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forestry, fisheries & the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

Towards the development of the Waste Economy Master Plan

PRESENTED TO: BUSA

29 NOVEMBER 2022

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Introduction

Project objectives: “unlocking and scaling up economic opportunities within the waste economy value chains”

High-level

Milestones & progress

= Draft report
= In progress
= Not started

Status quo report

- Circular economy value chain assessments (processes, technologies, role players)
- Market and economic analysis
- Identification of opportunities and challenges

Legal and policy analysis report

- Legislative and policy review
- Opportunities and challenges
- Recommendations

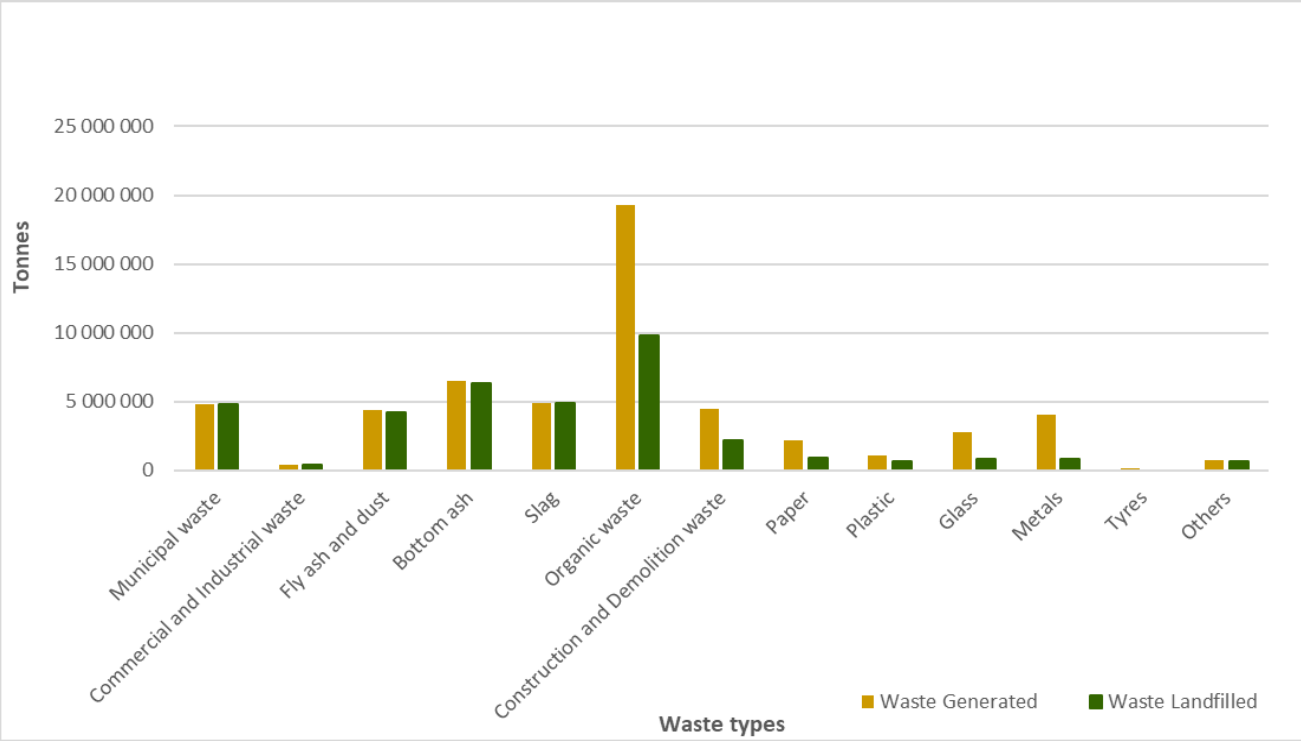
Stakeholder engagement report

- One-on-one
- Group (sectoral) workshops

Waste Economy Master plan

- Activities, roles, timeframes, budget
- M&E recommendations

Organic waste, bottom and fly ash, slag, municipal waste, construction and demolition waste, and packaging waste are the streams with the highest landfilled quantities



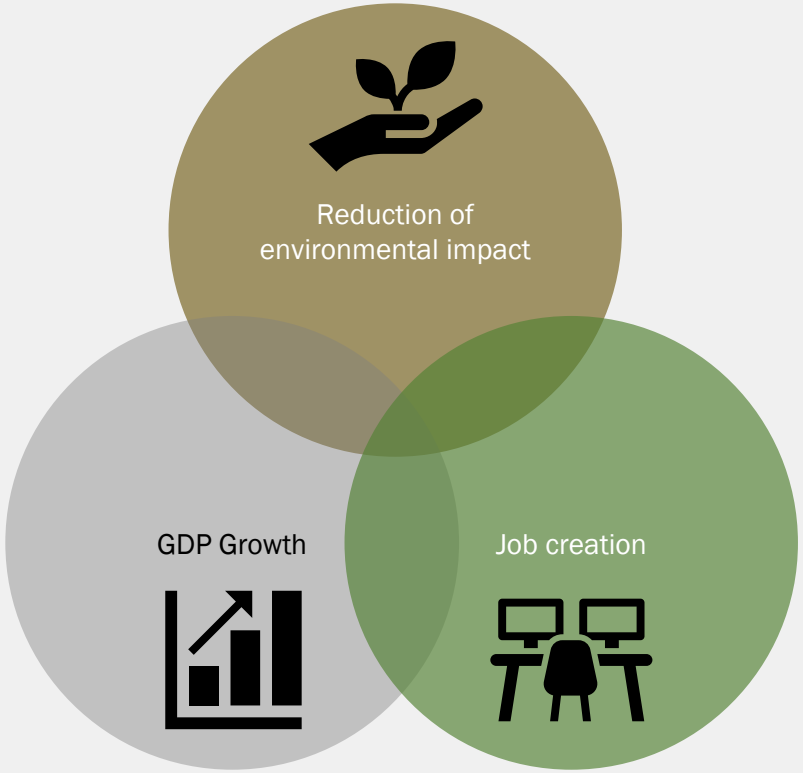
South Africa generates approximately 108 million tons of waste annually

This includes 55 million tonnes of general waste, 52 million tonnes of hazardous waste, and 1 million tonnes of unclassified waste

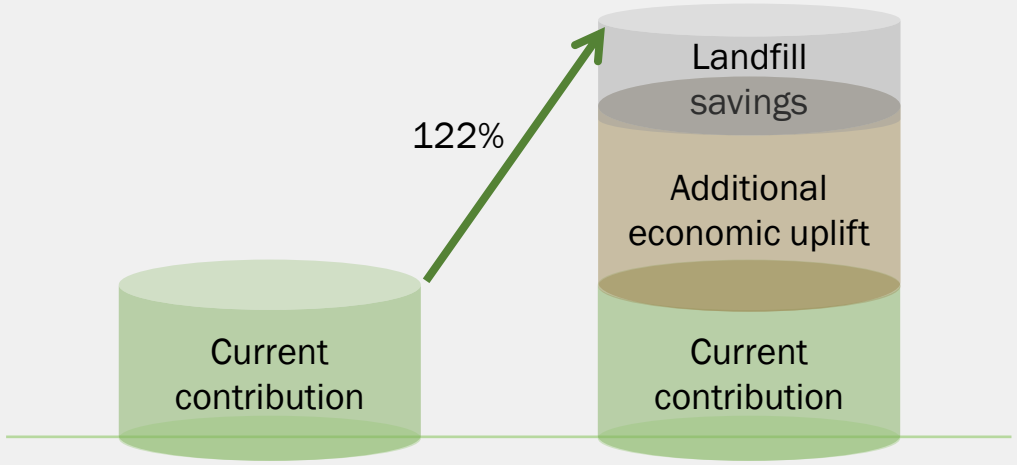
South African State of Waste (SoW) Report, DEA 2018

