Developing the waste economy by exploring opportunities outside traditional waste management

Toward the End of Waste: Wise Resource use in Waste Management

University of Stellenbosch Business School, Cape Town

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Goal of this presentation

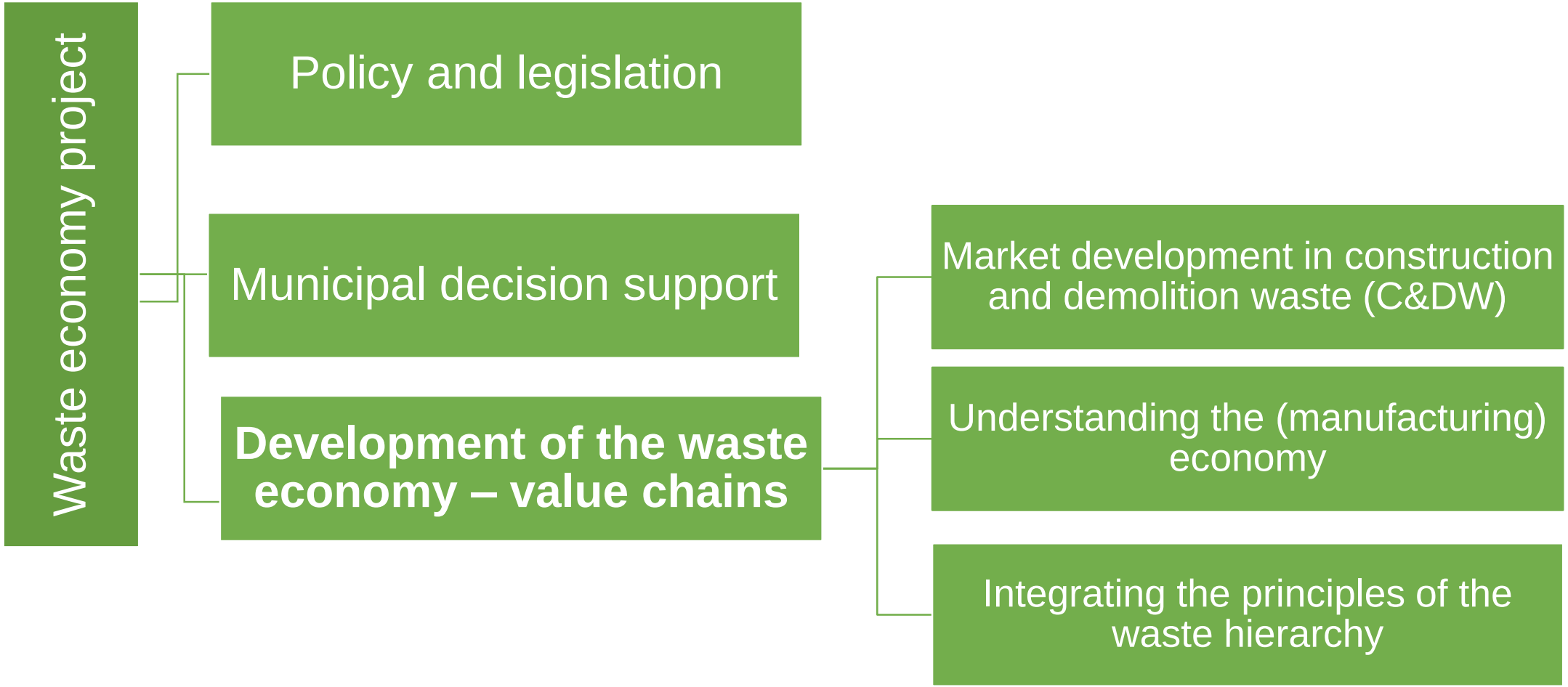
To give an outline of the proposed work for value chain development as part of the waste economy project at GreenCape

