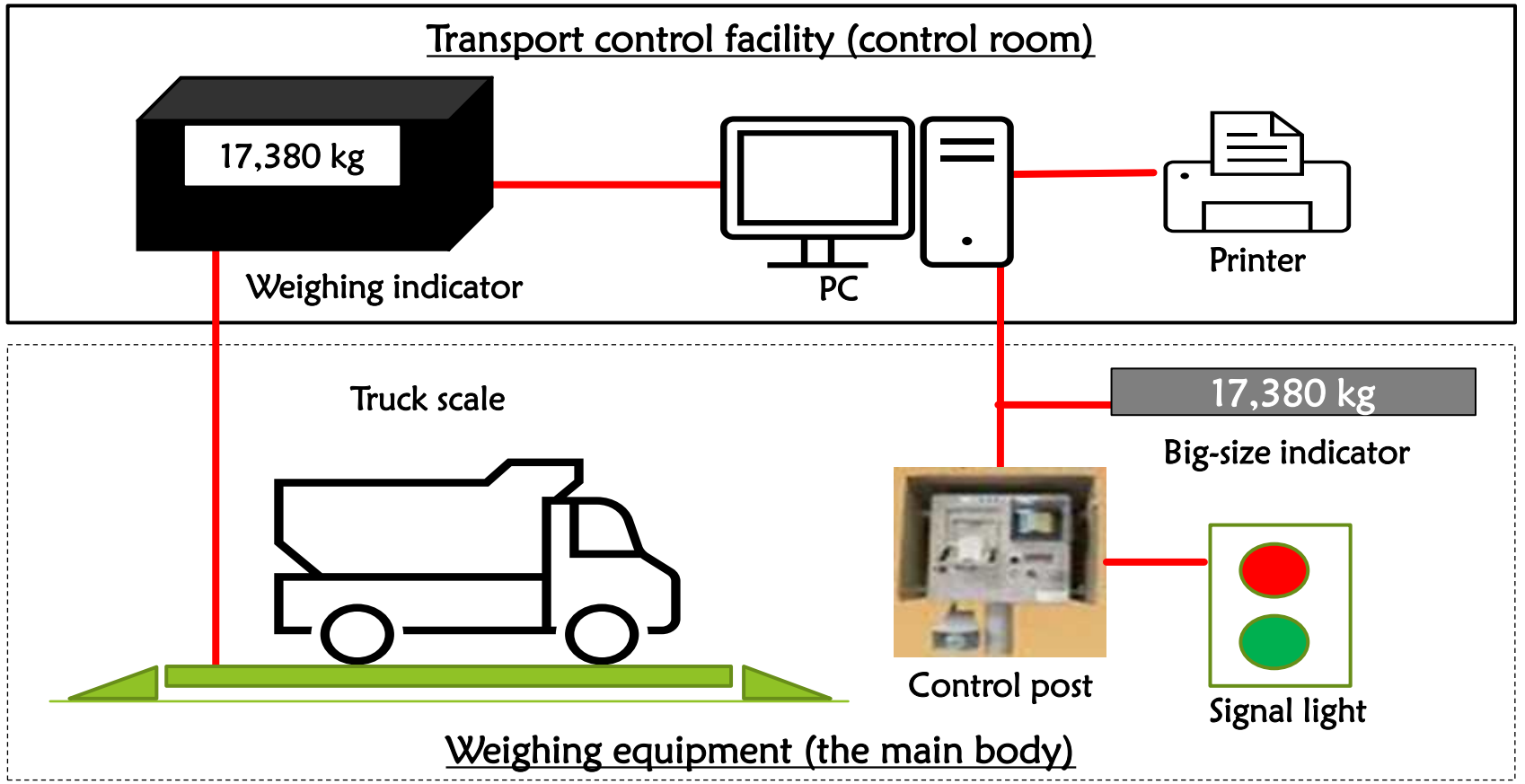
Landfill Gas Treatment Facilities



Vent pipes aiming at releasing landfill gas and facilitating the admission of fresh oxygen in the mass of waste.