Using available data, specific value chains were identified as focus areas for the status quo report based on the following criteria:

- High economic feasibility and business potential
- Evidence of likelihood to result in a significant increase in GDP contribution
- Likely to result in the creation of a significant number of jobs
- High waste generation quantities
- High potential to divert waste from landfill
- Has not been addressed in other master plans or other grand strategies



Potential Economic contribution: A total additional annual economic value uplift of about R11 billion assuming maximum (100%) diversion of waste

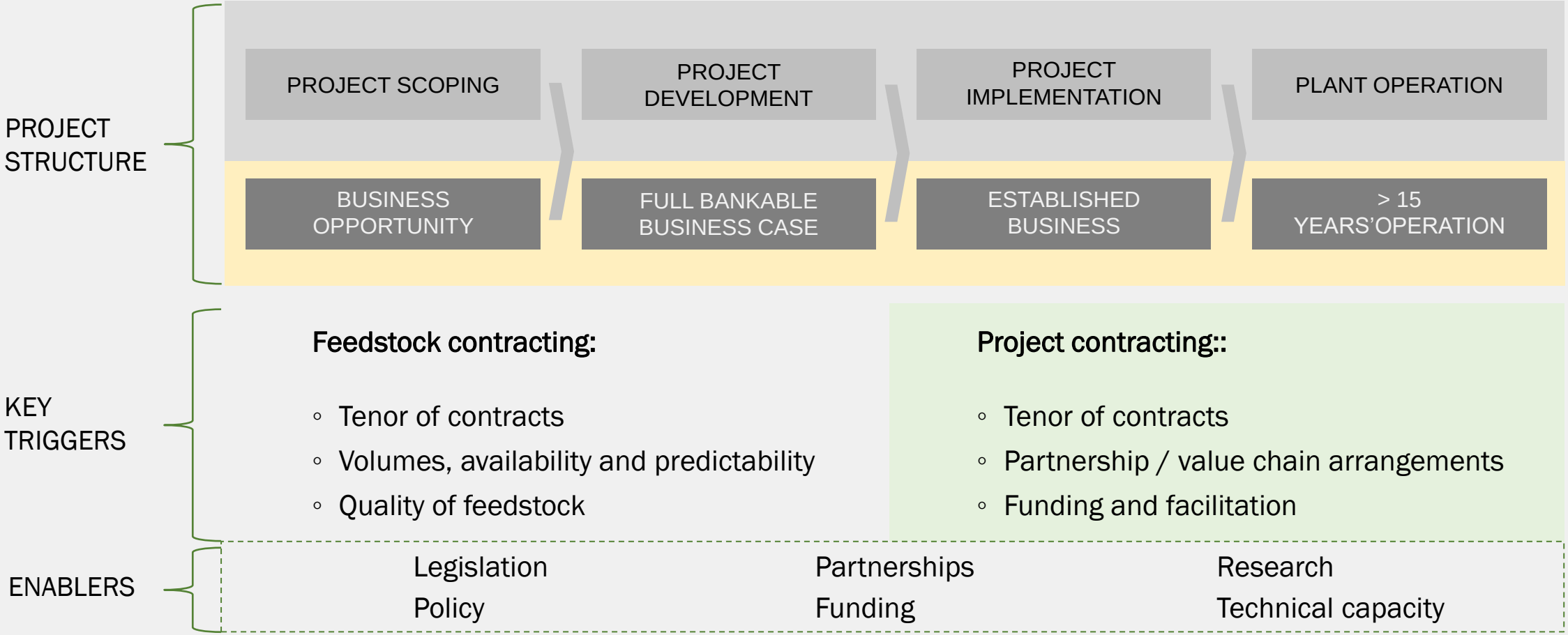


This plan should result in a significant uplift in recycling and economic output through immediately implementable projects

It is not intended to provide a theoretical answer on the best technical approach for beneficiation of any waste type

Success should be measured by the extent of enablement and facilitation of sustainable beneficiation activities

There are several key triggers that we need to consider as part of this plan, to ensure the smooth implementation of projects

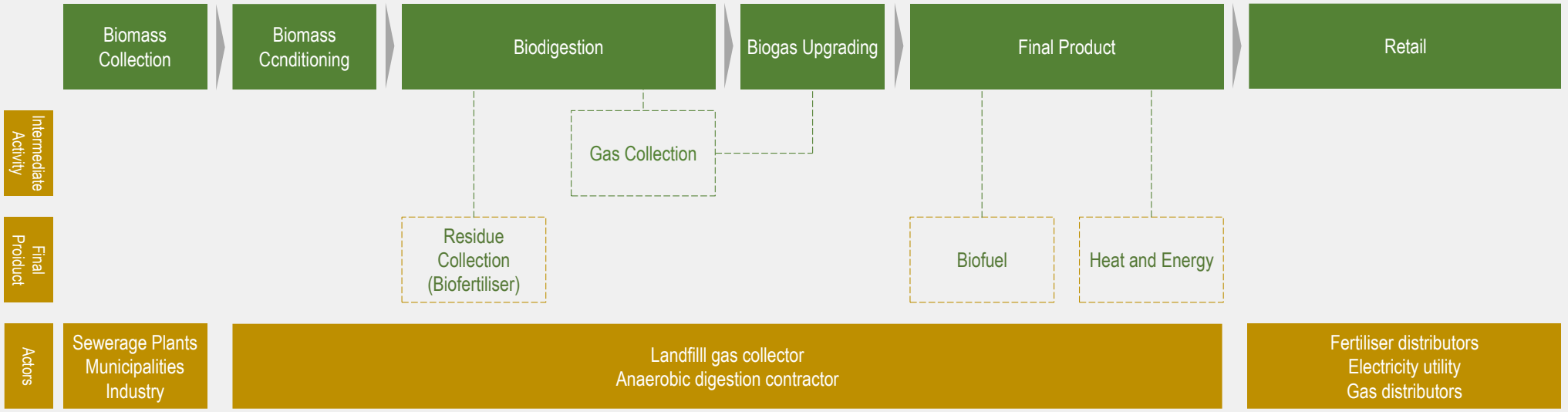


Five waste streams were chosen based on these criteria with our analysis and recommendations focused on these waste types

Wet organic waste to biogas	Construction and demolition waste	E-waste	Packaging waste	Absorbent hygiene products to RDF
(i) can be derived from a wide variety of organic waste	(i) low recycling complexity with easy access to technology	(i) has significant landfill impact	(i) recycled products have proven value	(i) extensive landfill and environmental impact
(ii) has the potential to divert large quantities or waste from landfill	(ii) readily absorbed into new construction activities	(ii) successful recycling leads to extraction of high-value materials	(ii) well-developed collection infrastructure in the country	(ii) potential for high value of recycled products
(iii) creates substantial economic value through beneficiation	(iii) Proven economic benefit to recycling	(iii) potential to scale up processing thus creating jobs and increasing exports	(iii) high recycling output from raw feedstock, thus eliminating landfill impact	(iii) collection should be relatively simple once the programme is established