Outline

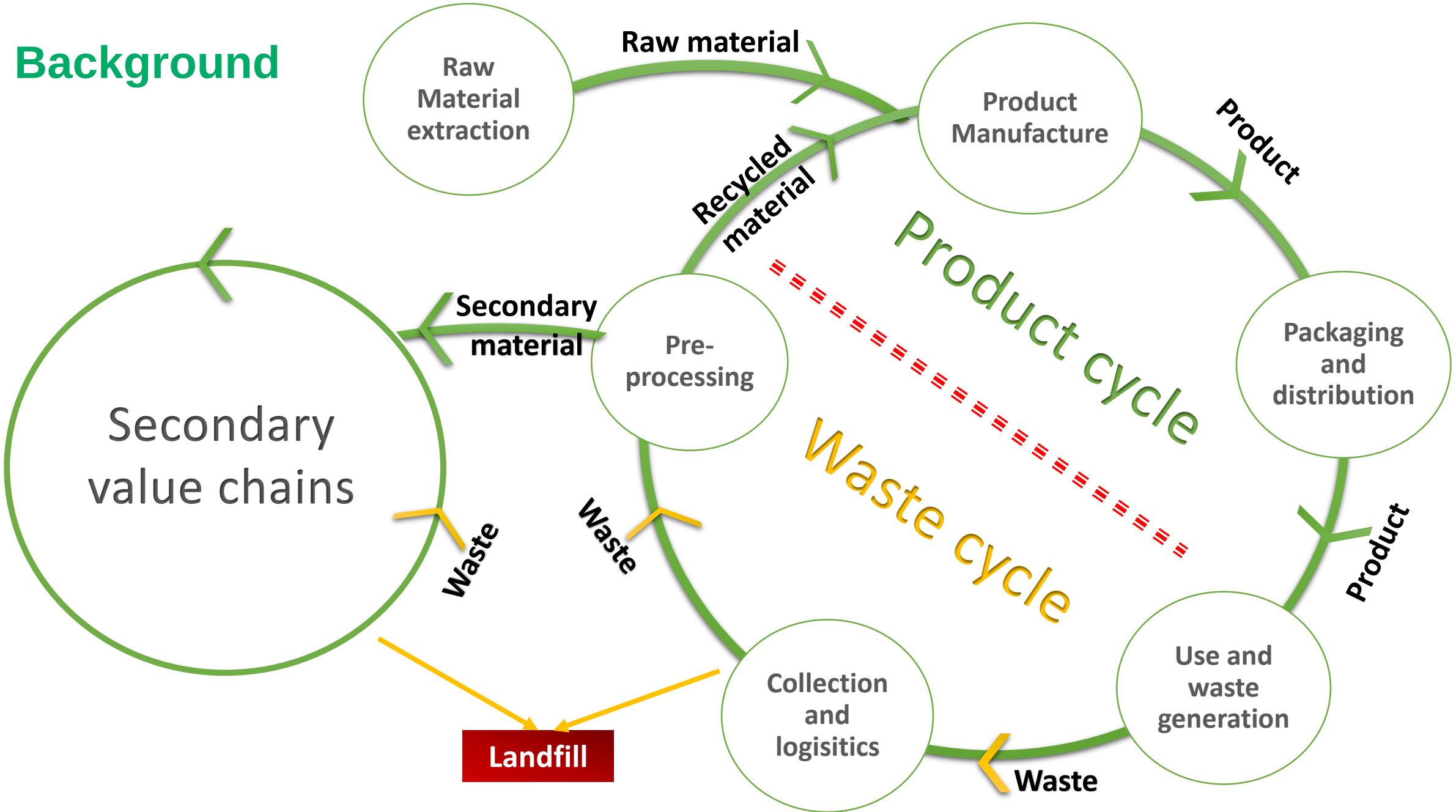
- Background (and very brief history) of WEP
- Purpose of the work
- Approach
- Preliminary outcomes
- Discussion and way forward

Background

2013 – 2017: Waste Economy Project



Background


Raw Material extraction
Raw material
Product Manufacture
Product
Packaging and distribution
Product
Use and waste generation
Waste
Collection and logisitics
Waste
Pre-processing
Secondary material
Secondary value chains
Waste
Landfill
Recycled material
Product cycle
Waste cycle

Purpose of the work

Identify and support upstream and downstream opportunities for growth (investment, job creation)

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Identify and support upstream and downstream opportunities for growth (investment, job creation)

The purpose of this work is to support a shift away from the traditional way of managing waste and identify new opportunities/markets for secondary materials based on the materials flows within the Western Cape.