3. Institutional Capacity Development – O. 1, 2 & 4 (21/24)

Transport Control Facilities



The facility for weighing, tallying and recording transported solid waste.

3. Institutional Capacity Development – O. 1, 2 & 4 (22/24)

Environmental Monitoring Facilities

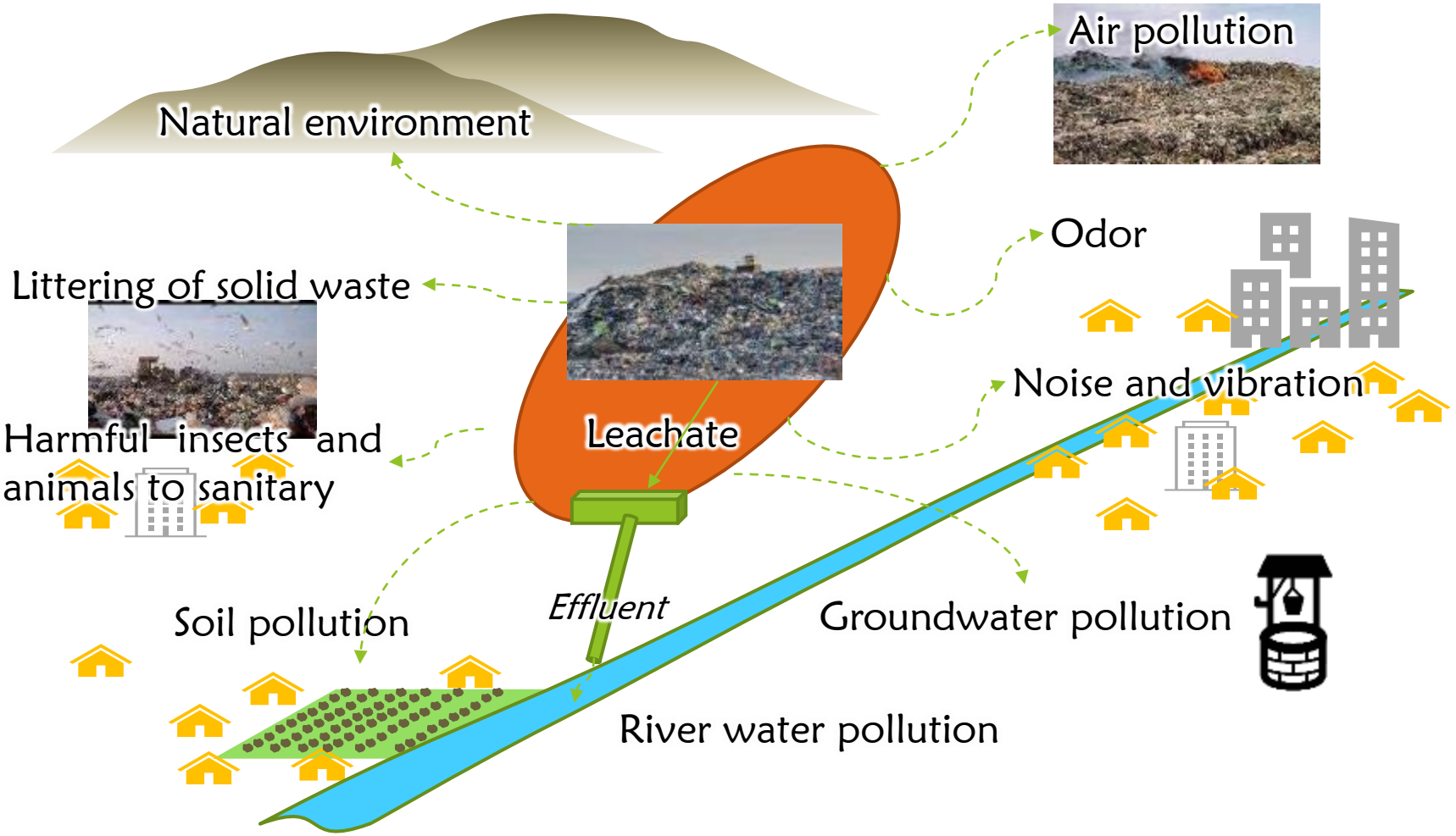
Participants of a training session.

