Western Cape Government

Transport and Public Works

Waste on Rail Concept Study

Final Report

February 2023

Table of Contents

TABLE OF FIGURES

LIST OF TABLES

Acronyms and Abbreviations

COCT	City of Cape Town
DEA&DP	Department of Environmental Affairs and Development Planning
DLG	Department of Local Government
DM	District Municipality
GDP	Gross Domestic Product
GFB	General Freight Business
IWMP	Integrated Waste Management Plan
LM	Local Municipality
MSW	Municipal Solid Waste
SMME	Small, medium, and micro enterprises
WC	Western Cape

1 Background

1.1 Introduction

The Western Cape Freight Strategy includes a Strategic Action 3A-5 on supporting the development of more waste-on-rail projects in the Western Cape, in partnership with DEA&DP, local municipalities, Transnet and the private sector.

The strategic action was identified under the broad Modal Rebalancing Strategic Focus Area, which aims to ensure that the transportation of freight is done using the most suitable transport modes to optimise costs. The costs include the direct costs of transportation and indirect costs such as externalities. Although the rebalancing of freight movement encompasses all transport modes, the most urgent need is to address the balance between road and rail, considering the significantly large volumes of freight being transported on road, even where such freight is suitable for transportation by rail.

Solid municipal waste is one of the types of freight that could potentially be transported by rail. However, at present, all waste in the Western Cape is transported by road. This approach is becoming more expensive as the distances to landfill sites are increasing, coupled with the recent fuel price increases. Distances to landfill sites have increased as a result of a policy position in favour of larger regional landfills as opposed to multiple, smaller landfills in each local authority.

1.2 Purpose of the study

The purpose of this study is to determine the potential for the transportation of waste on rail in the Western Cape and develop the framework within which this can be done. In section 1.1, the current state of waste transportation in the Western Cape, as well as the associated issues, were explored. The issues can be addressed by two objectives, as illustrated in Figure 1-1. Furthermore, the identified objectives lead to the transport and non-transport solutions.

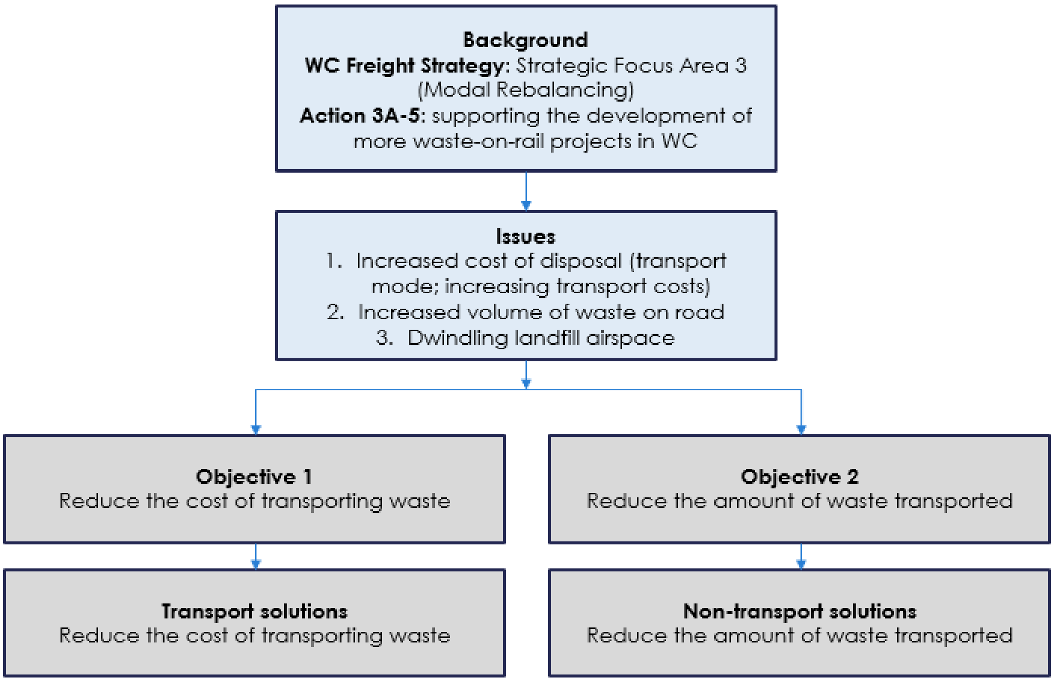

Figure 1-1: Project background, issues, and objectives

The main focus of this study is to examine the potential of waste-on-rail as a transport solution. Although the study is not aimed at non-transport solutions, the importance and intertwined relationship of the two solutions cannot be ignored. This was particularly evident from the various stakeholder engagements undertaken during the preparation of this report. Therefore, the report also provides a brief overview of some of the initiatives that authorities are undertaking to reduce the amount of waste that needs to be transported.

1.3 Study type and limitations

The waste-on-rail study was conducted at a conceptual level of accuracy. It involved a qualitative assessment of the potential for rail transport of waste in the Western Cape. Where necessary, only a high-level quantitative assessment was conducted, including the review of data from the local and district municipalities' Integrated Waste Management Plans (IWMP), Western Cape Freight Demand Model (WCFDM™) data and road/rail transport costs. It is intended that the concept study will assist in making preliminary decisions that will be refined in more detailed future feasibility studies.

This report aims to encourage municipalities to consider waste-on-rail as part of their transport solutions from the conceptual and planning phase. Therefore, the study considers the potential, complexities, advantages, disadvantages, and other pertinent waste-on-rail issues, as discussed in the report.

The study limitations are as discussed below:

1. **Planned regional landfill facilities**: The analysis excluded planned regional facilities such as Worcester and Mossel Bay since they are still conceptual, not operational. The exclusion of planned regional landfills from the analysis does not suggest a lack of waste-on-rail potential but rather, it reflects the long-term nature of operationalising landfill facilities, where assumptions are likely to change. For planning of regional landfill facilities, municipalities are strongly encouraged to consider waste-on-rail as part of their transport solutions.

2. **Availability of rail services**: As a result of illegal encroachment and occupation on the rail reserve and on the tracks, parts of the rail network were suspended indefinitely. Therefore, opportunities that are dependent on this network were not considered in this study.

3. **Transportation costs**: The study compared annual direct transportation costs resulting from factors such as fuel, maintenance, and operating costs as well as the cost of externalities. A full cost benefit analysis, however, is beyond the scope of this concept study and would only be required as part of a feasibility study, should there be sufficient interest and reason to pursue it.

1.4 Study methodology

An overview of the steps that were followed in the concept study is shown in Figure 1-2. A detailed discussion of the steps outlined is provided in the chapters that follow.

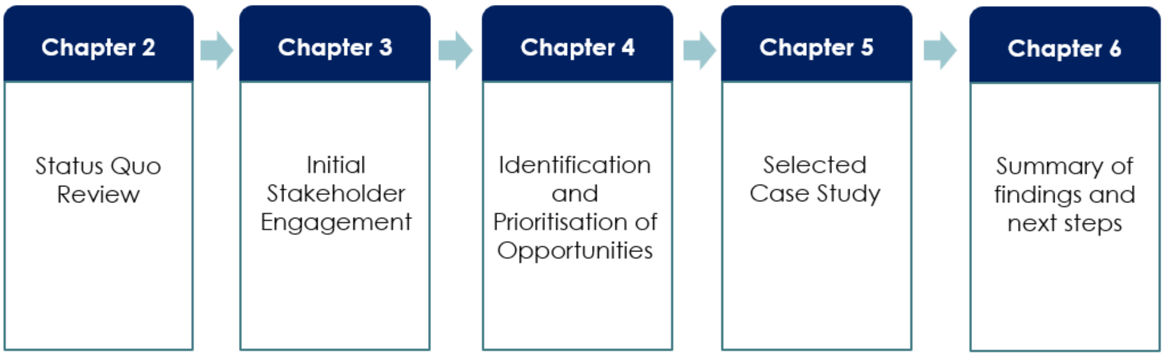

Figure 1-2: Waste on rail study steps

2 Status Quo Assessment

2.1 Introduction

As an industry, waste management is becoming increasingly important, as it not only protects the environment, but also plays an important role in the economy (Parker, 2021). South Africa's local waste economy is estimated to contribute approximately R24.3 billion to the Gross Domestic Product (GDP), creating 36 000 formal jobs and 80 000 informal jobs (GreenCape, 2020).

South Africa is moving towards regional landfills; a model of fewer landfills as opposed to the current local and smaller landfills, as reflected in the second generation of the Western Cape IWMP (DEA&DP, 2017). A shift towards fewer landfills is intended to reduce the environmental impact and cost associated with landfills, thereby contributing to more effective management of landfills.

2.2 Waste volumes

The Western Cape produced 2.7 million tonnes of waste in 2020, of which a significant portion was generated by the City of Cape Town due to its large population (DEA&DP, 2022). Figure 2-1 illustrates the correlation between waste generation and population for the regions of the Western Cape.

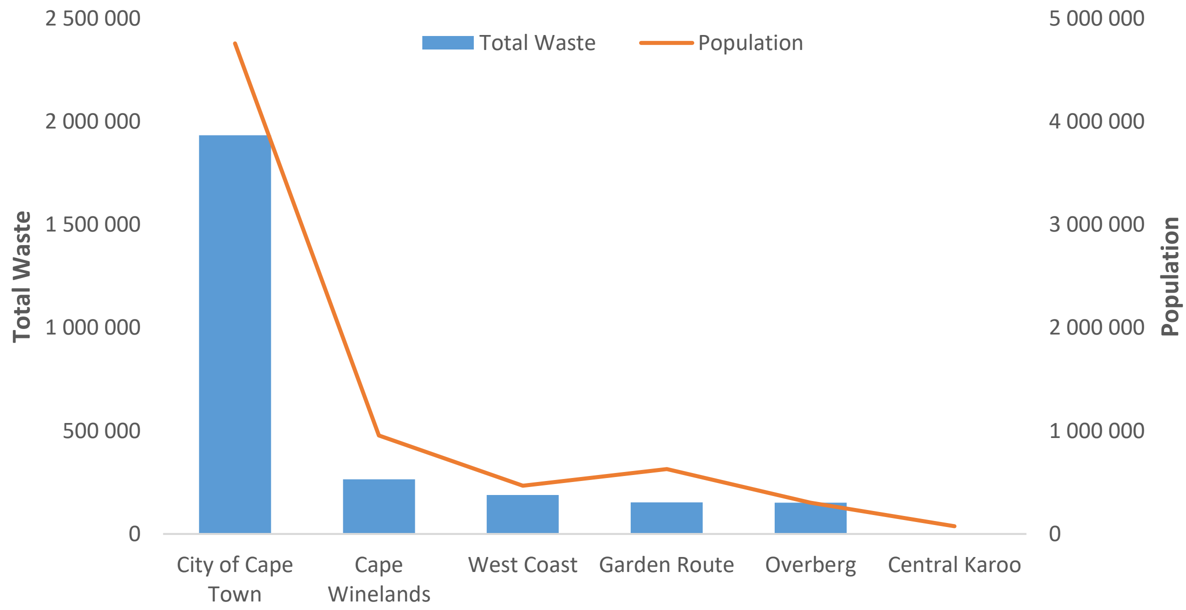

Figure 2-1: Relationship between waste generation and population in the Western Cape (DEA&DP, 2022); (Western Cape Government, 2021)

CoCT produces 72% of all waste produced in the Western Cape. Population density and commercial and industrial activities in Cape Town contribute to the high amount of waste produced.

2.3 Waste characterisation

There are several types of waste, including municipal solid waste (MSW), organic waste, construction and demolition waste, commercial and industrial waste, and other waste such as wet sewerage and e-waste. It is important to note that each group contains different materials. The following main groups are of concern for this study:

i. Municipal Solid Waste (MSW): non-recyclables, metals, paper, plastics, and glass.

ii. Commercial and industrial waste: waste from industrial and manufacturing sectors

iii. Construction and demolition waste: rubble material from building site and other construction activities

iv. Organics: agricultural residue, abattoir, food waste, and forestry residues.

v. Other: wet sewerage, e-waste, and tyres.