Wet organic waste to biogas

The qualities that make food waste and wastewater attractive for waste processing relate mainly to the sourcing of feedstock and off-take potential for products



Food waste
Can be sourced from large industrial customers such as food producers, and municipalities

Waste water
Easily accessible as it is concentrated at waste water treatment plants

The source of waste and the consumer of product can be the same in both instances

Food waste
Food producers can often consume the electricity and heat produced, while municipalities can feed electricity into their own grid

Waste water
The waste water plants can consume all of the electricity produced from biogas as they are heavy users of power

The economic value of the stream was estimated using the equation: $\mathbf{E}(wt) = \sum_{t}^{w} [(R1 * r) * Z] + (landfill\ cost\ savings)$, with the following parameters as inputs

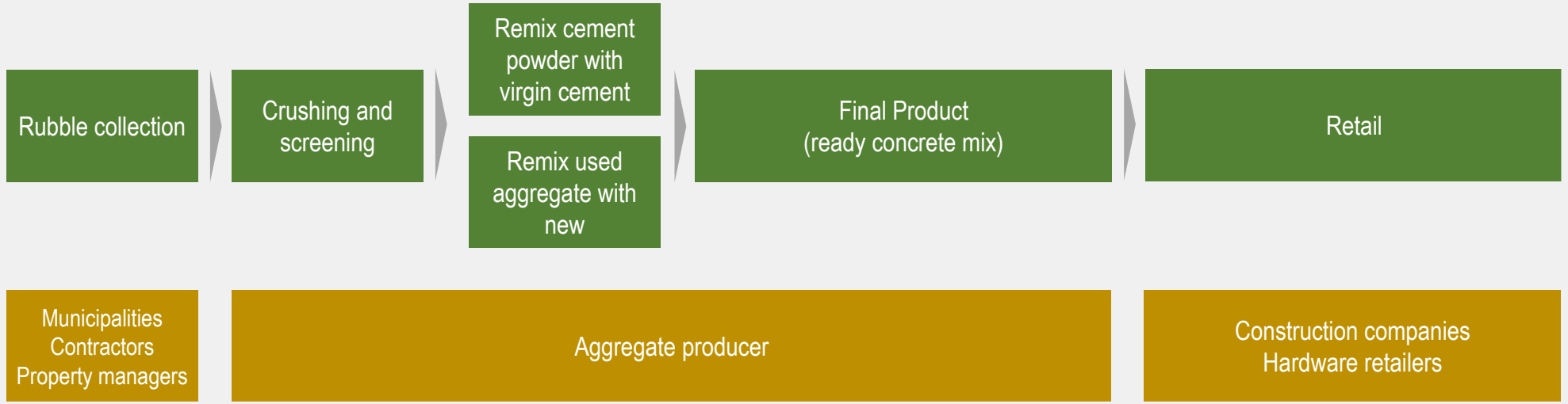
Term	Description	Input value	Reference
E	Economic contribution of a given waste stream *w* at a given time *t*	Calculated	Calculated
GW	Waste generated	Food: 11 700 000 tonnes Wastewater: 570 915 tonnes	DEFF and Urban Econ - Food only Calculated from GIZ Biogas Potential Report
R_1	Waste recycled	Food: 1 170 000 tonnes Wastewater: 57 092 tonnes	Calculated based on baseline 10% diversion (SoW) Future potential based on 50% Phakisa target
r	Biogas generation (m^3) per ton waste	Food: 90 m^3/ton Waste water: 180 m^3/ton	Chris Braybrooke, GM: Marketing at Veolia Services Southern Africa (infrastructurenews.co.za Jan 18, 2022)
PV	Product volume generated (Not in the equation but calculated using R_1 and r)	Food: 4 212 000 GJ Wastewater: 411 059 GJ	Calculated assuming 0,04GJ per m^3
Z	Price per product generated	250 (ZAR)	Based on a conservative R0.90 per kwh (current prices >120 c/kwh: globalpetrolprices.com)

Increased beneficiation of food waste and wastewater sludge from the current 10% levels to 50% results in a 460% increase in economic output value

	Direct (Rm)			Indirect (Rm)	Total (Rm)
Waste Type	Current economic contribution (recycling)	Potential economic contribution (recycling)	Added economic benefit (recycling)	Added landfill cost savings	Total Added Economic contribution
Food	1 053.0	5 265.0	4 212.0	468.0	4 680.0
Waste Water	102.7	513.8	411.1	194.1	605.2
TOTAL	1 155.7	5 778.8	4 623.1	662.1	5 285.2

Construction and demolition waste

The concrete waste processing requirements are not complex, with the feedstock collection and stockpiling being the key to a successful recycling initiative



Material Recycling Facilities (MRFs) facilities can obtain waste from the landfill sites after it is discarded

MRFs can enter into agreement with local C&D waste generators and transporters. This is an incentive for transporters because it allows them to negate landfill dumping fees

MRFs can enter into a contract with a municipality (after a tender process) to offtake waste

Through this model, the City of Cape Town is able to divert approximately 60% of rubble from landfill

The output of this value chain is crushed aggregates which can be used in concrete, as backfill, for land reclamation, and in some instances for road construction

Some manufacturers can take the process further and use the aggregates to generate bricks.

The current examples of off-takers are:

- Corobrik (Terramanzi Group, 2020)
- Rubble cycle

The economic value of the stream was estimated using the equation: $\mathbf{E}(wt) = \sum_{t}^{w} [(R1 * r) * Z] + (landfill\ cost\ savings)$, with the following parameters as inputs

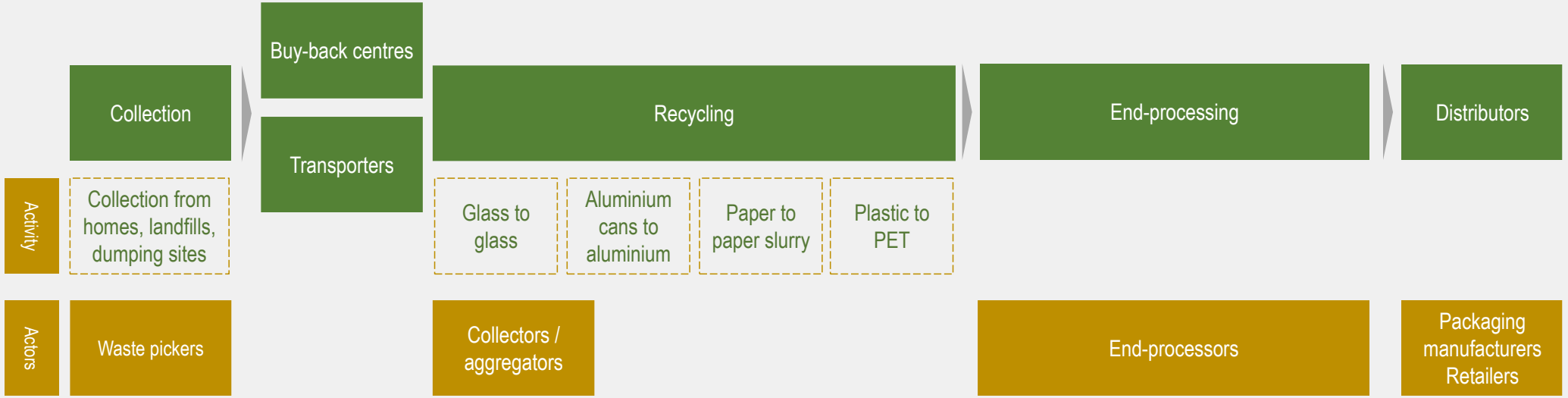
Term	Description	Input value	Reference
E	Economic contribution of a given waste stream *w* at a given time *t*	Calculated	Calculated
GW	Waste generated	4 800 000 tonnes	DFFE, 2018: SOW
R_1	Waste recycled (Calculated using a percentage of G above)	2 496 000 tonnes	CUrban Econ - Operation Phakisa 2022 Future potential based on 100% revised Phakisa target
r	Building aggregate generation (m^3) per ton waste	1,13 m^3/ton	Assumed 1 ton waste = 1 ton recycles
PV	Product volume generated (Not in the equation but calculated using R_1 and r)	2 820 480 m^3	Calculated
Z	Price per product generated	155 (ZAR)	Greencape, 2020