Facilities for monitoring environmental factors, ex. a thermometer, pH meter, conductivity meter and a groundwater level meter.

3. Institutional Capacity Development – O. 1, 2 & 4 (23/24)

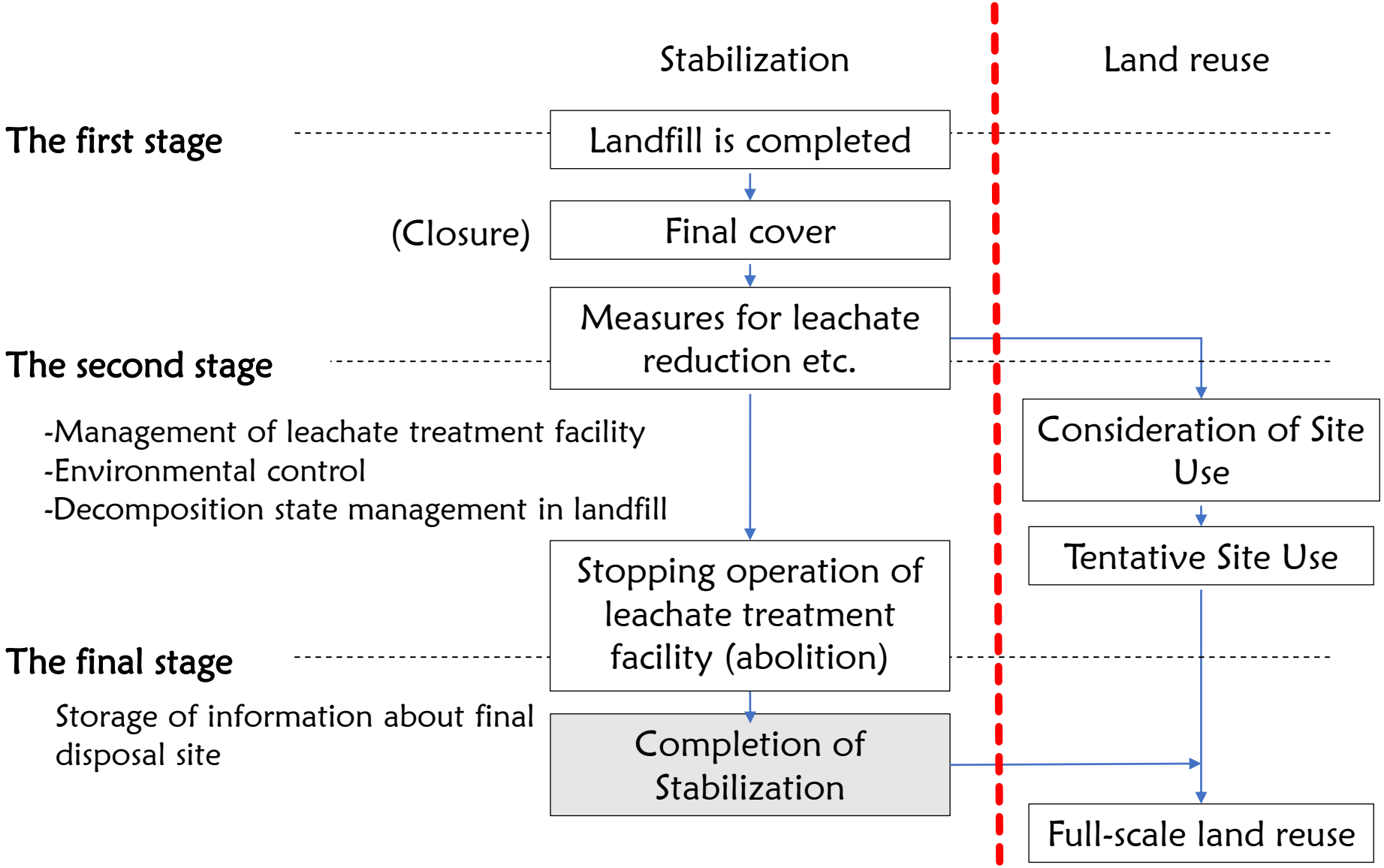
- Training on Sanitary Landfill Management