Figure 2-2 indicates the relative amount of waste generated in the Western Cape in 2020. MSW is the largest contributor to waste production, making up 60% of the total waste produced. The next biggest category is commercial and industrial waste, followed by construction waste and organic waste, respectively.

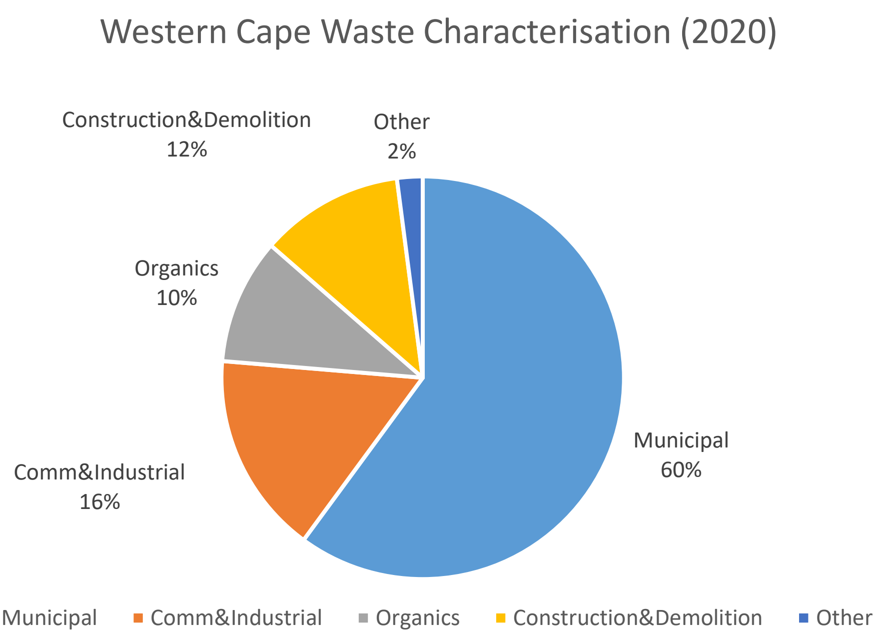

Figure 2-2: Characterisation of waste in the Western Cape (DEA&DP, 2022)

2.4 Current practices in waste transport

Not all waste is disposed of directly at a landfill site. Waste is typically transported to a drop-off site, material recovery station, or a transfer station, where it is consolidated before being transported to landfills. The process described above is shown in Figure 2-3. Waste compaction is a prerequisite for efficient transportation of waste. In most cases, waste is compacted at a transfer station (Parkinson, Fyvie, & Olivier, 2017), which typically operates as follows:

i. Waste is transported to the site by refuse collection vehicles.

ii. Waste is offloaded either directly into a compactor or close to the compactor and then pushed into the compactor.

iii. Waste is compacted directly into compactor bins.

iv. Full bins are moved to the loading area; and

v. Bins are loaded onto a truck or rail carriage for transport to a landfill site.

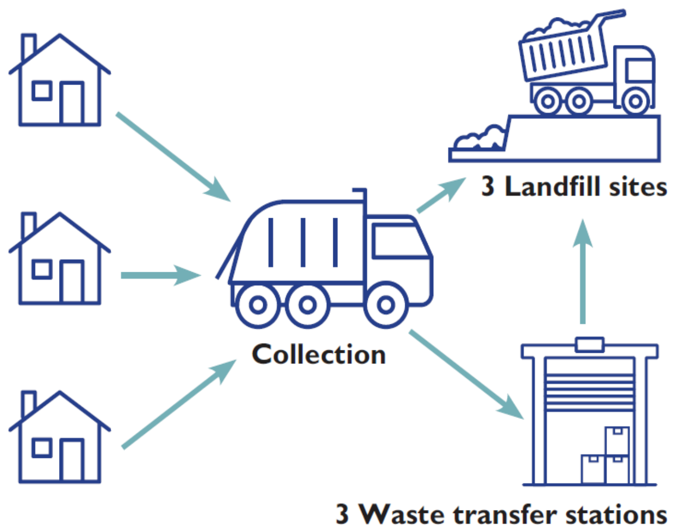

Figure 2-3: Waste collection and transfer process (Western Cape Government, 2022)

For this study, the focus will be on the transportation of consolidated waste to landfill sites rather than first-mile waste collection.

2.4.1 Advantages and disadvantages of road transport

The advantages and disadvantages of road and rail transportation of waste are discussed in Table 2-1.

Table 2-1: Advantages and disadvantages of road transport ((Parkinson, Fyvie, & Olivier, 2017)

Advantages	Disadvantages
Infrastructure requirement is a transfer station.	Increases the number of trucks on the road
Container turnaround times are faster, requiring fewer containers	Increased carbon emissions
Additional trucks can be hired/sourced during peak periods	
As waste is transported more frequently, nuisance odours and flies will be reduced	
Tendering may result in competitive pricing since several waste management companies offer waste transportation services	
Routes and schedules can be easily adjusted to accommodate seasonal changes	

2.4.2 Advantages and disadvantages of rail transport

The advantages and disadvantages of road and rail transportation of waste are discussed in Table 2-2.

Table 2-2: Advantages and disadvantages of rail transport ((Parkinson, Fyvie, & Olivier, 2017)

Advantages	Disadvantages
Will not increase road traffic	A significant capital investment is needed, including new sidings, cranes for loading and offloading, and dedicated vehicles to transport waste to the landfill.
Low carbon emissions compared to road	Longer turnaround times require more containers
Expanding rail transport to other localities can be easily achieved	Weekly waste collection, typically once or twice a week. Odours and flies may result from waste accumulation at transfer stations
	Route flexibility is limited by rail and disruptions are common

2.5 Modal split

General Freight Business (GFB) is defined as the competitive market space and consists of the total freight tonnes less coal, iron ore, and manganese exports, pipelines and stone and aggregate (Western Cape Government, 2022). The rail modal share for GFB is significantly less than the road modal share. This is evident across all sectors, as seen in Figure 2-4. However, while the rail modal share is extremely low in all sectors, it is currently non-existent for waste, where 100% of Western Cape waste (2.7 million tonnes) is moved by road.

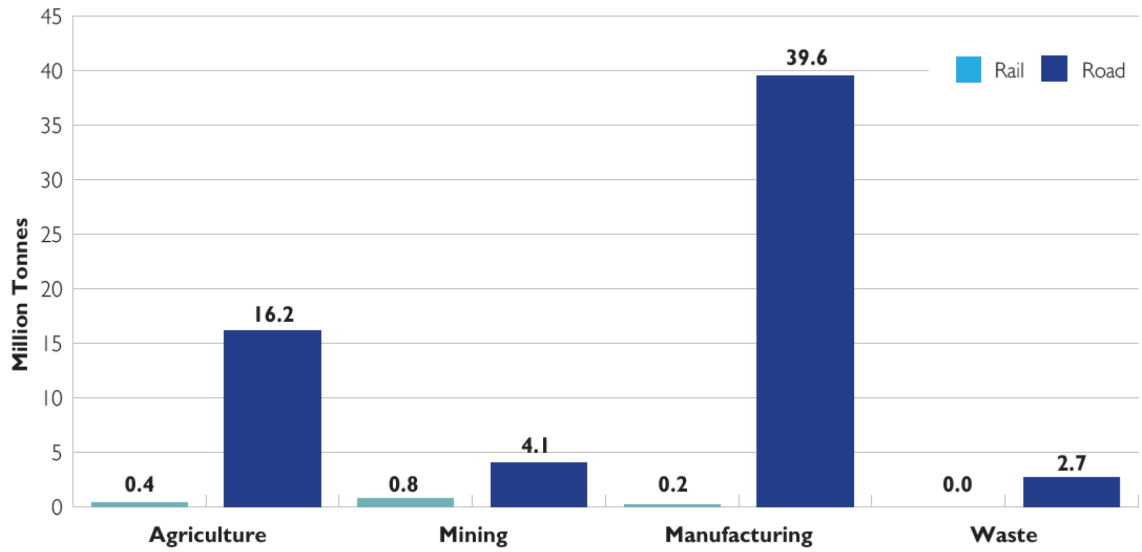

Figure 2-4: Modal split by sector in the Western Cape based on 2021 data (Western Cape Government, 2022)

It is noteworthy that waste is currently moved over very short distances, with an average distance of only 30km. This makes waste-on-rail a special case as rail is generally suitable for transporting large volumes over long distances.

2.6 Transportation costs

Figure 2-5 shows the direct transportation cost rates for general freight on rail and road, per distance category for 2021. The cost comparison reflects direct costs (such as fuel, operating costs, maintenance cost etc) but does not include external costs which require vastly more complex calculations (such as accidents, congestion, noise pollution etc). It is evident that the longer the distance, the lower the rates become. Rail transport costs for general freight reduces at a higher proportion in comparison to road-based transport cost of general freight as the transport distance increases.

It is worthwhile to note that road-based transport is a cheaper option for short distances of less than 50km. For longer distances, rail becomes more competitive compared to road.

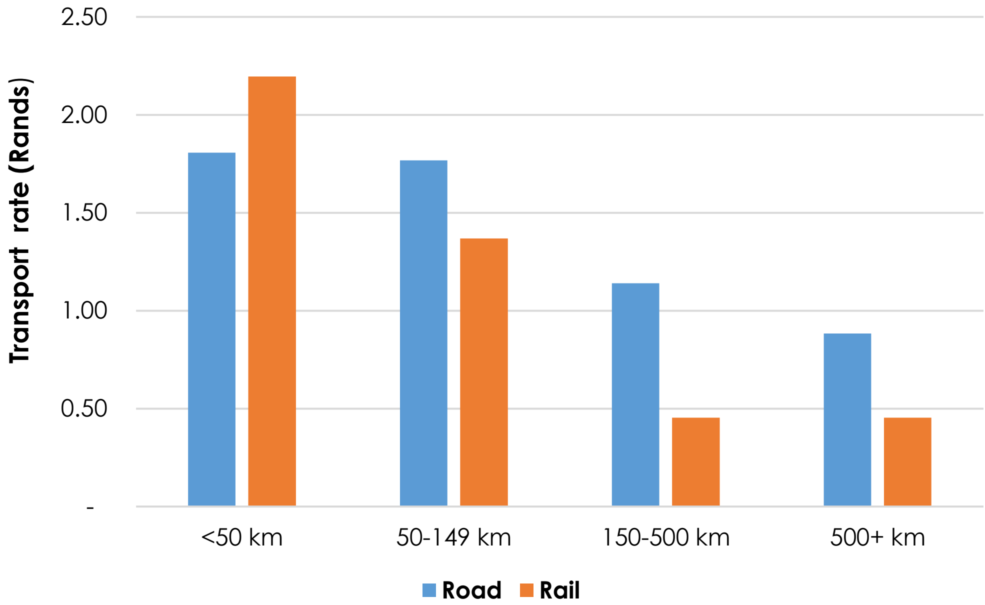

Figure 2-5: Transport costs in R/tonne-km for general freight per mode and distance category for 2021 (analysis on the 2021 Western Cape Freight Demand Model)

The movements of waste are currently generally in the distance category of less than 50km, and thus incurs the higher transport rates under either mode. However, the road rates in Figure 2-5, are indicative of average general freight, which is charged in only one direction, and usually is paired with other freight movements in the return direction. This is often not the case for waste, where dedicated waste vehicles travel to a waste land fill site fully loaded and return empty. The returning empty trucks means the transport costs of moving waste is often charged significantly higher, sometimes even twice as much as the rate for general freight. This is because the cost for empty the return trip is included in the rate.