Approach – how we have gone about it

Investigate material/product value chains and identify opportunities for development and support, ultimately leading to interventions that will result in investment and job creation

Understand
- material (and cash) flow
- stakeholders (and influence)

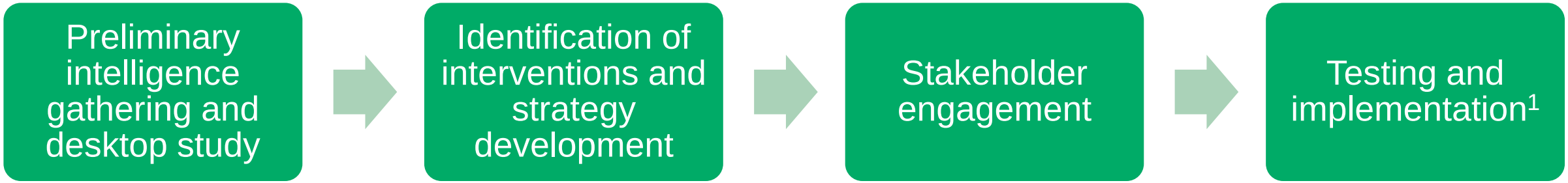
Engage with stakeholders across the value chain to determine suitability of interventions

Development of (plans for) interventions

Implementation of interventions

Approach

Development, testing and implementation of interventions



[1]Following review based on stakeholder engagements

Approach

Intelligence gathering and desktop study

- Material flow analysis
- Trade analysis
- Gross value add analysis
- Waste analysis

Material flow analysis

Import throughput
3,500,000 tpa

Import throughput – imports primarily destined out of CCT

Import throughput
3,500,000 tpa

y of Cape Town
Direct material
consumption

Exports
8,300,000 tpa

Domestic processed output (emissions)
9,000,000 tpa

Export throughput
3,000,000 tpa

Export throughput – exports originating from outside CCT

Export throughput
3,000,000 tpa

Hoekman, 2015

Material flow analysis – Imports (level 1)

Import 1 (level 1 data)	
Category	**2013 (tons)**
1. Biomass and biomass products	7,070,618
4. Fossil energy materials/carriers, raw and processed	4,986,301
3. Non-metallic minerals, raw and processed	2,281,356
5. Other products	827,309
2. Metal ores and concentrates, raw and processed	416,208
Total	**15,581,792**

Material flow analysis – Imports (level 2: Truncated – 20 categories)

Import 2 (level 2 data)	
Category	**2013 (tons)**
1.6. Products mainly from biomass	4,605,884
4.2. Liquid and gaseous energy products, raw and processed	4,532,727
1.1. Crops, raw and processed	1,036,057
1.3. Wood and wood products	1,034,883
3.11. Products mainly from non metallic minerals	860,831
5.3. Other Manufacturing Industries	678,271
3.04. Chemical and fertilizer minerals	659,074

Material flow analysis - Imports (level 3: Truncated – 65 categories)

Import 3 (level 3 data)		
Category	**2013 (tons)**	**"Ease"**
4.2.1.2. Crude oil in Pipes	3,928,640	MED-LOW
1.6.1. Other Agriculture	2,082,037	LOW
1.6.2. Processed Foods	1,796,306	LOW
3.11.2. Cement	827,072	MEDIUM
3.04.1. Chemicals	630,829	MEDIUM
1.3.4. Pulp of wood and paper	586,315	HIGH-MED
1.6.4. Beverages	502,847	MEDIUM
4.1.2. Coal Mining Domestic	441,711	MED-LOW
3.01.1. Stone	425,031	HIGH
4.2.5. Diesel	327,531	MED-LOW
1.1.03. Maize	231,109	LOW