Increased beneficiation of concrete waste from the current 52% levels to 100% can result in an additional R630 million in economic output value from recycling

Direct (Rm)			Indirect (Rm)	Total (Rm)
Current economic contribution (recycling)	Potential economic contribution (recycling)	Added economic benefit (recycling)	Added landfill cost savings	Total Added Economic contribution
437.2	840.7	403.5	230.4	633.9

Packaging waste

The packaging value chain is characterized by a well-developed collection and recycling ecosystem, and a high level of recyclability of material



Informal waste pickers play a key role in this value chain by picking the largely unseparated packaging waste from housing complexes, illegal dumping sites and landfill sites. The collected waste is then sent to buy-back centres or sold to transporters who transport it to recyclers.

Most packaging waste is infinitely recyclable, with recyclate often combined with virgin raw material

Packaging waste recycling product offtakes is raw material that can be used along with, or as replacement of, virgin material in the production of products that include the packaging materials themselves. Uptake of these recyclates is relatively high when compared to other waste streams, with producers advocating for recycling as a way of improving efficiencies in their operations.

The economic value of the streams was estimated using the equation: $E(wt) = \sum_{t}^{w} [(R1 * r) * Z] + (landfill\ cost\ savings)$, with the following parameters as inputs

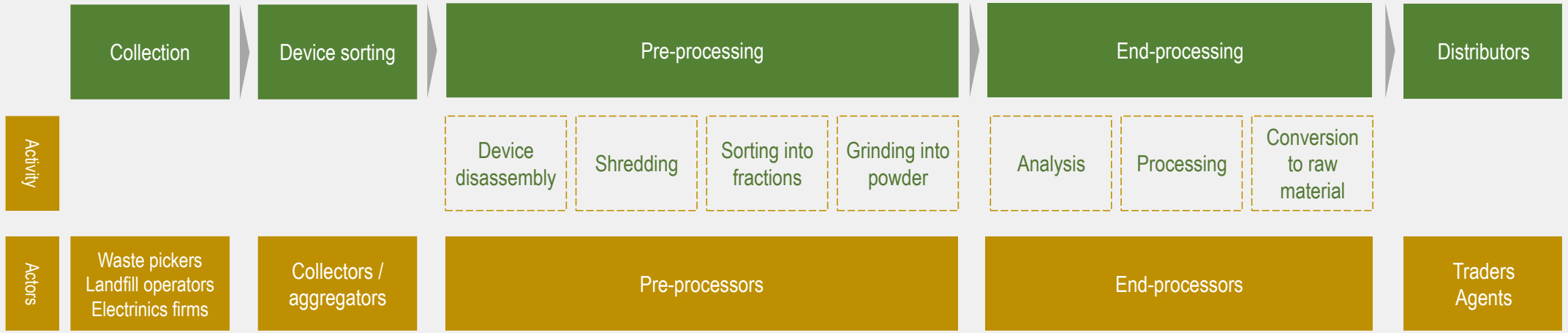
Term	Description	Input value	Reference
E	Economic contribution of a given waste stream *w* at a given time *t*	Calculated	Calculated
GW	Waste generated (tonnes)	Plastic: 1 113 000 Paper: 2 100 000 Cans: 4 035 929 Glass: 3 100 000	DFFE, 2018: SOW
R_1	Waste recycled (tonnes)	Plastic: 489 720 Paper: 1 300 000 Cans: 2 905 876 Glass: 1 364 000	Plastic: 44% DEFF and Urban Econ Cans: 72% Paper: 62% PAMSA 2021, recycledpaperza Glass: 44% theglassrecyclingcompany.co.za
r	Recyclate generation (tons) per ton waste: for a given type of packaging waste	1 tonne/tonne	Assumed 1 ton waste = 1 ton recyclate
PV	Product volume generated (Not in the equation but calculated using R_1 and r))	Plastic: 489 720 Paper: 2 100 000 Cans: 4 035 929 Glass: 3 100 000	Calculated
Z	Price per product generated (ZAR per tonne)	Plastic: 1 000 Paper: 1 000 Cans: 2 000 Glass: 89	scrapmetalpricessouthafrica.co.za trashincashin.co.za

Increased beneficiation of packaging waste from the current levels to maximum recyclable amount results in a 54% increase in economic output value

	Direct (Rm)			Indirect (Rm)	Total (Rm)
Waste Type	Current economic contribution (recycling)	Potential economic contribution (recycling)	Added economic benefit (recycling)	Added landfill cost savings	Total Added Economic contribution
Plastic	489.7	1 113.0	623.3	62.3	685.6
Cans	5 811.8	8 071.9	2 260.1	113.0	2 373.1
Paper	1 300.0	2 100.0	800.0	80.0	880.0
Glass	121.4	184.9	63.5	173.6	237.1
TOTAL	7 722.9	11 469.8	3 747.5	428.9	4 175.2

E-waste

There is a well-established e-waste picking and collection system, however, the processing is limited and mostly concentrated on low-level value extraction



There are more than 10 000 informal e-waste pickers. 2 000 of these pickers are regular collectors. These individuals collect a total of approximately 360 000 tonnes per year, or about **10%** of e-waste collected. This is sold to formal and/or informal scrap dealers as well as buy-back centres. In 2017, there were approximately 25 formal small to medium e-waste collectors. Each collects between 80 and 200 tonnes per year. (ERA, 2018).

There is a need to scale up processing to extract higher value elements

The recycling process for e-waste ends with different material such as plastics, metals, wiring, etc. Each of these may be treated differently, often having to join other recycling streams

For example, plastic derived from dismantling would have to be routed to the plastic recycling streams. Products such as PCBs, phosphor powder and batteries are exported.