Unless significantly compacted, the payload of waste on a truck is also often lower than the payload of other general freight. Therefore, the same tonnage of lower density waste, will cost more to be moved than other higher density freight of the same tonnage. Overall, this means that the transport charge for moving waste by road, can even be more expensive, and in the range of R2 to R5 per tonne-km, as opposed to R1.89 for short distance haulage of general freight.

2.7 Status of existing waste on rail projects

2.7.1 CoCT: Athlone to Vissershoek

The Athlone-Vissershoek rail link was one of the flagship waste transportation projects in South Africa. The rail sidings started at the Athlone transfer station, linking to the core network, and ended at the sidings at Vissershoek regional landfill site, covering a total distance of 21km. It is interesting to note that most of the City of Cape Town's major waste facilities have access to the rail network, as can be seen in Figure 2-6.

Prior to the suspension of the line due to informal settlements at Dunoon within the rail reserve and on the track, CoCT transported 1080 tonnes (equivalent to 60 containers) of waste per day from the Athlone to the Vissershoek landfill site. There are ongoing efforts by City of Cape Town and Transnet to resolve the encroachment issues at Dunoon. However, at present or for the foreseeable future, the Vissershoek-Athlone railway line is not operational, and the resumption of rail services is unlikely.

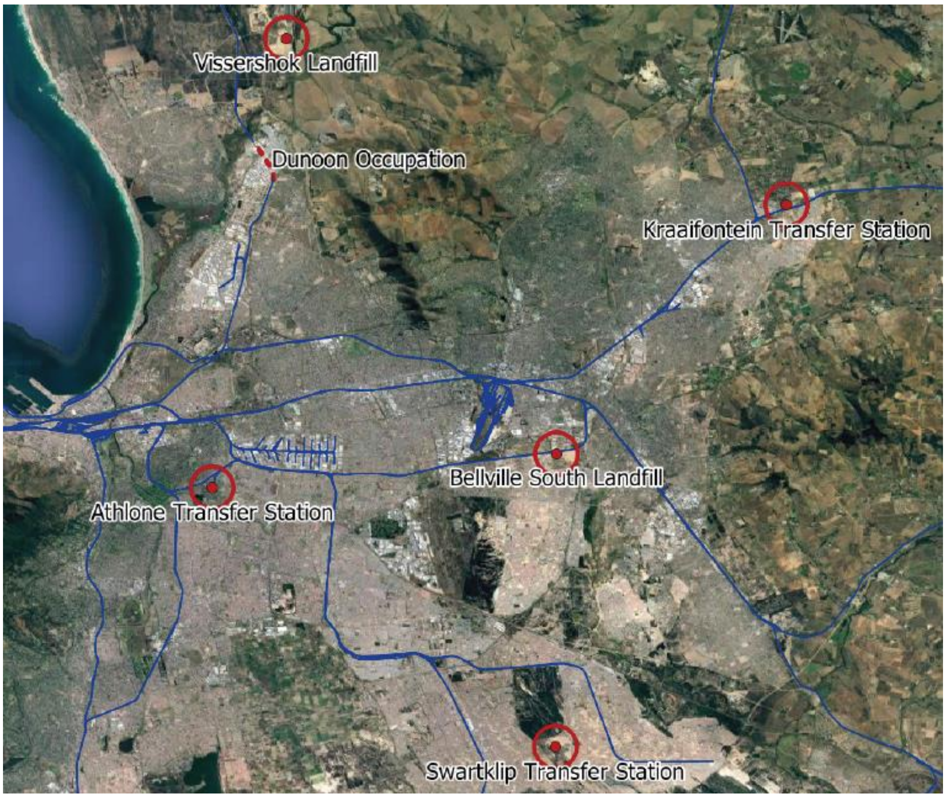

Figure 2-6: City of Cape town waste locations and rail network

2.7.2 Mossel Bay

A waste-on-rail project was considered in Mossel Bay in 2017. Garden Route District Municipality was actively engaged in the development of a regional landfill site for municipal waste adjacent to PetroSA (Parkinson, Fyvie, & Olivier, 2017). Given that the rail line between Mossel Bay and Worcester runs adjacent to this site, the site was suitable for a waste-on-rail solution. It was reported that Transnet was considering collaboration with all the municipalities in the region to introduce a solution of moving the solid waste by rail to the landfill site, which could result in cost savings for the municipalities and address the challenges from the shortage of landfill space. It is understood that the current PetroSA landfill site will be decommissioned in March 2023. Furthermore, the approval and legislative process of a new landfill facility adjacent to the current one is ongoing.

3 Insights from stakeholder engagement

3.1 Introduction

A stakeholder engagement process was conducted between the 26th of September and the 4th of November 2022. At the onset of the stakeholder engagement process, Transnet was consulted to discuss the potential waste-on-rail opportunities as well as assess Transnet's appetite and capacity for rolling out these potential projects. With respect to the current rail landscape, specifically the new rail policy and third-party or private operators on branch lines in the Western Cape, Transnet is amenable to private operators running the waste-on-rail service, which would include infrastructure upgrades and any other identified opportunities.

Figure 3-1 and Figure 3-2 indicate the local and district municipalities approached and consulted, respectively. A vast majority of the stakeholders were consulted, but there were a few instances where no responses to meeting requests were received. For all engagements, the discussion points were based on Figure 1-1, which provides the project background, issues, and objectives.

The contact list of all stakeholders consulted is provided in Appendix A.

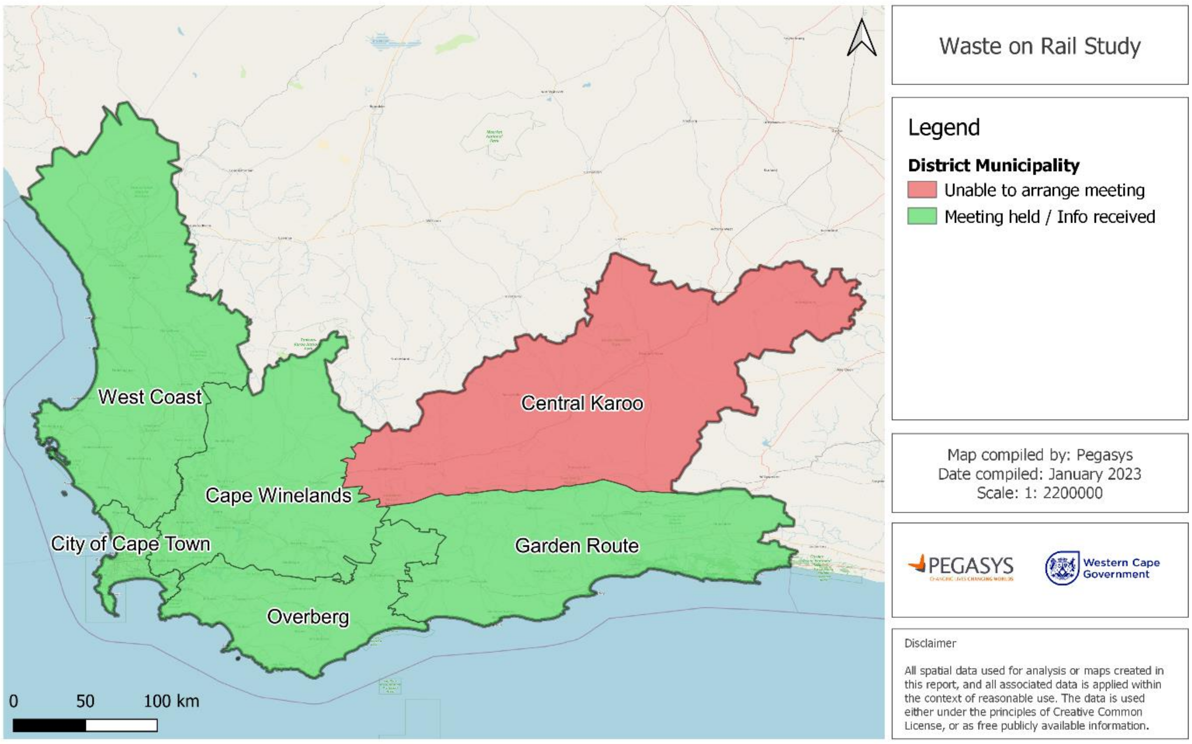

Figure 3-1: Schedule of district municipality stakeholder consultations

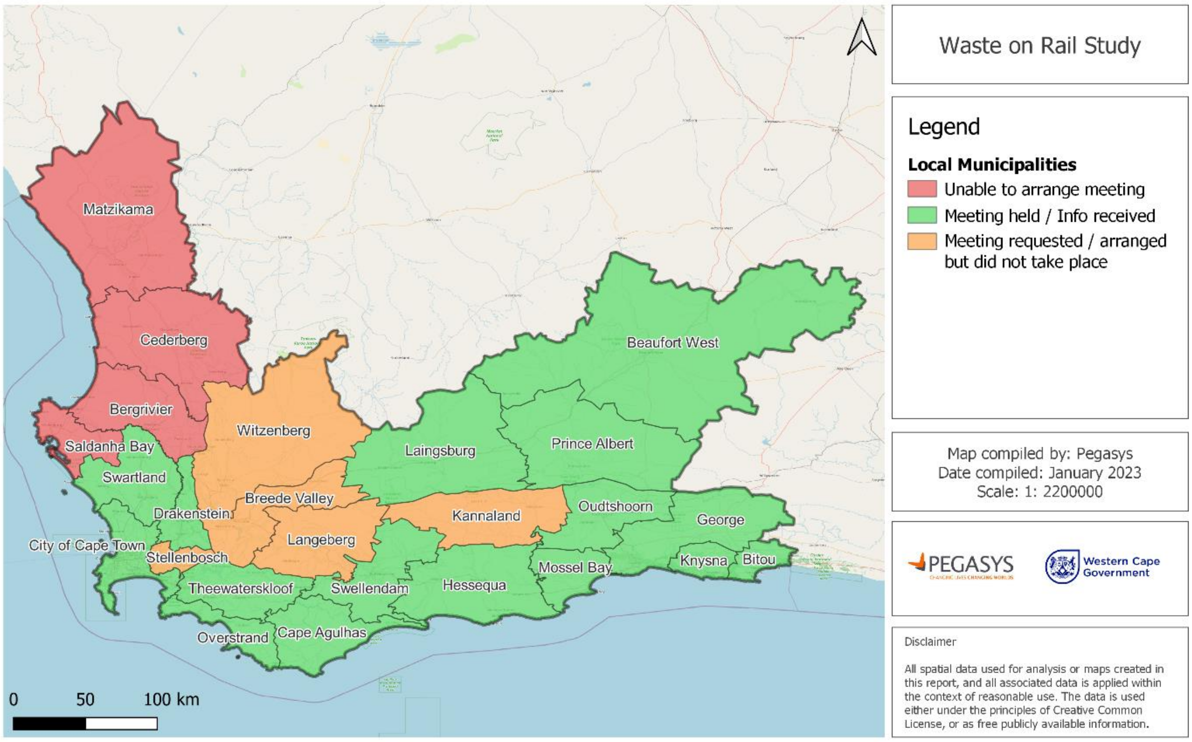

Figure 3-2: Schedule of local municipality stakeholder consultations

3.2 Feedback on objective 1

The main inputs and insights provided focussed on the need to reduce the cost of transporting waste as discussed below.

i. Transport/haulage costs are high. It is estimated that transportation and haulage costs account for approximately 70 % of waste management budgets.

ii. The recent fuel price increases have resulted in haulage contracts being increased, in some cases by up to 15 %.

iii. Although all modes of transport are considered when identifying a landfill site, rail is generally not considered due to the wider prevailing rail issues in South Africa. While the CoCT has transfer stations and landfill sites adjacent to the freight rail network, there are no concrete plans to construct sidings and other infrastructure to support waste on rail initiatives.

iv. Generally, rail is not considered a viable alternative due to the risk of service disruptions, resulting in delays and increased costs associated with finding alternate transportation options. Furthermore, delays can result in environmental concerns if waste remains at transfer facilities for a prolonged period. It is important to note that the acceptable time period during which waste can remain at a transfer station will vary depending on the type of waste, e.g., building rubble will not pose an environmental risk for any period of time, while food waste will cause environmental issues after a few days. Examples of disrupted rail lines include the lines to Garden Route and Vissershoek, respectively.

v. There is a need for focused liaison and workshop facilitation on regional strategies to improve transport to landfill sites. As an example of such focused workshops, a recent site visit at Karwyderskraal was followed by roundtable discussions on action items and feasibility studies.

vi. The result is that infrastructure costs for both direct and hybrid systems are unknown and therefore not considered. A cost-sharing model that incorporates investments in rail transport infrastructure and road haulage from stations could be explored to provide for data-driven decision-making.