Landfill Related Environmental Management



3. Institutional Capacity Development – O. 1, 2 & 4 (24/24)

Closing a landfill and promoting land reuse



4. Pursuing Financial Sustainability (1/11)

- Strategic approach:

- Enforcement of segregated disposal of Solid Waste, including review of Municipal by-Laws rulling SWM – This will create an enabling environment to boost the Circular Economy in the City, which will generate indirect financial resources for SWM services.

4. Pursuing Financial Sustainability (2/11)

- Strategic approach:

- Promote **Equity and Justice** by increasing revenues without aggravating the Cleaning Taxes

How ?

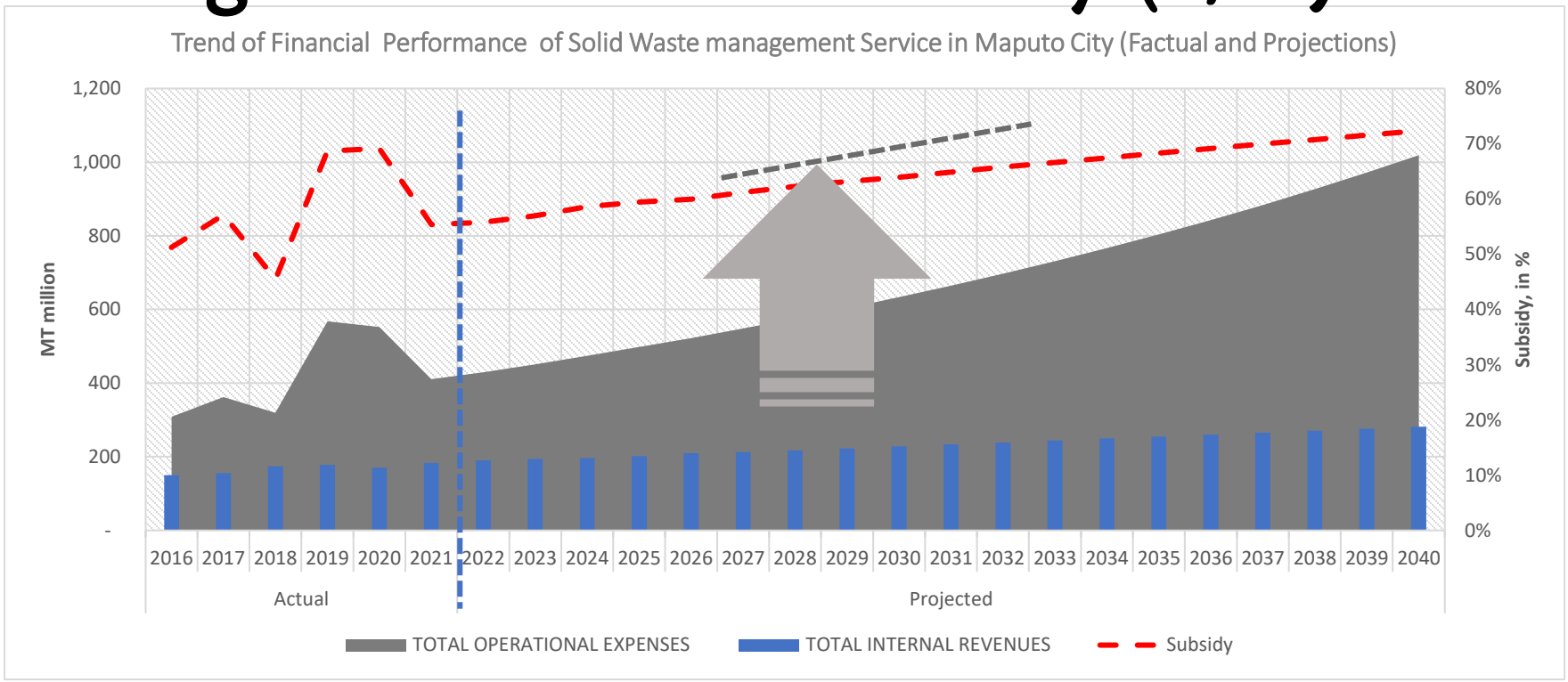
4. Pursuing Financial Sustainability (3/11)