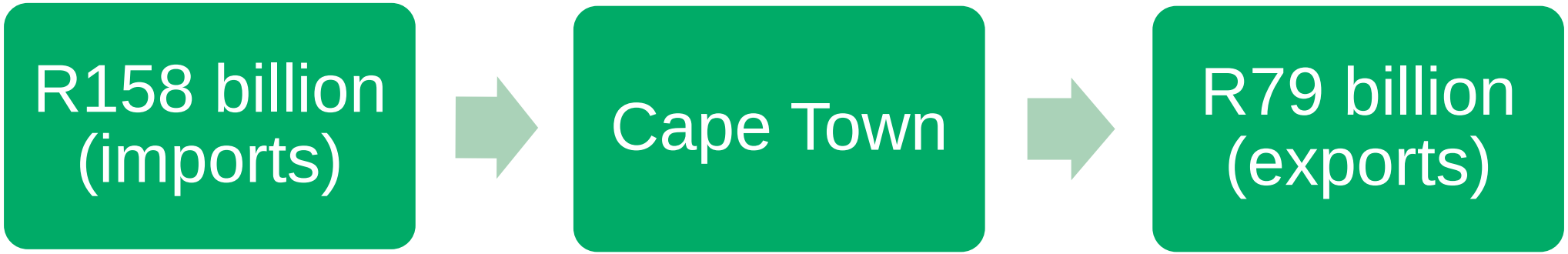
Material flow analysis - summary

- Understand the current flows of material across the boundaries
  - Imports – identify opportunities for substitution (development of new manufacturing, or boosting current capacity)
  - Exports – identify opportunities for boosting/expanding current manufacturing capacity
  - Domestic extraction – opportunity for reducing dependence on (or depletion of) the (local) environment

Trade analysis

Actual cash flows across boundaries

- Potential size of the market?



- Compare with waste budgets?

2016 Quantec Data

Trade analysis

- Similarly, as for MFA, multiple levels of aggregation:
  - 2, 4, 6 digit SIC code data available
    - Level 1 - 2 digit: 99 categories
    - Level 2 - 4 digit: 1260 categories
    - Level 3 – 6 digit: 6,800 categories

Trade analysis

- Understand the size of the market -gives a more comprehensive breakdown
  - Imports:
    - >R1 billion worth of primary polymers imported into Cape Town (R250m for polyethene)
    - R850 million worth of paper & paperboard, articles of pulp, paper and board
    - R3,7 billion worth of electronic equipment
  - Exports:
    - R8,8 billion worth of edible fruit, nuts, peel of citrus fruit, melons
    - R360m worth of furniture, lighting, signs, prefabricated buildings

Trade analysis – Imports (Cape Town)

Year	2010	2011	2012
H01: Live animals	10 108 565	9 323 559	9 467 036
H02: Meat and edible meat offal	459 484 462	786 347 592	1 163 890 930
H03: Fish, crustaceans, molluscs, aquati	604 934 623	859 369 091	827 779 243
H04: Dairy products, eggs, honey, edible	143 808 192	184 305 316	329 807 638
H05: Products of animal origin, nes	336 165 828	396 638 102	411 350 230
H06: Live trees, plants, bulbs, roots, cut f	9 187 799	14 325 023	10 662 820
H07: Edible vegetables and certain roots a	138 442 535	157 818 353	170 909 366
H08: Edible fruit, nuts, peel of citrus fruit,	130 510 770	162 543 966	194 979 678
H09: Coffee, tea, mate and spices	114 140 298	171 579 413	222 274 022
H10: Cereals	671 931 804	691 202 197	891 882 428
H11: Milling products, malt, starches, inu	36 551 460	38 233 990	70 812 354
H12: Oil seed, oleagic fruits, grain, seed,	49 188 069	62 048 645	93 386 561
H13: Lac, gums, resins, vegetable saps a	30 564 318	34 041 869	37 275 623
H14: Vegetable plaiting materials, vegetal	1 617 376	2 547 622	2 348 186
H15: Animal,vegetable fats and oils, cleav	168 703 863	247 680 951	246 183 006