The economic value of the streams was estimated using the equation: $E(wt) = \sum_{t}^{w} [(R1 * r) * Z] + (landfill\ cost\ savings)$, with the following parameters as inputs

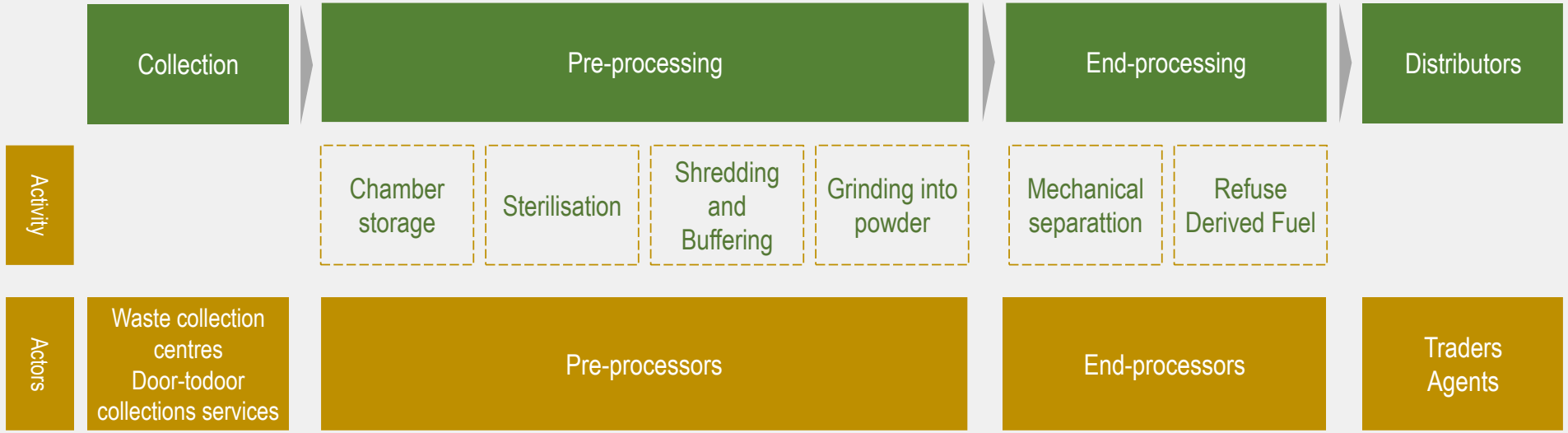
Term	Description	Input value	Reference
E	Economic contribution of a given waste stream *w* at a given time *t*	Calculated	Calculated
GW	Waste generated	360 000 tons	DFFE, 2018: SOW, Urban Econ - Operation Phakisa
R_1	Waste recycled (Calculated using a percentage of GW above)	36 000 tons	Calculated based on baseline 10% diversion (SoW, Urban Econ - Operation Phakisa) and Future potential assumed 100%
Z	Revenue generated per ton waste	R1 603 (ZAR/ton waste)	GreenCape 2022

There is potential for a 900% uplift of economic output from improved recycling of e-waste, demonstrating the need for more extensive beneficiation

	Direct (Rm)			Indirect (Rm)	Total (Rm)
Waste Type	Current economic contribution (recycling)	Potential economic contribution (recycling)	Added economic benefit (recycling)	Added landfill cost savings	Total Added Economic contribution
TOTAL	57.7	577.1	519.3	32.4	551.7

AHP waste

The value chain for AHP to RDF is undeveloped and will require a concerted effort supported by policy and industry participation



(i) the quantity of AHP waste generated is relatively high; (ii) there is consistent supply of the waste material at all seasons and (iii) there is an economic case for the waste stream, because its by-products have high CV and can be used as RDFs, as well as recycled materials such as pet litter and plastic goods, however, collection rates are low

There is significant benefit in converting AHP to fuel due to the high value of the product

Studies have shown that the circularity of AHP waste materials is feasible based on relatively large volumes of materials produced all year round (Broughton, E., Rajput, J., 2022). Recovered materials from AHPs presents as high quality secondary raw material for various manufacturing processes, while derived fuel from AHPs also presents as high calorific value material used as fuel.

The economic value of the streams was estimated using the equation: $\mathbf{E}(wt) = \sum_{t}^{w} [(R1 * r) * Z] + (landfill\ cost\ savings)$, with the following parameters as inputs

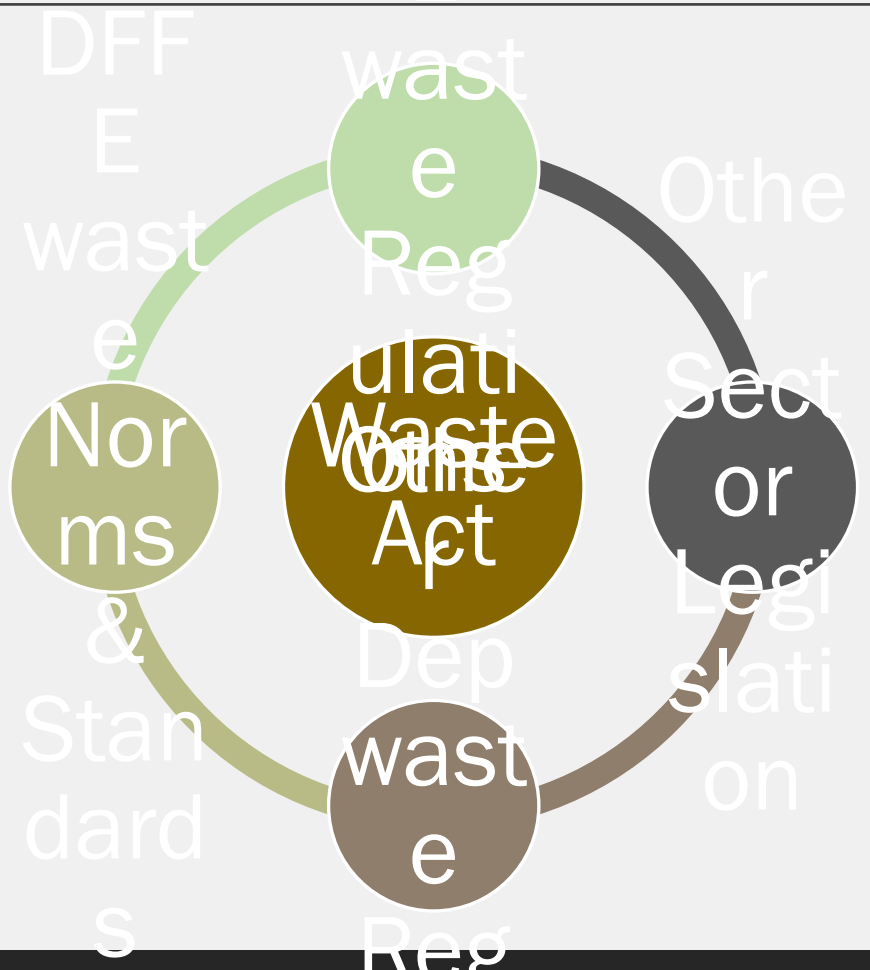
Term	Description	Input value	Reference
E	Economic contribution of a given waste stream *w* at a given time *t*	Calculated	Calculated
GW	Waste generated	530 074 tons	Operation Phakisa 2017 escalated by 2% per annum
R_1	Waste recycled	0 tons	Currently 0% Future potential assumed 100%
Z	Revenue generated per ton waste	R2 500 (ZAR/ton waste)	Based on R20 gigajoule per tonne and R250 per gigajoule

There is a possible R1.4 billion in added benefit in processing AHP waste to derive fuel, compared to the current zero value added through recycling