- Since its introduction in 2008, the Cleaning Tax is charged through the Electricity billing system (Power utility – **EDM**)

- The current **taxation structure** is based on **Categories of Consumers**

Consumer' Categories	Domestic		Non domestic	
	kWh	MT	kWh	MT
Low	max 200	45	max 200	80
Medium	201-500	75	201-500	160
High	500 <	110	500 <	250

4. Pursuing Financial Sustainability (4/11)



- A cost-beneffit analysis shows that the total revenues from the Cleaning Taxes are far bellow the total operational expenditures of SWM services in the City, and this gap tends to increase with time.

4. Pursuing Financial Sustainability (5/11)

- It is estimated that if no immediate action is taken, SWM operational costs will continue relying on subsidies from other sectors, growing beyond 70% by 2040.

- As the sector has plans to invest in capital-intensive Technologies to respond to the increasing demand and challenges, particularly safety, environment and population growth, it is forecast that the costs are likely to duplicate in the next 5 years.

4. Pursuing Financial Sustainability (6/11)

- A recent study within the Project, based on the records of electricity consumption during the last 15 years, produced evidences of a Linear Correlation between the Electricity Bill and the Quantity of SWM generated.

O maior consumo de energia eléctrica indica maiores actividades econômicas que se traduzem em mais produção de resíduos.

O custo de gestão de resíduos está directamente relacionado ao volume de resíduos produzidos pela população, empresas e instituições na Cidade. Todos podem contribuir para apoiar a GRS por meio da distribuição justa de custos.

4. Pursuing Financial Sustainability (7/11)

❑ As the total average quantity of SW produced in the city and the total operational expenditures of the service are well known, they were used to determine a unit cost to be set as minnimum tariff for the calculation of the Cleaning Tax based on the electricity⇔solid waste correlation (kg/kWh).

SWM operational costs (MT)

Total SW produced (kg)

Total Electricity Consumed (kWh)

A Unit Cost of SWM services provided is determined (2021)