Trad

	2012
H27: Mineral fuels, oils, distillation products, etc	110 337 881 866
H84: Nuclear reactors, boilers, machinery, etc	7 483 004 650
H85: Electrical, electronic equipment	3 707 283 553
H64: Footwear, gaiters and the like, parts thereof	3 183 745 622
H61: Articles of apparel, accessories, knit or crochet	2 931 400 397
H39: Plastics and articles thereof	2 620 832 212
H62: Articles of apparel, accessories, not knit or crochet	2 530 611 158
H22: Beverages, spirits and vinegar	2 522 908 011
H90: Optical, photo, technical, medical, etc apparatus	2 020 527 305
H16: Meat, fish and seafood food preparations nes	1 653 616 626
H89: Ships, boats and other floating structures	1 336 955 847
H94: Furniture, lighting, signs, prefabricated buildings	1 308 406 643
H87: Vehicles other than railway, tramway	1 300 674 323
H38: Miscellaneous chemical products	1 300 528 376
H30: Pharmaceutical products	1 197 469 472
H95: Toys, games, sports requisites	1 177 612 743
H02: Meat and edible meat offal	1 163 890 930
H29: Organic chemicals	1 070 361 560
H73: Articles of iron or steel	1 036 199 316

Trade analysis – Exports (Cape Town)

Year	2010	2011	2012
H01: Live animals	3 017 223	2 904 042	6 605 442
H02: Meat and edible meat offal	98 053 699	49 688 183	51 268 424
H03: Fish, crustaceans, molluscs, aquatic	2 558 054 652	2 808 392 390	2 752 786 111
H04: Dairy products, eggs, honey, edible a	136 937 967	85 953 913	128 177 149
H05: Products of animal origin, nes	17 591 972	19 479 605	20 960 321
H06: Live trees, plants, bulbs, roots, cut fl	74 103 743	70 601 451	97 502 582
H07: Edible vegetables and certain roots a	154 805 001	155 589 930	248 176 668
H08: Edible fruit, nuts, peel of citrus fruit, r	8 155 753 238	8 208 075 438	8 856 141 084
H09: Coffee, tea, mate and spices	97 461 297	120 094 081	135 671 015
H10: Cereals	17 758 292	23 755 691	8 214 814
H11: Milling products, malt, starches, inuli	26 368 451	19 392 048	28 169 843
H12: Oil seed, oleagic fruits, grain, seed, f	56 036 384	103 861 157	96 253 977
H13: Lac, gums, resins, vegetable saps ar	14 856 395	19 440 625	14 722 461
H14: Vegetable plaiting materials, vegetab	1 189 491	622 534	810 883
H15: Animal,vegetable fats and oils, cleava	53 893 328	71 394 258	106 028 344

Gross value add analysis – understanding our manufacturing

The measure of the value of goods and services produced in an area, industry or sector of an economy

- P: Primary sector [SIC: 1-2]
- **S: Secondary sector [SIC: 3-5]**
- T: Tertiary sector [SIC: 6-9, 0]

- R424 billion – 13.8% of SA's GDP in 2016
- Manufacturing (secondary sector) - 18.5%

Gross value add analysis

Manufacturing sectors – 13 sectors, broken down into a further 35 sub-sectors

- SC03: Food, beverages and tobacco [SIC: 301-306]
- SC04: Textiles, clothing and leather goods [SIC: 311-317]
- SC05: Wood, paper, publishing and printing [SIC: 321-326]
- SC06: Petroleum products, chemicals, rubber and plastic [SIC: 331-338]
- SC07: Other non-metal mineral products [SIC: 341-342]
- SC08: Metals, metal products, machinery and equipment [SIC: 351-359]
- SC09: Electrical machinery and apparatus [SIC: 361-363]
- SC10: Radio, TV, instruments, watches and clocks [SIC: 371-376]
- SC11: Transport equipment [SIC: 381-387]
- SC12: Furniture and other manufacturing [SIC: 391-392]
- SD13: Electricity [SIC: 41]
- SD14: Water [SIC: 42]
- SE15: Construction [SIC: 51-53]