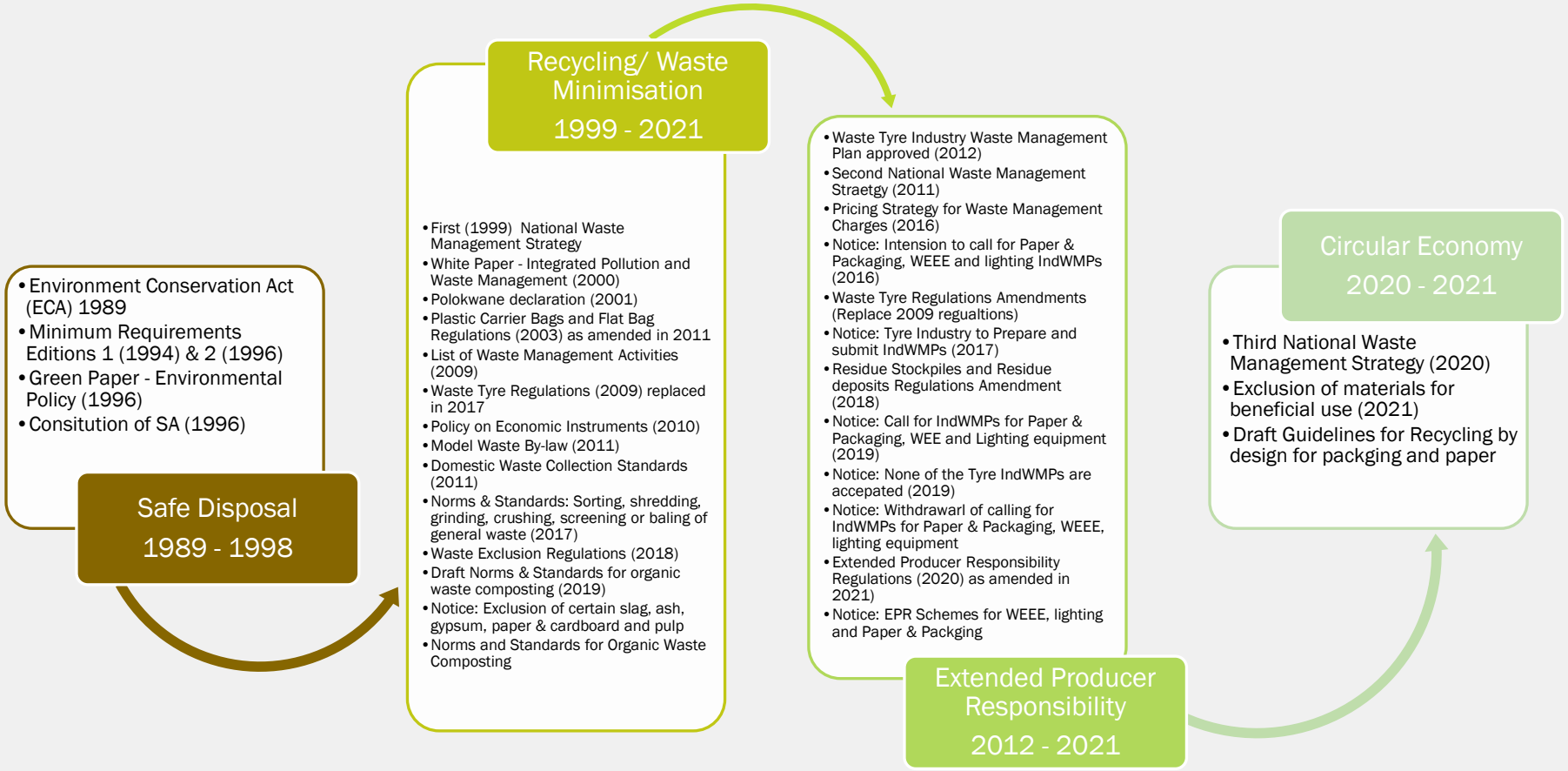
	Direct (Rm)			Indirect (Rm)	Total (Rm)
Waste Type	Current economic contribution (recycling)	Potential economic contribution (recycling)	Added economic benefit (recycling)	Added landfill cost savings	Total Added Economic contribution
TOTAL	0	1 325.2	1 325.2	53.0	1 378.2

Legal framework review

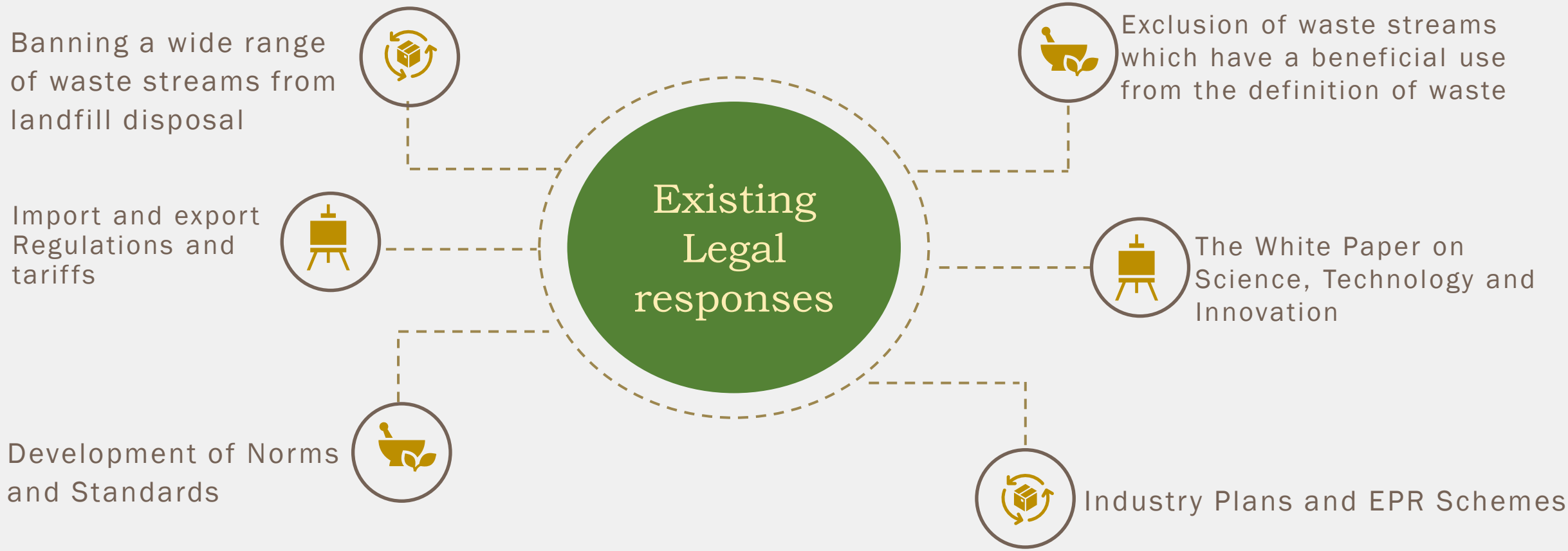
The Waste Act, together with its subsidiary set of Regulations and Norms and Standards, which are within the mandate of the DFFE are the main regulatory framework for waste in the country. However, there are other waste regulations drafted by other Departments e.g. DTI . In addition, legislation from other sectors may have relevance to waste management.