Domestic:
0.59 MT/kWh

Non-Domestic:
1.21 MT/kWh

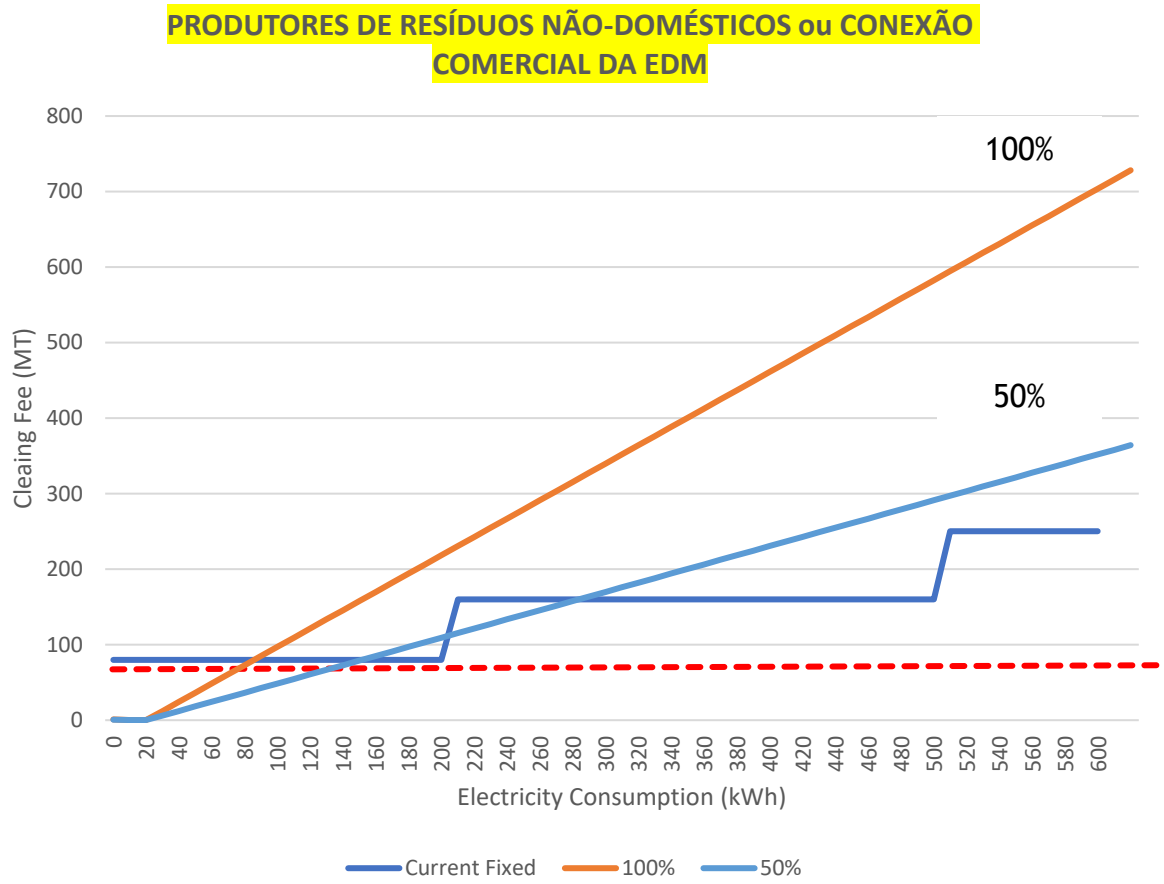
4. Pursuing Financial Sustainability (8/11)

- The study also revealed that the current taxation system is unfair, penalizing particularly consumers under the Medium and Lower categories, who end up subsidizing part of the services provided to high income citizens.

- To correct this injustice, the City, assited by JICA, is working on a new taxation structure through which the Cleaning Tax will be calculated directly by converting the total amount of kWh from the electricity bill to total equivalent kilograms of Solid Waste, then multiply it by the unit cost.

4. Pursuing Financial Sustainability (9/11)

- Proposed Model (Options):



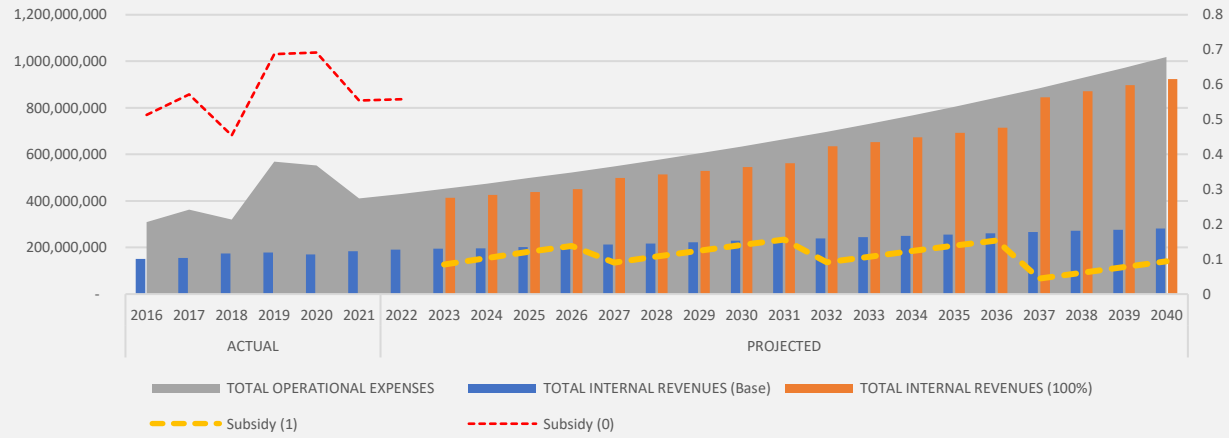
Consumo médio
Não-Doméstico: 269.77 kwh/mês