3.3 Feedback on objective 2

A summary of the main inputs and insights concerning the reduction of waste transported is presented below.

i. All stakeholders have concerns or issues in waste management. Through the engagement process, stakeholders requested additional assistance from DEA&DP on permit monitoring, funding applications, information sharing on initiatives, and collaboration efforts (even across municipal and district boundaries).

ii. Resources and coordination support are needed for funding applications (to decommission landfill sites, address waste reduction at the source, integrate with regional landfill facilities, conduct specialist studies, etc.).

iii. Budget constraints, difficulty in identifying suitable locations for new landfills, and long permit approval times are hindering the discussion around waste-on-rail initiatives.

iv. Workshops focused on reducing waste at source, procuring professional services, submitting funding applications, and obtaining permits can help to capacitate local authorities.

v. Smaller local municipalities generally have insufficient waste volumes for recycling or waste-to-energy initiatives to be feasible and/or viable. In addition, budgets are not sufficient to explore such initiatives. It was suggested that regional or combined efforts be explored.

3.4 Summary of stakeholder consultation insights

A summary of the waste-on-rail opportunities that were identified by stakeholders is presented below:

I. Overberg DM is amenable to exploring the possibility of a hybrid rail transport model between Botriver and the existing Karwyderskraal landfill.

II. The West Coast, Cape Winelands and the Garden Route would consider exploring hybrid scenarios for landfill sites outside of Klawer, Worcester and Mossel Bay, respectively.

III. As the Central Karoo does not have a regional landfill, local municipalities are responsible for managing waste at local landfill sites. Therefore, local municipalities in Central Karoo are not considering using rail, particularly considering their limited volumes and budgetary constraints.

A summary of the current transport mode, landfill sites, and nature of the contract for the local municipalities consulted is provided in Table 8-2 (Appendix A); whilst Table 8-3 (Appendix A) provides a summary of stakeholder responses concerning the non-transport initiatives in the Western Cape.

4 Identification and Prioritisation of Opportunities

4.1 Introduction

The purpose of this step in the project was to identify potential opportunities for waste on rail solutions. As a first step, the operational and planned regional landfill facilities were mapped, in line with the national policy direction towards regional landfills as opposed to the current local and smaller landfills model (DEA&DP, 2017). Following which, the freight rail network, and associated stations/hubs were mapped. This was followed by an assessment of local authorities that could utilise the selected facilities before investigating the potential operational model. The process described above is illustrated in Figure 4-1.

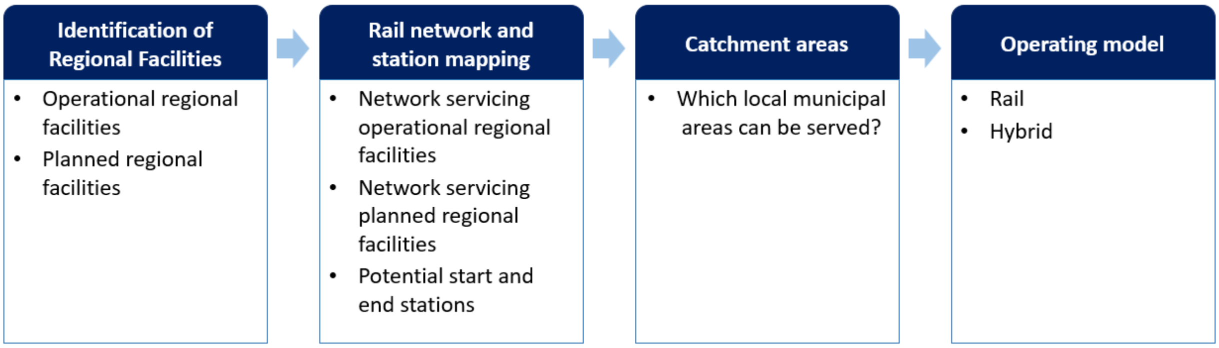

Figure 4-1: Process of identifying and prioritising waste on rail opportunities

4.2 Identification of regional landfill sites

The operational and planned landfill sites in the Western Cape are shown in Table 4-1 and Figure 4-2. At present, there are two regional landfill facilities that are operational, namely Karwyderskraal in the Overberg region and PetroSA in the Garden Route region.

As this concept study is aimed at identifying waste-on-rail opportunities, a similar process outlined in the following sections can be followed once the planned regional landfill sites become operational. The fact that planned regional landfill sites were not considered in this prioritisation process does not suggest a lack of waste-on-rail potential. Rather, it points to the long-term nature of operationalising landfill facilities. In the planning and construction period, assumptions may have already changed, hence it was decided that only operational facilities be considered.

Table 4-1: Landfill sites in the Western Cape

Region	Landfill Facility	Status
CoCT	*Vissershoek	Vissershoek is a municipal landfill facility. No regional landfill facility in the Cape Metro
Garden Route	Mossel Bay	Planned – Approvals and legislative process underway
Garden Route	PetroSA	Operational – Anticipated decommissioning in March 2023
Cape Winelands	Worcester	Planned – Approvals and legislative process underway
West Coast	Vredendal	Planned – Approvals and legislative process underway
Overberg	Karwyderskraal	Operational
Central Karoo	None	N/A

Although Vissershoek is a municipal landfill facility in the Cape Metro, it was included on the list due absence of a regional landfill facility in the Cape Metro. Furthermore, the waste volumes disposed at Vissershoek are comparable to the waste volumes at other regional landfill facilities.

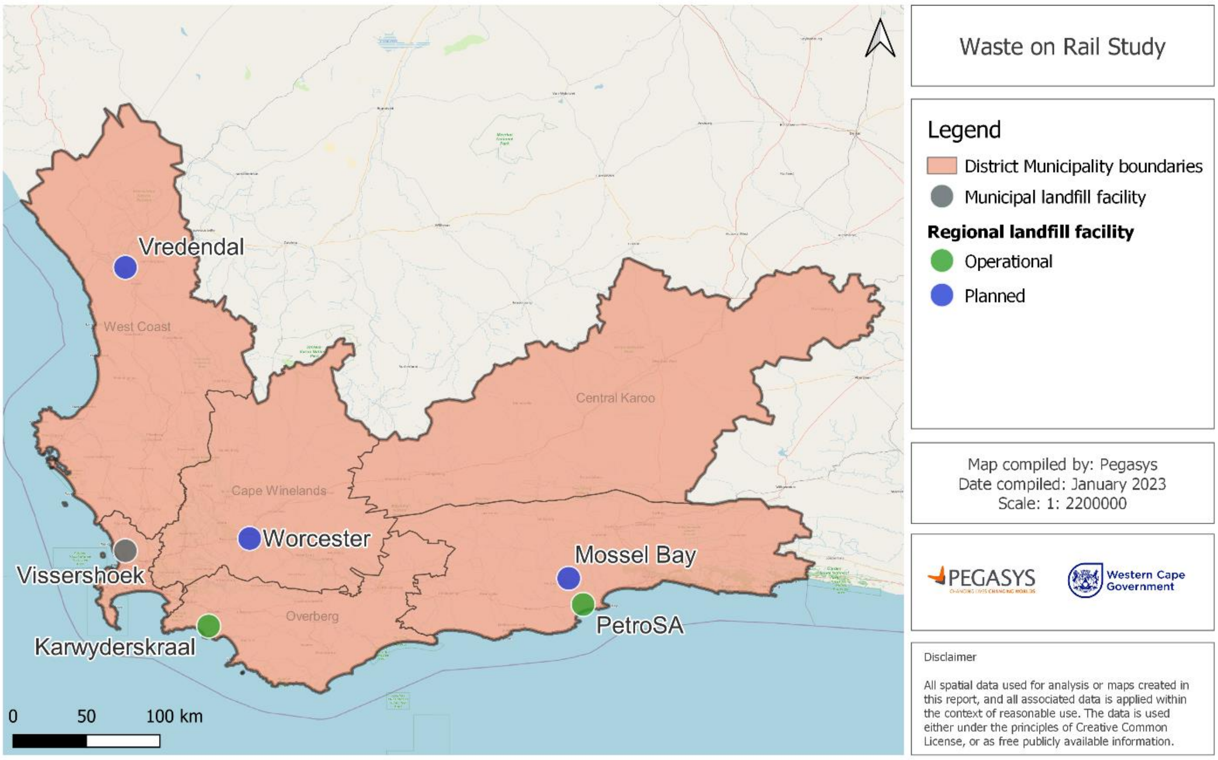

Figure 4-2: Landfill sites in the Western Cape

4.3 Core freight rail network and station mapping

The existing freight rail network in the Western Cape is shown in Figure 4-3. The regional landfill facilities identified in Table 4-1 were overlaid on top of the existing freight rail network.

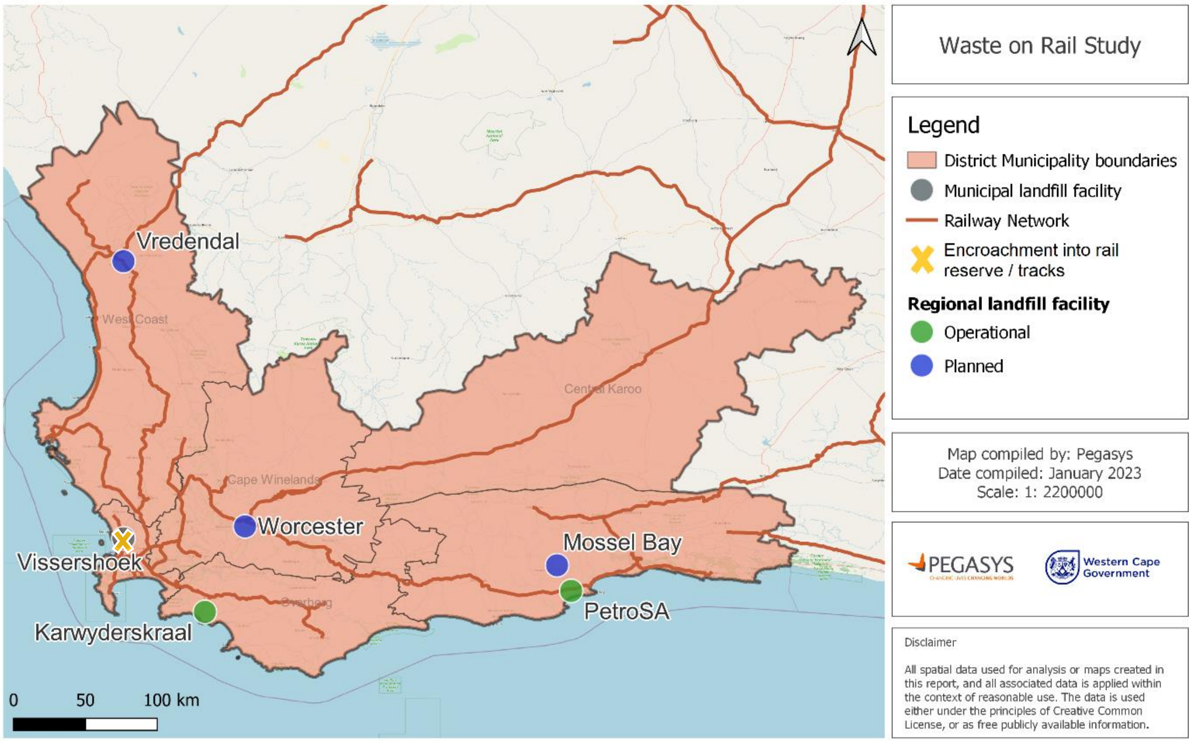

Figure 4-3: WC freight rail network and location of regional landfill facilities

It is evident that most planned and operational regional landfill sites are in fair proximity to the core freight rail network. The report previously mentioned that planned regional facilities such as Worcester and Mossel Bay were excluded from further analysis since these sites are not yet operational, rather than lack of potential for waste-on-rail.