Gross value add analysis

Sector	Sub-sectors	Size of sector (GVA, ZAR millions)	Potential Jobs per million ZAR Revenue (WC)	Potential Jobs per million ZAR Revenue (SA)
SE15: Construction [SIC: 51-53]	51 Building construction 52-53 Civil engineering & other construction	15,142	1.8	2.5
SC06: Petroleum products, chemicals, rubber and plastic [SIC: 331-338]	331-333 Coke & refined petroleum (38%) 334 Basic chemicals (26%) 335-336 Other chemicals & man-made fibers (26%) 337 Rubber products (4%) 338 Plastic products (7%)	8,886	2.1	6.7
SC03: Food, beverages and tobacco [SIC: 301-306]	301-304 Food (78%) 305 Beverages (18%) 306 Tobacco (5%)	7,240	3.4	6.2
SD13: Electricity [SIC: 41]	41 Electricity, gas & steam	5,959	3.6	7.2
SC08: Metals, metal products, machinery and equipment [SIC: 351-359]	351 Basic iron & steel (39%) 352 Basic non-ferrous metals (11%) 353-355 Metal products excluding machinery (27%) 356-359 Machinery & equipment (23%)	5,505	2.3	4.6
SC05: Wood, paper, publishing and printing [SIC: 321-326]	321-322 Wood & wood products (23%) 323 Paper & paper products (51%) 324-326 Printing, publishing & recorded media (26%)	4,450	2.7	4.2
SC12: Furniture and other manufacturing [SIC: 391-392]	391 Furniture (28%) 392-393 Other manufacturing (72%)	3,756	2	3.9
SC11: Transport equipment [SIC: 381-387]	381-383 Motor vehicles, parts & accessories (93%) 384-387 Other transport equipment (7%)	2,214	2.2	5.4

Waste analysis

Import substitution: Sector analysis

Imports	Normalized Trade (ZAR/t)	Jobs per 1000 tonnes		
		Direct (WC)	Total (WC)	Total (SA)
Paper	1,570	1.5	4.8	8.2
Stone+Granite+Bricks	574	0.6	1.0	1.4
Animal feed	864	0. 9	2.2	4.2
Metals	5,440	5.4	16	31
Plastic	15,300	15	36	77
Glass	3,570	3.6	5.3	9.3

Import substitution: Waste analysis

Imports	Secondary material available	Tonnes per annum available	Material worth (ZAR)~	Total jobs potential (SA)
Paper	Paper	70,000	R 109 900 000	57
Stone+Granite+Bricks	C&D	980,000	R 562 520 000	1,370
Animal feed	Organics	120,000	R 103 680 000	500
Metals	Metal	120,000	R 652 800 000	3,720
Plastic	Plastic	52,000	R 795 600 000	4,000
Glass	Glass	38,000	R 135 660 000	353

Manufacturing growth: Sector analysis

Exports	Normalized Trade (ZAR/t)	Jobs per 1000 tonnes		
		Direct (WC)	Total (WC)	Total (SA)
Stone+Bricks	137	0.6	1.0	1.4
Wood and wood products	863	2	3.9	7.3
Fertilizer	172	0.2	0.5	1.6
Paper	1,680	1.5	4.8	8.2

Manufacturing growth : Waste analysis

Exports	Secondary material available	Tonnes per annum available	Material worth (ZAR)~	Total jobs potential (SA)
Stone+Bricks	C&D	980,000	134,260,000	1,370
Wood and wood products	Paper	70,000	60,410,000	50
Fertilizer	Organics	120,000	20,640,000	
Paper	Paper	38,000	117,600,000	57

Where to?