Limite @100%: 65.5 kwh
Limite @ 50%: 131 kwh

Isso ainda acontece, mas com menos ocorrência porque 60%-80% das conexões comerciais podem ser pós-pagas

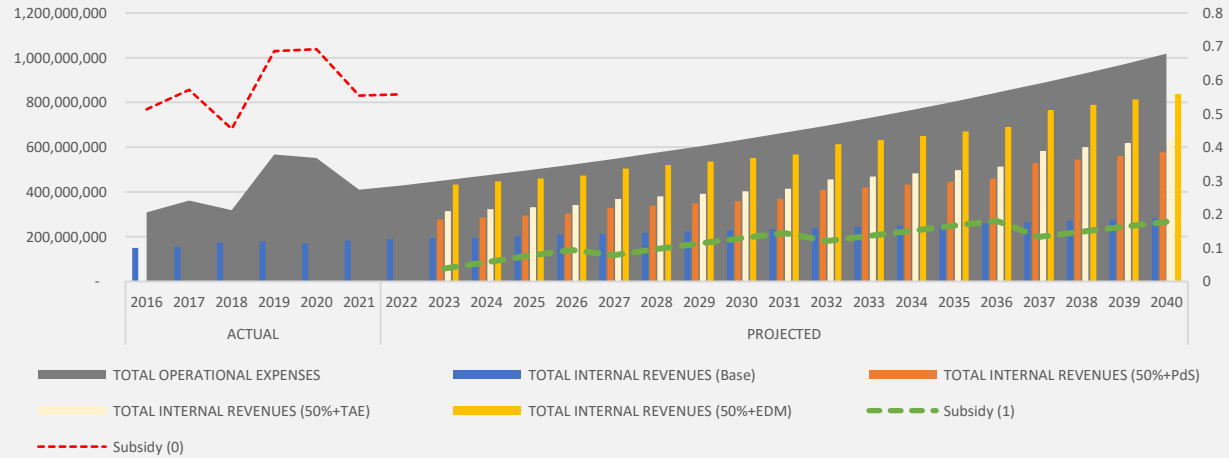
4. Pursuing Financial Sustainability (10/11)

Cenário 1, Projecção Financeira: Preço unitário de 100% para taxa de limpeza via EDM



Subsídio médio: **11%**
Prós: 1. Sistema de cobrança altamente eficiente;
2. Maior transparência;
3. Não há necessidade da taxa fixa para produtores de residuos não domésticos
Con: 1. Alto impacto da taxa de limpeza na factura de energia (até 10% para doméstica; >20% para não doméstica)

Cenário 2, Projecção Financeira: Preço unitário de 50% para taxa de limpeza via via EDM + Outras Estratégias



Melhor caso, subsídio médio: **12%**
Prós: 1. Sistema de cobrança altamente eficiente;
2. Maior transparência;
3. Impacto razoável na factura de energia;
Con: 1. Necessidade da taxa fixa para produtores de residuos não domésticos
2. Necessidade de forte colaboração com a EDM

4. Pursuing Financial Sustainability (11/11)

- Communication and Collaboration:
  - ❑ Invest in a smart communication strategy.
  - ❑ A strong and direct collaboration between different Municipal Departments (Economic Activities; Finance; Solid Waste Management; etc.) and the Power utility (EDM) is crucial.

5. The Way Forward (1/6)

Joint Coordination Committee Meetings:

- Fifth Meeting of the Joint Coordination Committee of the Project held on 7 December 2022 to assess the progress of the project activities and decide on the way forward.

- 44 participants were present, including the Councilor for Spatial Planning, Environment and Construction, representatives from the Embassy of Japan and JICA Mozambique Office, the Matola Municipal Councilor for Solid Waste Management, representatives of The Ministry of Land and Environment, the representative of the Ministry of Education and Human Development, the Municipal Deputy-Director of Planning and Finance, the Municipal Director of Health, Directors and technicians from the Municipal Directorate for Environment and Solid Waste Management Services, and JICA Experts.