The cases for Vissershoek, Karwyderskraal and PetroSA are discussed below.

4.3.1 Vissershoek

As discussed in Section 2.7.1, the Athlone-Vissershoek rail solution was one of the flagship waste transportation projects in South Africa. The rail sidings started at the Athlone transfer station, linking to the core network, and ended at the sidings at Vissershoek regional landfill site.

Due to the encroachment of informal settlements onto the rail reserve in the Dunoon area, the rail services were suspended in March 2018. It is understood that there are ongoing efforts by City of Cape Town and Transnet to resolve the housing issue at Dunoon to allow resumption of the train services. However, such processes often take several years to be resolved.

At present or for the foreseeable future, the Vissershoek-Athlone railway line will not be operational or considered viable for the resumption of rail services. For this reason, no waste-on-rail opportunities for Vissershoek will be explored further in this study.

4.3.2 PetroSA

Previous efforts in establishing waste-to-rail solutions at PetroSA were discussed in Section 2.7.2. PetroSA landfill facility is adjacent to the rail network as shown in Figure 4-3. However, the current PetroSA landfill facility is scheduled for decommissioning in March 2023. The planning for a new regional facility, on a land parcel adjoining the current PetroSA, is underway.

Due to the planned decommissioning of the current PetroSA regional facility, no waste-on-rail opportunities for this facility will be explored further in this study.

4.3.3 Karwyderskraal

Karwyderskraal regional landfill site is approximately 22 km from the freight railway network. The rail line passes through Strand and Caledon, before branching off to Protem and Bredasdorp stations. Botriver station can be viewed as a potential waste on rail hub in the region. Figure 4-4 shows the current state of infrastructure at the Botriver station. It is evident that the station requires significant rehabilitation for any potential waste-on-rail functionality.

Figure 4-4: Current conditions of the infrastructure Botriver rail station

4.4 Catchment areas

The reasons for excluding Vissershoek and PetroSA from further analysis are discussed in section 4.3.1 and 4.3.2. The Vissershoek-Athlone rail link is not operational due to the encroachment into the rail reserve at Dunoon, whilst PetroSA is scheduled for decommissioning in March 2023. As a result, both facilities will not be explored further in the analysis. Therefore, only Karwyderskraal will be considered in this study.

4.4.1 Karwyderskraal catchment area

At present, only Theewaterskloof LM and Overstrand LM make use of the Karwyderskraal regional landfill site for waste disposal. There are opportunities for Cape Agulhas, Swellendam and, CoCT to use Karwyderskraal for waste disposal, as discussed below:

1. Although Cape Agulhas and Swellendam are part of the Overberg DM, the two municipalities are currently not using the regional landfill site for waste disposal. Some of the reasons include the long distances to the landfill site. Karwyderskraal may be a consideration for Cape Agulhas and Swellendam as the local landfill sites are running out of airspace in their respective municipalities.

2. City of Cape Town is outside the Overberg DM. However, the Helderberg region of the metro borders the Overberg DM and waste from this area can potentially be disposed at Karwyderskraal landfill facility.

4.5 Operating model

Figure 4-5 shows the three models of waste transportation, namely road, rail, and hybrid haulage. By far, road haulage is the most common operating model in South Africa. The most notable rail haulage model in the Western Cape was the Athlone transfer station to Vissershoek landfill facility, which is non-operational for the foreseeable future as noted in Section 4.3.1. Hybrid haulage models offers advantages of both road and rail haulage (as discussed in Section 2.4.1 and 2.4.2) but also involve two or more mode transfers.

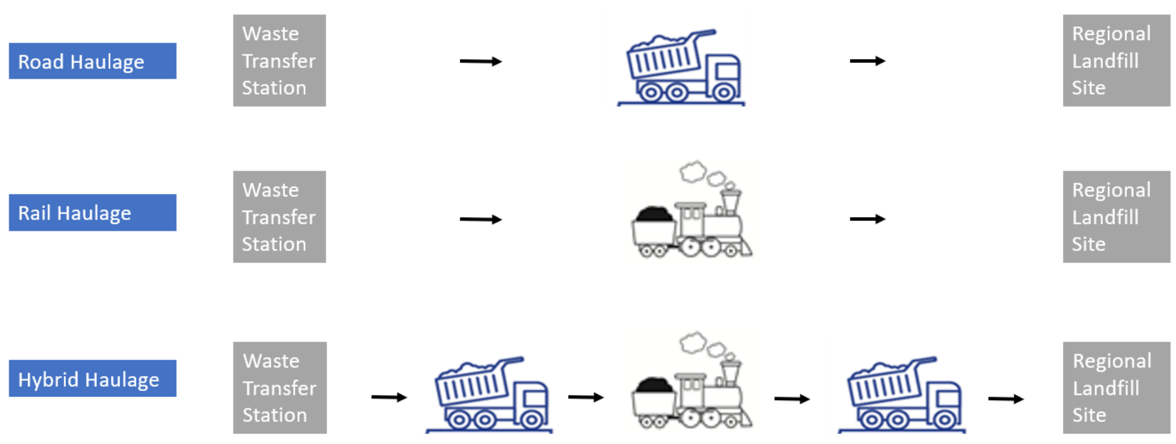

Figure 4-5: Operating models for waste transportation

5 Selected Case Study: Karwyderskraal Transport Options

5.1 Introduction

In Chapter 4, it was stated that planned regional facilities such as Worcester and Mossel Bay will not be included in the analysis because these sites are not yet operational, rather than due to a lack of potential for waste-on-rail. Therefore, this section examines the options for transporting disposable waste to Karwyderskraal. As a point of departure, Karwyderskraal was selected for the following reasons:

i. The identification and prioritisation methodology outlined in Chapter 3 identified Karwyderskraal as an operational regional landfill site located close to the freight rail network, including related stations/hubs.

ii. A stakeholder engagement, organised by the Department of Local Government (DLG), was held on the 8th of November 2022 at the Karwyderskraal landfill site to explore waste-on-rail opportunities, waste-to-energy opportunities, and stakeholder cooperation. This session was attended by the political leadership in the Overberg DM, provincial departments, local authorities, and technical experts. The stakeholder engagement demonstrated the willingness in exploring the above-mentioned opportunities and therefore makes Karwyderskraal regional facility a suitable option for further investigation.

Figure 5-1: Karwyderskraal regional landfill site in the Overberg DM

5.2 Current road costs in the Overberg District Municipality

Overberg DM commissioned a report to determine the best transport option for Swellendam LM, including logistics for waste transport throughout all four local municipalities (Palm & Visser, 2020). The report examined waste tonnage and transport costs for the Overberg region in the twelve months prior to the Covid lockdown (Table 5-1). Table 5-1 shows that Swellendam and Cape Agulhas spent the most to transport a tonne of disposable waste, whilst Overstrand LM spends the least amount per tonne to transport waste. The average cost per tonne in the Overberg DM is R203.72.

Table 5-1: Summary of costs and disposed waste in Overberg District Municipality (Palm & Visser, 2020)

Region	Cost (Rand)	Disposed Waste (ton)	Rate (R/tonne)
Overstrand	R 7 686 211.00	47 402	R 162.15
Theewaterskloof	R 2 218 640.00	10 031	R 221.18
Swellendam	R 3 092 489.40	8 580	R 360.43
Cape Agulhas	R 3 091 457.72	12 961	R 238.52
Overberg DM	**R 16 088 798.12**	**78 974**	**R 203.72**

Overstrand and Theewaterskloof LMs currently use the regional landfill site at Karwyderskraal for waste disposal, whilst Cape Agulhas and Swellendam LMs are using landfills in their respective jurisdictions. The distances from the various transfer stations to the landfill facilities and the amount of waste from each transfer station is unknown. Therefore, the average rate per tonne-km for road could not be determined.

The indicative rates for road and rail transport were discussed in Section 2.6. Despite being based on general freight costs, the rates were deemed sufficient for this concept study. Therefore, the current road rates that were used in this study are shown in Table 5-2.

Table 5-2: Average road cost per tonne-km (Western Cape Government, 2022)

Length	Average cost per tonne-km
Less than 50 km	R 1.89
Between 50 km and 149 km	R 1.77
Between 150 km and 500 km	R 1.14
More than 500 km	R 0.88

5.3 Calculation of rail capacity and costs

On the Strand-Botriver section, Transnet operates a 20-wagon train, whereas a 10-wagon train runs on the Bredasdorp, Protem and Botriver section. An estimate of the total amount of tonnage that can be transported by train each day is provided in Table 5-3.

Table 5-3: Train capacity for Strand – Botriver and Bredasdorp – Protem – Botriver sections

Description	Strand – Botriver	Bredasdorp – Protem - Botriver
Number of wagons	20	10
Containers	40	20
Tonnes per container	15	15
Tonnes per day	**600**	**300**

The costs of transporting waste containers for the identified sections were sourced from Transnet. Table 5-4 provides a detailed calculation of the average cost per tonne for the rail mode.

Table 5-4: Calculation of rail average cost per tonne

Description	CoCT: Strand – Botriver	Cape Agulhas: Bredasdorp – Botriver	Swellendam: Protem – Botriver
6m empty container	R 1 483.00	R 1 483.00	R 1 483.00
6m heavy (13-22 ton) container	R 2 228.00	R 2 228.00	R 2 228.00
Total return cost for 15 tonnes of waste	R 3 711.00	R 3 711.00	R 3 711.00
Average cost per tonne	R 247.40	R 247.40	R 247.40
Return Distance	146	280	310
Average rail cost per tonne-km	R1.69	R 0.88	R 0.80

It is worthwhile to note that the average cost per tonne of transporting containers is the same (R247.40) for all three rail segments. However, because the rail segments are of different distances, it implies that the average costs per tonne-km for the three sections are also different. The average cost per tonne-km for rail ranges from R 0.80 for Swellendam LM and R1.69 for CoCT.

5.4 Karwyderskraal operating model

Overstrand and Theewaterskloof LMs currently use the regional landfill site at Karwyderskraal for waste disposal, whilst Cape Agulhas and Swellendam LMs are using landfills in their respective jurisdictions. As a result of their proximity to the regional landfill site, Overstrand and

Theewaterskloof are likely to continue using road haulage contracts for waste transportation, as depicted in Figure 5-2.