Interventions in “waste management”

	Aggregation/ Storage	Collection	Sorting and pre-processing	Processing/ re-manufacture/Processing	Disposal
Avoid					
Reduce					
Reuse					
Recycle		Policy and legislation			
Recover		Municipal decision support			
Dispose		Market development in C&DW			

?
?
?
?

Interventions in manufacturing

	Product Conceptualisation	Design	Manufacturing	Distribution (wholesale and retail)	Use/ Consumption
Avoid					
Reduce					
Reuse					
Recycle					
Recover					
Dispose					

?????

Interventions in “waste management”

Reduce

Concept	Aggregation/ Storage	Collection	Sorting and pre-processing	Processing/ re-manufacture	Disposal
Alternative mechanism for delivery of service (or?) Plan for servicisation of products	Aggregation/storage to be provided by owner (manufacturer or retailer) -or as a contracted service: provision of storage sevices (including or excluding collection and/or transport)	Collection by owner (manufacturer or retailer) or return by user: Contracted service GC: Engagement with manufacturers on servicisation? Influence: little - manufacturers/ designers mutlinational	By owner (manufacturer or retailer) Contracted service	Manufacturer owned: remanufacture or second user Opportunity for reconditioning of goods?	
Dematerialisation of products and services	Upstream interventions (Economic cycle)				
(a) Reduce packaging					
(b) Lightweighting					
(c) Reduce consumption					

Interventions in manufacturing

Reduce

Product Conceptualisation	Design	Manufacturing	Distribution (wholesale and retail)	Use/ Consumption
Alternative mechanism for delivery of service (or?) Plan for servicisation of products	Design for end-of-life to enable servisiation (e.g. white good communication, condition monitoring, dissasembly; bulk distribution)	Provide mechanism for servicisation of products: -enable remanufacturing and reuse of components -sale of service rather than product (e.g. aircraft engine, photocopier) -maintain ownership of product	Ownership (e.g. car hire companies) Become service provider rather than retailer: -sells service -allow for return of products	"Consumer education - buying patterns ""Use"" servicisation "Mind-set shift from ownership to use of service
Dematerialisation of products and services	Design for dematerialisation (bulk distribution, avoiding non-recyclable materials in packaging/products)	Promoting responsible/sustainable packaging/bulk distribution where possible etc	Promote/stock "sustainable products"	Support/use "sustainable" products
(a) Reduce packaging	-Adapt manufaturing processes -Communication and marketing -Business opportunity for innovation	- Adapt manufaturing processes -Communication and Marketing	-Procurement policy -Create enabling retail environment (bulk packaging) -Allow for dematerialisation e.g. bulk provision of consumer goods/refillable etc -Opportunity for provision of services (e.g. refill station) -Communications & Marketing	-Mind-set shift: -Buy bulk, long-shelf life products where possible (buy products not packaging)
(b) Lightweighting	Use a different material for same outcome Business opportunity for innovation	-Adapt manufaturing processes -Communication and marketing	-Procurement policy -Communications and Marketing	-Mind-set shift: -Purchase/use low impact (lightweight) goods
(c) Reduce consumption	-Concentrated products -More effective products	-Adapt manufaturing processes -Communication and marketing	-Procurement policy -Communications and Marketing	-Mind-set shift: -Purchase/use "adequate" amounts

Integration across the value chain

Product Conceptualisation	Design	Manufacturing	Distribution (wholesale and retail)	Use/ Consumption

	Aggregation/ Storage	Collection	Sorting and pre-processing	Processing/ re-manufacture/Processing	Disposal
Avoid					
Reduce	Avoid				
Reuse	Reduce				
Recycle	Reuse				
Recover	Recycle				
Dispose	Recover				
	Dispose				

There will be challenges

- Boundaries: local vs regional vs national
- Economies of scale?
- Big man versus little man (need to ensure integration of the right people)
- Perception/mindset shift

Thank You

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