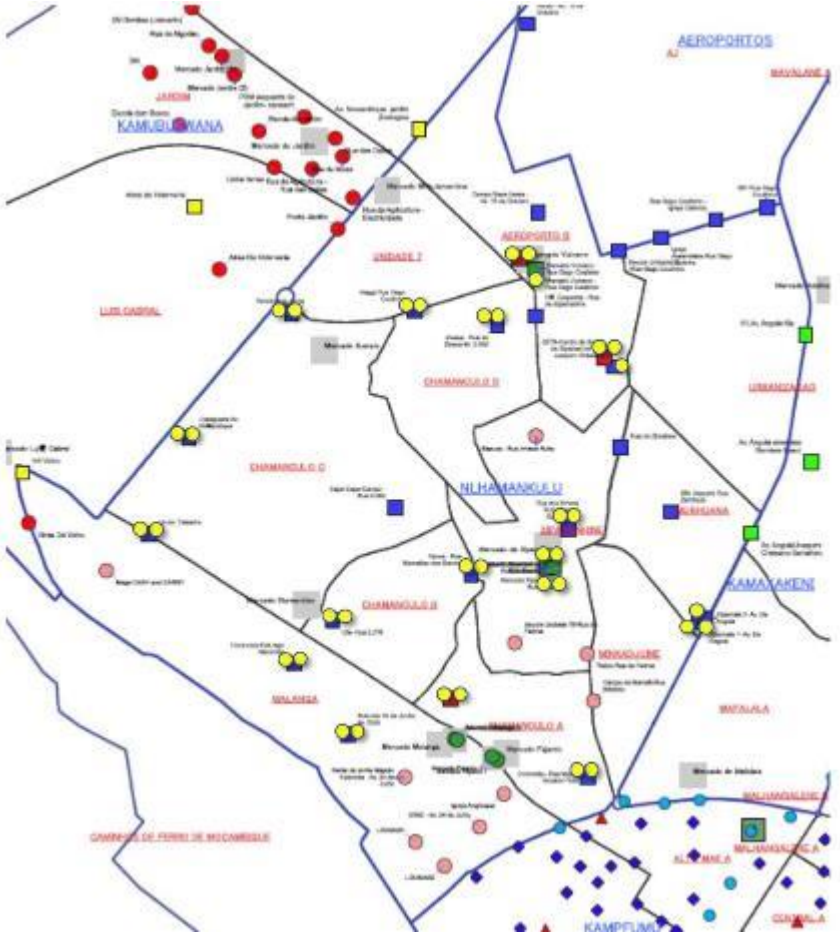
5. The Way Forward (2/6)

Output 1:

- Prepare a mid-term review report on the progress of the Solid Waste Management Master Plan implementation.

Output 2:

- Prepare an improvement plan for waste collection and transportation services, including recommendations for the next Terms of Reference for the procurement of outsourced Secondary Waste Collection Services.



5. The Way Forward (3/6)

- Outputs 3 and 6:

- Continue promoting the 5Rs, public awareness, and environmental education activities

- Encourage and promote recycling, including the composting of organic waste.

- Establish a link between Maputo City and Mauricio de Sousa, the author of the "Turma da Mônica" Brazilian comic book, so that a partnership could be established to create comic books with environmental content that can be used for environmental education in Mozambique.

5. The Way Forward (4/6)

- Output 4:
  - Make proper use of the Guideline on Sanitary Landfill Management in the upcoming planning, construction, and operation of the sanitary landfill in KaTembe
- Output 5:
  - Finalize the strategy aiming at attaining financial sustainability of Solid Waste management services in the City, with strong involvement of the City Power Utility EDM.
  - analyze the institutional aspects to enhance the organizational capacity of the Municipal Department of Solid Waste management, particularly on revenues collection.

5. The Way Forward (6/6)

- Output 7:

- Focus on compiling experiences and lessons, and produce a documentary and brochure disseminating the “Maputo Model”.




- Continue socializing the Project by enhancing collaboration with related Ministries and partners, including sharing with other cities the major experiences and lessons learned.

OBRIGADO