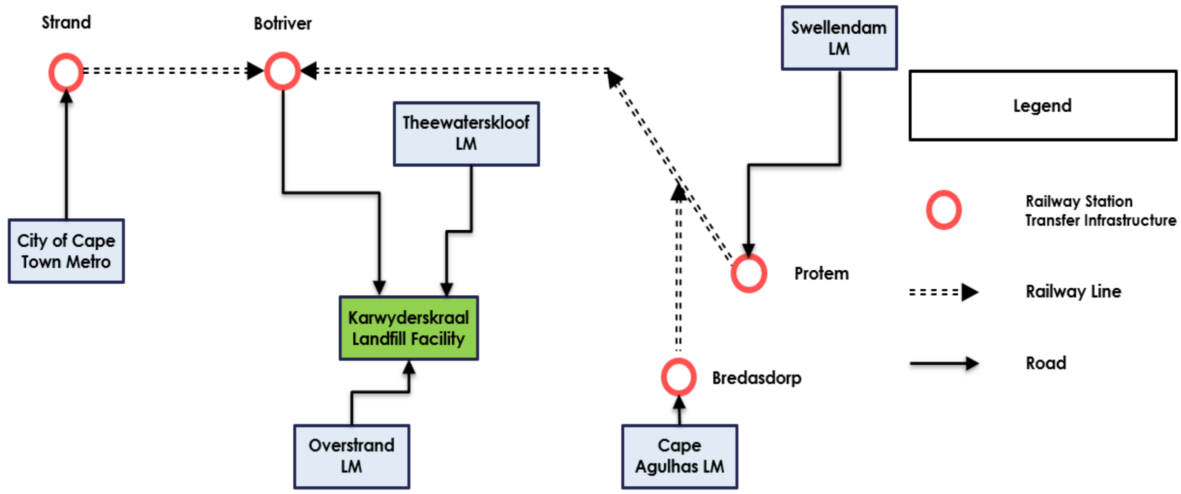

Figure 5-2: A potential transport model for the Karwyderskraal regional landfill facility

Due to the rapidly diminishing landfill airspace in Swellendam and Cape Agulhas, alternative landfill facilities, such as the Karwyderskraal regional landfill facility, are being explored. Therefore, the purpose of this case study is to provide a better understanding of alternative waste transportation options for Cape Agulhas, Swellendam, and the City of Cape Town (Helderberg region), as outlined in Section 4.3.3.

The following steps will be followed in order to determine the comparative costs of hybrid and road-based transport for the Karwyderskraal case study:

1. Calculation of route distances
2. Waste tonnage for Karwyderskraal
3. Determination of road-based transport costs for Karwyderskraal
4. Determination of rail-based transport costs for Karwyderskraal
5. Determination and comparison of total direct hybrid and road-based transport costs for Karwyderskraal case study.
6. Determination and comparison of total externality costs for the Karwyderskraal case study.
7. Determination and comparison of combined (direct and external) costs for the Karwyerskraal case study

5.4.1 Calculation of route distances

The one-way distance for both road and rail segments for the Karwyderskraal model are presented in Table 8-4 in Appendix A. The return distances for the road and hybrid transport options are calculated and presented in Table 5-5.

Table 5-5: Return distance for both road and hybrid transport options

Return Trip	Road transport	Road portion of the hybrid model	Rail portion of the hybrid model
CoCT – Karwyderskraal – CoCT	146	72	90
Cape Agulhas – Karwyderskraal – Cape Agulhas	280	124	250
Swellendam – Karwyderskraal – Swellendam	310	198	198

5.4.2 Waste tonnage for the Karwyderskraal model

It is estimated that Cape Agulhas and Swellendam dispose of 250 tonnes and 165 tonnes of waste per week, respectively (Palm & Visser, 2020). A weekly disposable tonnage of 600 tonnes per day has been assumed for the eastern part of Cape Town Metro, which equates to the maximum daily tonnage for Strand – Botriver rail section. Furthermore, it was assumed that waste would be transported five times per week, resulting in a weekly tonnage of 3 000 tonnes. A summary of the weekly and annual tonnages for Swellendam, Cape Agulhas and CoCT are presented in Table 5-6.

Table 5-6: Weekly and annual waste tonnages for Swellendam, Cape Agulhas and CoCT

Region	Weekly tonnage	Annual Waste (tonnes)
Swellendam	165	8 580
Cape Agulhas	250	13 000
Cape Town	3 000	156 000

5.4.3 Determination of direct costs for the Karwyderskraal model

This section details the calculation process used to determine the direct costs for the Karwyderskraal model. The total direct annual road and hybrid costs are determined in the sections below.

5.4.3.1 Direct road costs for the Karwyderskraal model

A detailed calculation of the direct road costs portion of the hybrid model is provided in Table 5-7.

Table 5-7: Calculation of the annual direct road costs of the hybrid model

Description	Swellendam	Cape Agulhas	CoCT
Return distance	198	124	72
Rate per tonne-km	1.14	1.77	1.77
Tonnage	8 580	13 000	156 000
Annual direct road costs	R 1 936 678	R 2 853 240	R 19 880 640

5.4.3.2 Direct rail costs for the Karwyderskraal model

Table 5-8 provides a breakdown of the costs associated with the rail portion of the hybrid model. The rates used in calculation were sourced from Transnet as discussed in Section 5.3.

Table 5-8: Calculation of the annual direct rail costs of the hybrid model

Description	Swellendam	Cape Agulhas	CoCT
Weekly waste	165	250	3 000
Number of 15-ton containers	11	17	200
Number of containers in a year	572	884	10 400
Cost per container	R3 711.00	R3 711.00	R3 711.00
Annual direct rail cost	R2 122 692	R3 280 524	R38 594 400

5.4.3.3 Total direct cost summary for the Karwyderskraal model

The direct road-only and hybrid total estimated costs for the Karwyderskraal case study are presented in Table 5-9 and Table 5-10. As expected, the highest transport cost is for CoCT due to the tonnage of waste disposed.

Table 5-9: Calculation of total direct road-only costs

Description	Swellendam	Cape Agulhas	CoCT
Return Distance	310	280	146
Rate per tonne-km	1.14	1.14	1.77
Waste tonnage	8 580	13 000	156 000
Annual direct road-only costs	R3 032 172	R 4 149 600	R 40 313 520

Table 5-10: Calculation of total direct hybrid costs

Component	Swellendam	Cape Agulhas	Cape Town
Road portion of hybrid model	R 1 936 678	R 2 853 240	R 19 880 640
Rail portion of hybrid model	R 2 122 692	R 3 280 524	R 38 594 400
Annual direct hybrid costs	R 4 059 370	R 6 133 764	R 58 475 040

Figure 5-3 shows a graphical representation of the road-only and hybrid costs for CoCT, Cape Agulhas and Swellendam local municipalities. From the annual road-only costs to the annual hybrid costs, increases of 45%, 48% and 34% for CoCT, Cape Agulhas and Swellendam, respectively. It is evident that the hybrid model of transporting waste is substantially expensive compared to the road-only that is currently in place in the Western Cape.

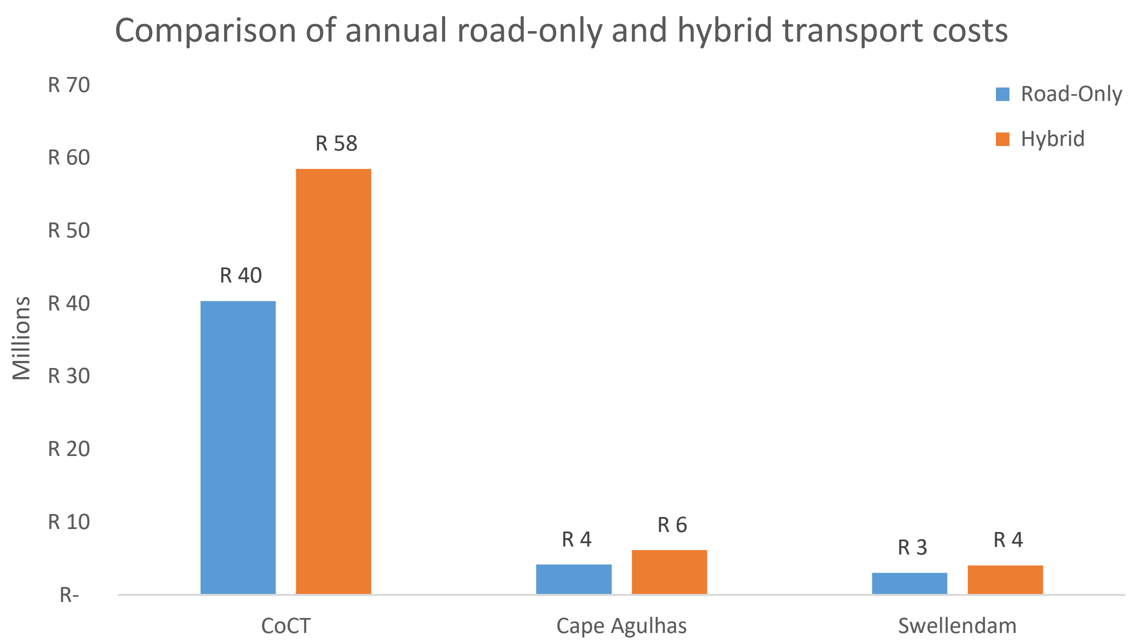

Figure 5-3: Comparison of annual road-only and hybrid transport costs

5.4.4 Determination of the externality costs for the Karwyderskraal model

The detailed cost comparison presented in Section 5.4.3 ignores the externality costs. To have a holistic view of transportation costs, externalities such as emissions, congestion, and noise must be considered. The 2017 national externality cost rates for the various components are shown in Table 8-5 in Appendix A. These are the most updated rates available and can be viewed as conservative cost estimates. The cost of externalities is expressed in cents per tonne-km and is applicable to both loaded and empty trains or trucks as the externality cost take expected load factors into account. The externalities explored in this study include:

i. **Accidents** – cost of damage to vehicles involved, cost of injuries and/or fatalities and burden to society.

ii. **Congestion** – the increase in travel time road users experience due to travel demand exceeding road capacity constraints.

iii. **Emissions** – the cost of CO_2 and other gases produced by burning fuel.

iv. **Landway** – cost associated with the expanded use of land by transport infrastructure, which could have been used for other economic activities.

v. **Noise** – based on willingness to pay to avoid the proximity of living near noisy road or rail infrastructure.

vi. **Policing** – cost based on the national estimated budget per person spent traffic police.

5.4.4.1 Hybrid externality costs for the Karwyderskraal model

Table 5-11, Table 5-12 and Table 5-13 provides the calculation of the hybrid externality costs for the Karwyderskraal model.

Table 5-11: Calculation of road externality costs for the hybrid model

Description	Swellendam	Cape Agulhas	CoCT
Distance	99	62	36
Waste tonnage	8 580	13 000	156 000
Tonne-km	849 420	806 000	5 616 000
Road externality cost (c/tonne-km)	23.11	23.11	23.11
Annual road externality costs	R196 301	R186 267	R1 297 858

Table 5-12: Calculation of rail externality costs for the hybrid model

Description	Swellendam	Cape Agulhas	CoCT
Distance	99	125	45
Waste tonnage	8 580	13 000	156 000
Tonne-km	849 420	1 625 000	7 020 000
Rail externality cost (c/tonne-km)	1.73	1.73	1.73
Annual rail externality costs	R14 695	R28 113	R121 446

Table 5-13: Calculation of the hybrid model externality costs

Component	Swellendam	Cape Agulhas	Cape Town
Road portion of hybrid model	R196 301	R186 267	R1 297 858
Rail portion of hybrid model	R14 695	R28 113	R121 446
Annual hybrid externality costs	R210 996	R214 379	R1 419 304

5.4.4.2 Road-only externality costs for the Karwyderskraal model

The calculation of the externality costs for the road-only model are presented in Table 5-14. It is clear that the road-only externality costs are significantly higher than externality costs for the hybrid model.