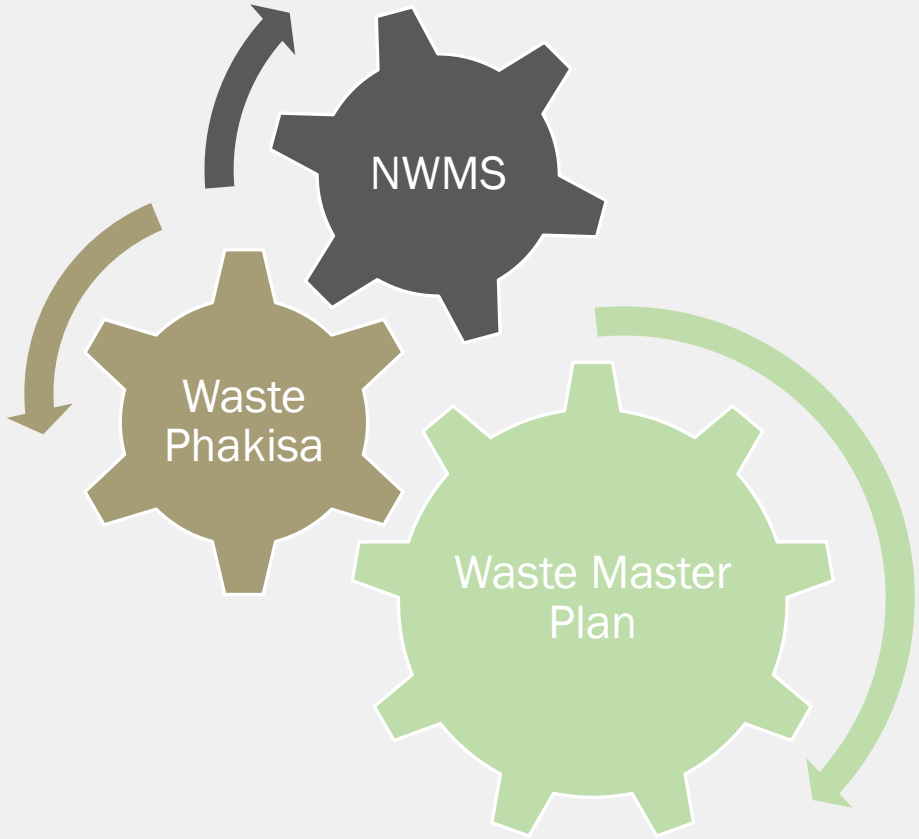
Over the years, there has been an explosion in the development of legislation in the waste sector in SA. The waste economy has been explored as early as 1999 with the advent of recycling initiatives and has been organically growing with the newer concept such as EPR schemes and now recently with circular economy.



Existing legislation that promotes waste economy: Interventions include minimising time and cost implications of compliance processes as well as developing programmes that promote recycling, reuse and energy recovery.



In addition to the above legislation: SA already has other **planning documents** that have already set targets intended to promote the waste economy. Both the National Waste Management Strategy and the Waste Phakisa are important planning documents that have already set the foundation for the waste economy to grow.



There are some legislative barriers that have been identified that still need to be dealt with.

EXISTING BARRIERS	POSSIBLE ACTIONS
Section 78 of MSA assessment process for municipalities to get external parties involved in waste services	Centralised approach to Section 78 assessment to reduce the burden on individual municipalities
Procurement restriction on contract duration periods	Procurement should take into account sector specific needs and operations. Procurement of equipment and vehicles should be aligned with full amortization of loans for the purchase of such. Amend Treasury Procurement Policy Guideline to include Green Procurement targets identified under Phakisa to ensure implementation. Also extend to include other waste streams. Develop a platform that shows available stock for different waste streams that have beneficial use or that can be recycled, re-use etc. (Phakisa was only specific for biomass only.)
The Waste Classification Regulations require analyses from SANAS accredited laboratories, although these are few and this creates delays in compliance.	Sufficient time needs to be given to allow businesses to comply, given the restriction posed by not having many SANAS accredited laboratories.

Legislative barriers: There are some legislative barriers that have been identified that still need to be dealt with.

EXISTING BARRIERS	POSSIBLE ACTIONS
Delays in approval processes	Streamline and fast track Regulation 9 of the classification Regulations: Approval process by introducing timelines for processing (Phakisa) Section 19 of NEMWA: Application can be made for specific waste streams to be exempted from being considered as a waste based on proven beneficial use (Phakisa). Amend and fast track the application processes associated with Exclusion Regulations Develop compliance guideline for businesses
Lack of implementation, monitoring and evaluation	Implement existing legislation and planning documents Develop a monitoring and evaluation framework

There is sufficient legislation, what needs to be strengthened is implementation, monitoring and evaluation. In order to take the economy to the next level will require a paradigm shift from waste management to resource management.

Key takeaways

There is already an extremely complex legislative system governing waste management

The existing legislative framework is sufficient to promote the waste economy.

A review of existing legislation is required to give clarity, avoid contradictions and duplications

A paradigm shift is required in order to take the waste economy to the next level.

Make legal compliance easy and affordable

Implement existing legislation and ensure monitoring and evaluation of set targets and goals

Waste to be seen as a resource

Stakeholder engagements

Points of Discussion

- Stakeholder engagement to date;
- Issues, challenges and opportunities forthcoming from stakeholder engagement;
- Thematic analysis of issues, challenges and opportunities; and
- Contextualising the development of the WEMP (way forward).

Stakeholder engagement: We engaged and continue to engage stakeholders in order to:

Stakeholders engaged to-date

Organisation / Group / Forum	Number of organisations presented	Issues raised
Interwaste	1	• The department must consider funding for waste pickers from levies collected to enable them to give waste for free to processing facilities like RDF facilities that cannot be sustained when waste is purchased by the facility • Low landfill dumping fees are making waste diversion unfavourable
PlasticSA	1	• Government must put measures in place to ensure separation at source by providing a minimum of 2 bins (dry+wet). • The model must incorporate waste pickers.
Packaging SA	1	• Not very interested in master plans.
EWASA	1	• Happy with the finalization of EPR legislation • Ensure enforcement of EPR legislation to ensure that there are no "free riders"

Stakeholders engaged to-date

Organisation / Group / Forum	Number of organisations presented	Issues raised
CSIR	1	• MSA S.78 requirements to conduct an assessment prior to outsourcing of municipal services is a hinderance. Alongside this is the lengthy PFMA processes. • MFMA has a restriction on the duration of contracts_ usually 3 years. These time restrictions are sometimes not suitable for private waste management services that also involve loans which extend beyond 3 years. • MFMA S120 PPP (public private partnerships) process is cumbersome and costly • NEMWA: Definition of “waste” is still subject to interpretation. • NEMWA: The process for licensing listed activities that may benefit waste economy is lengthy.
IWMSA	47	• How does this plan fit into other plans and strategies (NWMS, Phakisa) • Requirements of peer review for the final plan

Stakeholders engaged to-date

Organisation / Group / Forum	Number of organisations presented	Issues raised
Academia	6	• Research (lessons learned) required to inform successful outcome especially to see what works internationally • Targets must be measurable • Current circular economy studies/plan must be taken into consideration (understanding the social circle)
DFFE Phakisa Team	-	• Inputs from Phakisa paramount • Waste value chains must distinguish between potential value and extractable (accessible value)
Packaging sector	8	• Groups like Remade should also be involved • Target setting of paramount importance

Stakeholders engaged to-date

Organisation / Group / Forum	Number of organisations presented	Issues raised
CAIA	All members	• Generation volumes varies pending the source of information and should be verified • Correct terminology to be used • AHP not necessarily good RDF source
E-waste sector	7	• Phakisa initiatives needs to be fast tracked • Significant research has been performed by Mintek • E-waste policy in existence and should be sourced
Construction & demolition	4	• Legislation currently inadequately applied and enforcement must be upscaled • Waste exclusion opportunities must be better pursued • Role players needs to be defined with concomitant accountabilities

Stakeholders engaged to-date

Organisation / Group / Forum	Number of organisations presented	Issues raised
Waste picker associations (ARO) and University of Johannesburg forum	5	• Support separation at source initiatives • Require access to private landfill sites • Suggests that the waste economy master plan must ensure economic growth and awareness for low-income communities.
Funders	1	• There is good risk appetite for green projects • Project must demonstrate security of feedstock supply and offtaking contracts over 10 years or more. • Where project developers have a tender with a municipality, the said municipality must be in good standing financially.
Local government		

Planned engagements

Organisation / Group / Forum	Date	Examples of organisations invited
National Treasury	28 Nov 2022	National Treasury
Local Government	14 No 2022	All municipalities

Summary of challenges identified during engagements

Challenges
MFMA is limiting contracts for offtake of waste to 3 years while funders need at least 5 year contracts. The alternative (setting PPPs) is time consuming.
Ineffective/insufficient separation of waste at source = contaminated waste + loss of recyclables due to cherry picking
Time and costs associated with Authorizations (EIAs, licensing, SANAS)
MSA requires section 78 assessment prior to outsourcing of municipal services.

Challenges
There are no incentives or requirements for procurement of circular products
Waste generators are not willing to divert waste at a premium price when landfilling is a cheaper option

Summary of opportunities identified during engagements

Opportunities
Electricity challenges: Favourable for energy-based circular products
Grant funding opportunities are becoming increasingly available for green economy
Technologies are becoming readily available
Rise in cost of virgin materials (plastic, construction aggregates, etc)

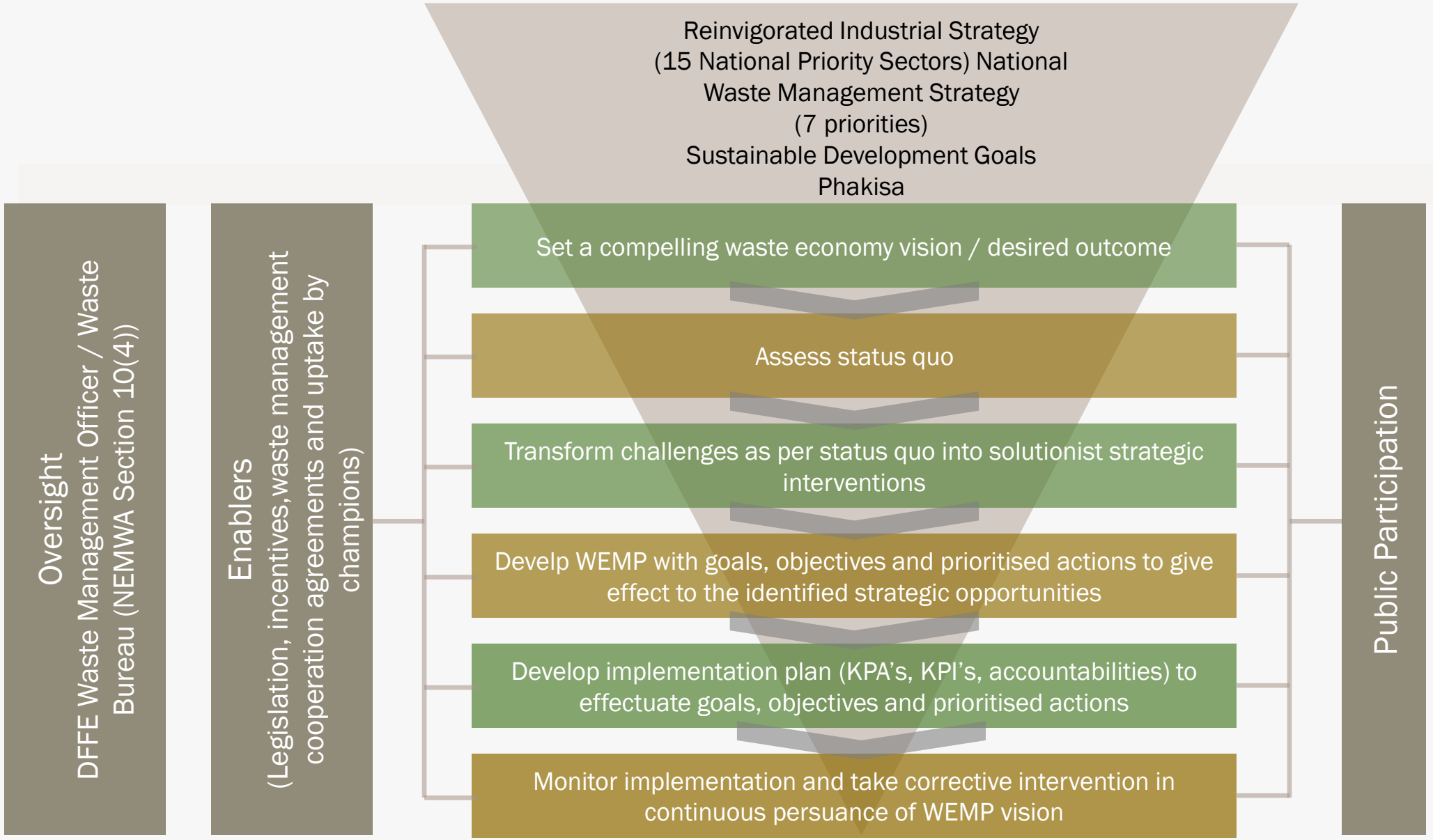
Opportunities
Limited landfill space which creates urgency to consider alternative waste management approaches
Rising costs of electricity will improve the business case for waste to energy projects
Increase national GDP, improve job opportunities and alleviate poverty
Establish vibrant waste economic strategic community

A thematic analysis of the opportunities and challenges suggest that the master plan should consider commitments in the following areas

Theme	Focus Area
Separation at source	Focus Area 1: Ensure separation at source
Municipal contracting	Focus Area 2: Create an enabling contracting environment for private sector to participate in municipal solid waste management. Standardise contracting approaches for feedstock and off-takes and create a contracting framework beyond MFMA tenor
Legislation	Focus Area 3: Creating an enabling legislative environment: For example revision of MFMA, PFMA & MSA, and Waste Ac
Government procurement	Focus Area 4: Encouraging circular products in procurement guidelines
Funding	Focus Area 5: Unlocking project funding mechanisms
Compliance	Focus Area 6: Ensuring compliance with EPR regulations

These focus areas will be revised based on stakeholder inputs

Waste Economy Master Plan Conceptualised



Planned activities

Organisation/Group/Forum	Completion date
Stakeholder engagements	Ongoing
Regional stakeholder workshops	12 and 13 December 2022 (tentative)
Draft WEMP	December 2022
Final WEMP	January 2023 (target date may be revised)

Stakeholder engagement process will continue throughout the project

Thank you!

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ADDITIONAL AREAS TO BE ADDRESSED

What is BUSA's view in supporting small businesses and contributing to social upliftment in the waste economy sector

BUSA to check with members if they can share a document outlining issues raised to the department in relation to the definition of waste