Table 5-14: Calculation of the road-only externality costs

Description	Swellendam	Cape Agulhas	CoCT
Return Distance	155	140	73
Waste tonnage	8 580	13 000	156 000
Tonne-km	1 329 900	1 820 000	11 388 000
Road externality cost (c/tonne-km)	23.11	23.11	23.11
Annual road-only externality costs	R307 340	R420 602	R2 631 767

5.5 Summary of findings

The Karwyderskraal case study explored the annual direct and externality costs for road-only and waste-on-rail hybrid solutions. Whilst the total direct road-only costs are lower than the total direct hybrid costs, the road-only externality costs are significantly higher compared to the hybrid model (Figure 5-4). Although there is a significant difference between the externality costs of the road-only and hybrid models, the externality costs remain to be a small percentage of the total costs, as illustrated in Figure 5-5.

This case study suggests that an increase in waste volumes transported by rail over longer distances will result in greater savings on the externality costs over a prolonged period of time. The decrease in externality costs demonstrates the environmental and societal benefits associated with waste-on-rail transport.

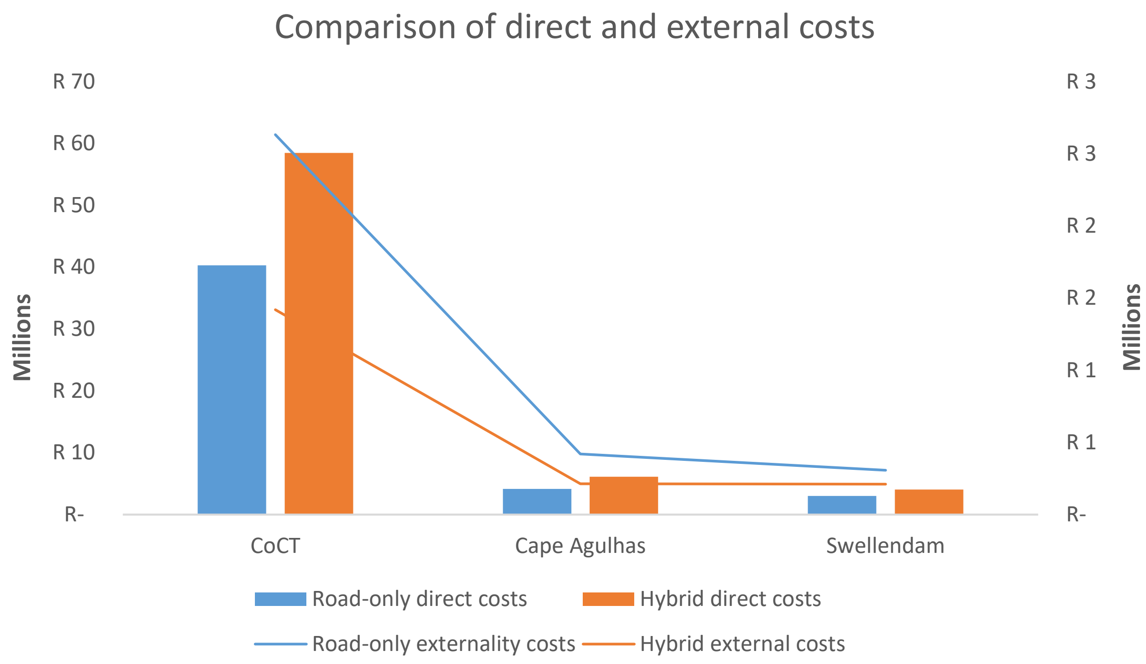

Figure 5-4: Comparison of annual road-only and hybrid transport externality costs

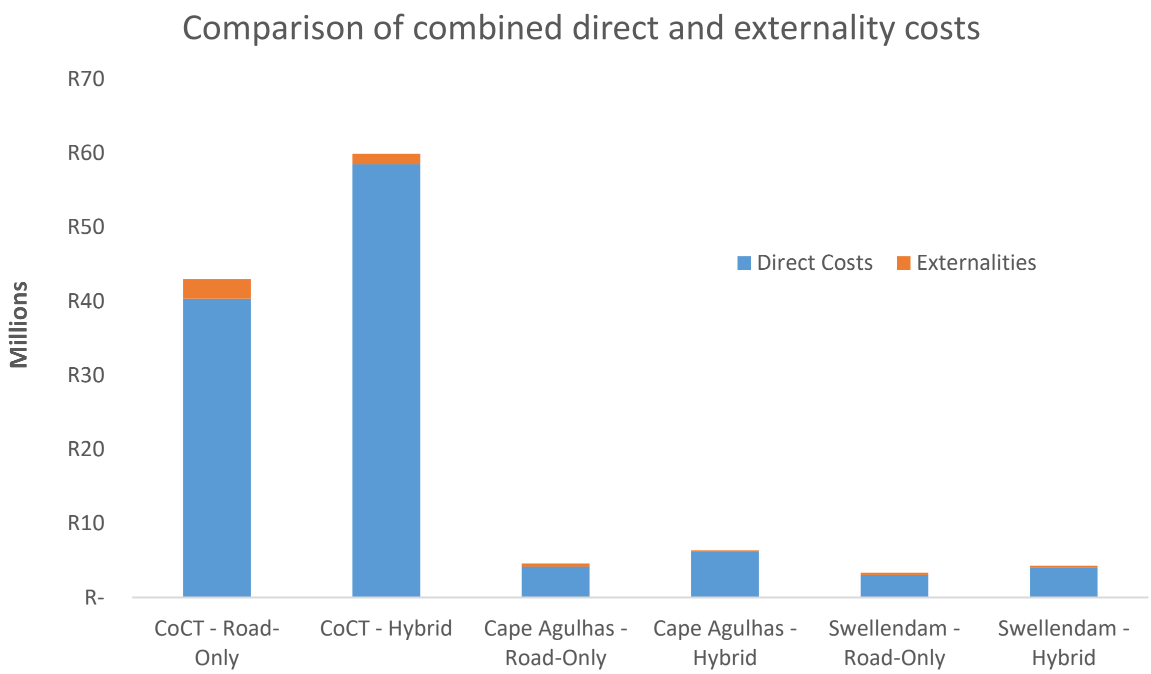

Figure 5-5: Comparison of combined (direct and externalities) annual road-only and hybrid transport costs

5.6 Limitations of Karwyderskraal case study

The concept study only investigated the haulage costs for the waste disposal at Karwyderskraal regional landfill site. A more detailed feasibility study will be required to determine the full project cycle costs and a cost benefit analysis.

i. It may be necessary to develop transfer stations and compactor systems in the various municipal jurisdictions for the rail alternative to be implementable.

ii. Cranes and/or reacher stackers required for loading and unloading containers as well as the cost of containers and handling fees should be costed.

iii. A significant capital investment required for upgrading of existing rail infrastructure and/or construction of new rail sidings should also be costed.

iv. Space requirements for loading and unloading of containers at transfer stations and rail stations need to be investigated.

v. The disposal fee to be charged at Karwyderskraal regional site may be different to the disposal costs at other locations that municipalities are currently using.

6 Summary of findings and next steps

6.1 Summary of findings

The study investigated alternative waste transportation options considering the ever-increasing costs and high volume of waste transported by road. In particular, the study explored the potential of waste-on-rail in the Western Cape and the development of a framework within which this can be achieved.

The study shows that waste-on-rail opportunities are not only limited to rail-only solutions but can be a combination of road and rail (hybrid solutions). The report also unpacked the potential, complexities, advantages, disadvantages, and other pertinent waste-on-rail issues in order to serve as a guideline for municipalities considering waste-on-rail as part of their transport solutions.

Karwyderskraal case study investigated the annual direct and externality costs for road-only and hybrid waste-on-rail solutions. Whilst the total direct road-only costs are lower than the hybrid model direct costs, the road-only externality costs are significantly higher than the hybrid model. The use of rail for long-distance waste transportation could result in better externality costs. Despite the externality costs consisting of a small percentage of the total expenditure, it should be noted that a conservative approach was taken during the externality cost calculations. The externality costs can form a greater percentage of the total costs if more external cost aspects are included in the calculations. This illustrates the positive environmental and societal effects of waste-on-rail transport.

In summary, the concept study showed that there is a good basis for further waste-on-rail investigations in the Western Cape. However, there are key barriers to implement waste-on-rail solutions. The model-specific and systemic factors are discussed below.

6.1.1 Model-specific findings and recommendations

Several model-specific factors affecting the implementation of waste-on-rail initiatives are discussed below:

i. Regionalisation of waste policies inadvertently results in some municipalities transporting waste over longer distances, resulting in an increase in transportation costs. Regional landfills also suggests that the landfill airspace will be used up quickly. With high upfront capital costs and an extremely lengthy permit approval process, smaller municipalities with low disposable waste may be reluctant to partner with high waste producers such as CoCT. Hybrid waste transport systems will therefore be required to implement formula-based approaches towards transport costs for municipalities transporting waste over long distances. In other words, a model of equitable cost sharing for transport and capital expenditure, based on a sound cooperation agreement, may be a key requirement for waste-on-rail models to regional facilities work.

ii. Due of the current economic climate, municipalities are likely to struggle to finance sustainable waste-on-rail projects as a result of dwindling budgets. In addition, the recent fuel volatility resulted in an increase in the waste transport costs thus adding further stress to the already constrained waste transport budgets in most local municipalities. It will therefore be necessary for municipalities to access waste transport grants to implement a sustainable waste transport service and cover the initial setup costs. The sustainability of both services can be tested by comparing the costs of road-based waste transport with rail transport assuming a constant increase in fuel prices over a 10, 20 or 25-year period.

iii. The configuration of hybrid waste-on-rail solutions typically involves one or two modes of transfer. There can be substantial handling fees for mode transfers, thereby increasing the total costs associated with transporting waste to regional landfill facilities. Further investigation is required to determine an accurate estimation of these costs and their correlating impact on the total transport cost for hybrid waste-on-rail solutions.

6.1.2 Systemic findings and recommendations

A discussion of systemic factors affecting the potential waste-on-rail solutions is presented below:

i. A lack of a reliable rail system and disruptions to the rail service make rail an unfavourable waste transport option. Delays may cause environmental concerns if waste remains at transfer facilities. Without alternative road haulage contracts in place, municipalities are not likely to opt for waste-on-rail solutions. A dual waste transport system will not be feasible due to financial constraints, which will favour a single waste transport service. A long-term waste transport contract should be established between Transnet (or private operators) and municipal stakeholders. An agreement of this nature will allow Transnet to optimise and manage its services, potentially resulting in improvements in maintenance and customer service.

ii. Transnet is facing a myriad of challenges in maintaining and operating the freight rail network in South Africa. Due to its strategic positioning in South Africa, turnaround efforts are likely to focus on key economic sectors. Despite the importance of waste economy, Transnet is unlikely to prioritise waste-on-rail over manufacturing, mining, agriculture or exports and imports. This limits the potential success of standalone waste-on-rail solutions on any given corridor. It is therefore necessary to consider waste-on-rail initiatives in the context of synergies with other key economic sectors.

iii. In terms of roles and responsibilities for waste-on-rail solutions, municipalities view the provision of rail infrastructure as the mandate of Transnet and not the local authorities. For any future waste on rail opportunities, Transnet will need to play a significant role in making such opportunities possible through the provision of a reliable rail transport service.

iv. Although the costs of rail infrastructure and the necessary upgrades for both direct and hybrid systems are still unknown, rail infrastructure projects typically involve high upfront capital costs. Given the current environment, Transnet is unlikely to fund any capital costs for waste-on-rail solutions since it is not a key priority for Transnet. The dwindling municipal budgets of most local municipalities are also nowhere near enough to cover the level of funding required. Therefore, it will be necessary for provincial or national government to allocate funds in this regard through dedicated grants or for projects to be funded and operationalised through Private Sector Participation.

v. Other than CoCT, no other local municipality produces a sufficient amount of waste to benefit from the inherent benefits of the rail mode. The low amount of disposable waste generated in most local municipalities increases the unit transport costs due to a lack of economies of scale. Therefore, it is highly unlikely that any other local municipality, without outside support, has the capacity to rollout a waste-on-rail solutions. An analysis of waste production trends and subsequent expected future volumes will allow for the determination of benchmark timelines during which local municipalities will produce sufficient volumes of waste to validate waste-on-rail operations.

vi. Regionalisation of waste requires cooperation and funding from all entities involved. The continued absence of or fluctuation in political leadership in some municipalities often delays the signing of cooperation agreements, which adversely impacts the implementation of crucial initiatives.

6.2 Conclusion

The study demonstrated that it is theoretically possible to implement waste-on-rail initiatives in the Western Cape. It is important to note, however, that the success of these initiatives depends on overcoming barriers such as the lack of reliable rail networks, the high cost of rail infrastructure, limited capacity of local municipalities and initial setup costs. Waste-on-rail initiatives are not necessarily cheaper than road transport in terms of direct costs and have significant implementation and rollout risks. However, the reduced cost of externalities for waste-on-rail solutions that is ignored in direct cost calculations makes a case for further investigation. The externalities explored in this study include accidents, congestion, emissions, landway, noise and policing. Despite the cost and risk factors identified above, the decision to implement waste-on-rail should place more emphasis on the benefits of the society at large to achieve the best overall outcome. Environmental concerns related to an increase in carbon emissions due to the gradual increase in road-based transportation also point to the responsibility of decision makers to implement sustainable, environmentally friendly transport systems.

7 Bibliography

DEA&DP. (2017). *Western Cape Integrated Waste Management Plan (2017 - 2022).*

DEA&DP. (2022). *Annual statement of waste management report 2020.* Cape Town: Western Cape Government.

GreenCape. (2020). *Waste: 2020 Market Intelligence Report.* Cape Town.

Palm, J. G., & Visser, W. (2020). *Transport options for Swellendam Municipality to Karwyderskraal regional waste disposal facility.*

Parker, D. (2021). *Significant untapped potential in local waste economy*. Retrieved from Engineering News: https://www.engineeringnews.co.za/article/significant-untapped-potential-in-local-waste-economy-2021-09-24/rep_id:4136

Parkinson, K., Fyvie, W., & Olivier, M. (2017). *Oudtshoorn Solid Waste Transportation Feasibility Assessment.*

SA Transport. (2021). *Western Cape Intercative Rail Map*. Retrieved from https://www.sa-transport.co.za/trains/sa_stations/western_cape_interactive_map.html

Transnet. (2015). *Footprint in Western Cape Rail.*

Western Cape Department of Health. (2020). *2020 Covid-19 Population Data.* Retrieved from Western Cape Government: https://www.westerncape.gov.za/assets/departments/health/h_102_2020_covid-19_population_data.pdf

Western Cape Government. (2021). *Socio-Economic Profile.*

Western Cape Government. (2022). *WCFDM Report.*

8 Appendix A

8.1 List of stakeholders consulted

Table 8-1: List of stakeholders consulted

District Municipality	Municipality	Contact	Designation	Email	Meeting Date	Status
	City of Cape Town	Jo-Anne Petersen		jo-anne.petersen@capetown.gov.za	31 October 2022	Attended
		Rosina Lesoetsa	Head: Integrated Waste Management Policy & Strategy	Rosina.Lesoetsa@capetown.gov.za	31 October 2022	Attended
		Shaazia Bhailall		Shaazia.Bhailall@capetown.gov.za	31 October 2022	Apologies
Cape Winelands		Francois van Eck	Cape Winelands District	francois@capewinelands.gov.za	10 October 2022	Attended

District Municipality	Municipality	Contact	Designation	Email	Meeting Date	Status
			Municipality - Executive Director: Technical Services			
		Christo Swart	Deputy Director: Project Management	christo@capewinelands.gov.za	10 October 2022	Attended
	Stellenbosch	Clayton Hendricks		Clayton.Hendricks@stellenbosch.gov.za	10 October 2022	Invited
	Witzenberg	Johnny Jacobs		johnny@witzenberg.gov.za	10 October 2022	Invited
	Drakenstein	Thys Serfontein	Senior Manager: Solid Waste and Landfill Management	thys.serfontein@drakenstein.gov.za	10 October 2022	Attended
	Breede Valley	S Visagie		svisagie@bvm.gov.za	10 October 2022	Invited

District Municipality	Municipality	Contact	Designation	Email	Meeting Date	Status
	Langeberg	Glenn Slingers		gslingers@langeberg.gov.za	10 October 2022	Invited
Central Karoo		Ralph Links	Acting Municipal Manager	ralphl@skdm.co.za	10 October 2022	Invited
	Laingsburg	John Komanisi	Manager Infrastructure	john@laingsburg.gov.za	19 October 2022	Attended
		Johan Mouton	PMY Manager	jmouton@laingsburg.gov.za	19 October 2022	Attended
	Beaufort West	Vuyokazi Ruiters	Dir Infrastructure Services	wastemanager@beaufortwestmun.co.za	24 October 2022	Attended
	Prince Albert	Ashley America	Manager: Infrastructure Services	ashley@pamun.gov.za	21 October 2022	Attended
Garden Route		John G Daniels	Executive Manager: Roads Services	johnd@gardenroute.gov.za	24 October 2022	Attended
	Kannaland	Sherilene Adams		sherilene@kannaland.gov.za	24 October 2022	Apologies

District Municipality	Municipality	Contact	Designation	Email	Meeting Date	Status
	Hessequa	Andre Hanssen		andre@hessequa.gov.za	24 October 2022	Attended
	Mossel Bay	Warren Manuel		warren.manuel@mosselbay.gov.za	24 October 2022	Attended
	Oudtshoorn	Rodwell Witbooi		rodwell@oudtmun.gov.za	24 October 2022	Attended
	George	Janine Fernold		jfernold@george.gov.za	24 October 2022	Attended
	Knysna	Natalie Salmons		nsalmons@knysna.gov.za	24 October 2022	Attended
	Bitou	Douglas Baardtman		dbaartman@plett.gov.za	24 October 2022	Attended
Overberg		Francois Kotze	Manager: Environmental Management Services	fkotze@odm.org.za	04 October 2022	Attended
	Swellendam	Johan van Niekerk	Manager: Waste Management	jvanniekerk@swellendam.gov.za	04 October 2022	Attended

District Municipality	Municipality	Contact	Designation	Email	Meeting Date	Status
	Cape Agulhas	Walter Linnert	Manager: Solid Waste	WalterL@capeagulhas.gov.za	04 October 2022	Attended
	Overstrand	Craig Mitchel	Manager: Engineering Services	cmitchel@overstrand.gov.za	04 October 2022	Attended
	Theewaterskloof	Hegans Martinus		hegansma@twk.org.za	04 October 2022	Attended
West Coast		Chris Koch	Director: Infrastructure Services	ackoch@wcdm.co.za	01 November 2022	Attended
		Nico de Jongh		ndejongh@wcdm.co.za	01 November 2022	Attended
	Swartland	Pieter Marais	Manager: Solid Waste	maraisp@swartland.org.za	06 October 2022	Attended
Transnet		Reggie Brown		Reggie.Brown@transnet.net	26 September 2022	Attended

8.2 Summary of current state of waste in the Western Cape

Table 8-2: Summary of current state of waste transport in the Western Cape

Local Municipalities	Waste Transfer: Mode of Transport	Contract or In-house Freight Service	Landfill Site Location	Rail Transfer Station nearest to Regional Landfill, if applicable	Rail Feasibility Study Conducted
City of Cape Town	Road	Contract	Vissershoek	Direct line inactive	Yes
Stellenbosch	Road				
Witzenberg	Road				
Drakenstein	Road	Contract	Wellington	Wellington	No
Breede Valley	Road				
Langeberg	Road				
Laingsburg	Road	In-House	Laingsburg	N/A	No
Beaufort West	Road	In-House	Beaufort West	N/A	No
Prince Albert	Road	In-House	Prince Albert	N/A	No
Hessequa	Road	Contract	Riversdale	Voorbaai	No

Local Municipalities	Waste Transfer: Mode of Transport	Contract or In-house Freight Service	Landfill Site Location	Rail Transfer Station nearest to Regional Landfill, if applicable	Rail Feasibility Study Conducted
Mossel Bay	Road	Contract	PetroSA	N/A	No
Kannaland	Road	Contract	PetroSA	Voorbaai	No
Oudtshoorn	Road	Contract	Oudtshoorn	N/A	Yes
George	Road	Contract	George	Line inactive	No
Knysna	Road	Contract	PetroSA	Line inactive	No
Bitou	Road	Contract	PetroSA	Line inactive	No
Swellendam	Road	In-house	Swellendam	Bot River	No
Cape Agulhas	Road	Contract	Bredasdorp	Bot River	No
Overstrand	Road	Contract	Karwyderskraal	N/A	No
Theewaterskloof	Road	Contract	Karwyderskraal	N/A	No
Swartland	Road	Contract	Malmesbury	N/A	No
Saldanha Bay	Road				
Berg River	Road				

Local Municipalities	Waste Transfer: Mode of Transport	Contract or In-house Freight Service	Landfill Site Location	Rail Transfer Station nearest to Regional Landfill, if applicable	Rail Feasibility Study Conducted
Cederberg	Road				
Matzikama	Road				

8.3 Summary of stakeholder responses concerning non-transport initiatives in the Western Cape

Table 8-3: Summary of stakeholder responses in relation to non-transport initiatives in the Western Cape

Local Municipalities	Reduction of Waste at Source	Reduction of Waste at Landfill	Private Sector initiatives being explored
City of Cape Town	Yes	Yes	Yes
Stellenbosch	Yes		
Witzenberg	Yes		Yes
Drakenstein	Yes	Yes	Yes
Breede Valley	Yes		
Langeberg	Yes		
Laingsburg	Yes	No	Yes
Beaufort West	No	No	No
Prince Albert	No	No	No
Hessequa	Yes	Yes (?)*	No
Mossel Bay	Yes	Yes (?)*	No
Kannaland	Yes	Yes (?)*	No

Local Municipalities	Reduction of Waste at Source	Reduction of Waste at Landfill	Private Sector initiatives being explored
Oudtshoorn	Yes	Yes (?)*	No
George	Yes	Yes (?)*	No
Knysna	Yes	Yes (?)*	No
Bitou	Yes	Yes (?)*	No
Swellendam	Yes	Yes	Yes
Cape Agulhas	No	Yes	No
Overstrand	Yes	Yes	No
Theewaterskloof	Yes	Yes	No
Swartland	Yes	Yes	Yes
Saldanha Bay			
Berg River			
Cederberg			
Matzikama			

*Not sure of the extent of recycling applied at PetroSA – to be confirmed. Blank spaces – no information received.

8.4 Karwyderskraal operating model

Table 8-4: One-way distances for the road and rail segments for the Karwyderskraal model

Start	End	Mode	Distance (km)
Macassar	Strand	Road	14
Strand	Botriver	Rail	45
Macassar	Karwyderskraal	Road	73
Cape Agulhas	Bredasdorp	Road	40
Bredasdorp	Botriver	Rail	125
Cape Agulhas	Karwyderskraal	Road	140
Swellendam	Protem	Road	77
Protem	Botriver	Rail	99
Swellendam	Karwyderskraal	Road	155
Botriver	Karwyderskraal	Road	22

Table 8-5: National externality cost rates per component, 2017 (Western Cape Government, 2022)

Externality component	Road (c per tonne-km)	Rail (c per tonne-km)
Accidents	4.79	0.41
Congestion	2.95	-
Emissions	8.97	1.21
Landway	0.87	0.08
Noise	3.24	0.03
Policing	2.29	-
Total	23.11	1.73

Contact Person

Email: **Corrine.Gallant@westerncape.gov.za**

Tel: +27 21 483 6909 **Fax:** +27 86 510 0611

Department of Transport and Public Works

www.westerncape.gov.za

Western Cape Government