# Secondary Aggregates in Roads

## Opportunities and challenges in the South African context

**Road Pavement Forum**

4 May 2016

GreenCape

# The Nature of Secondary Materials

Secondary materials are sometimes called ‘wastes’

- Waste is something to which we ascribe no value
- Construction and demolition ‘waste’ (C&DW)
  - Energy – extraction and production
  - Distribution networks
- = Inherent value?
- Economic viability?

# Inherent Value – Inherent Issues?

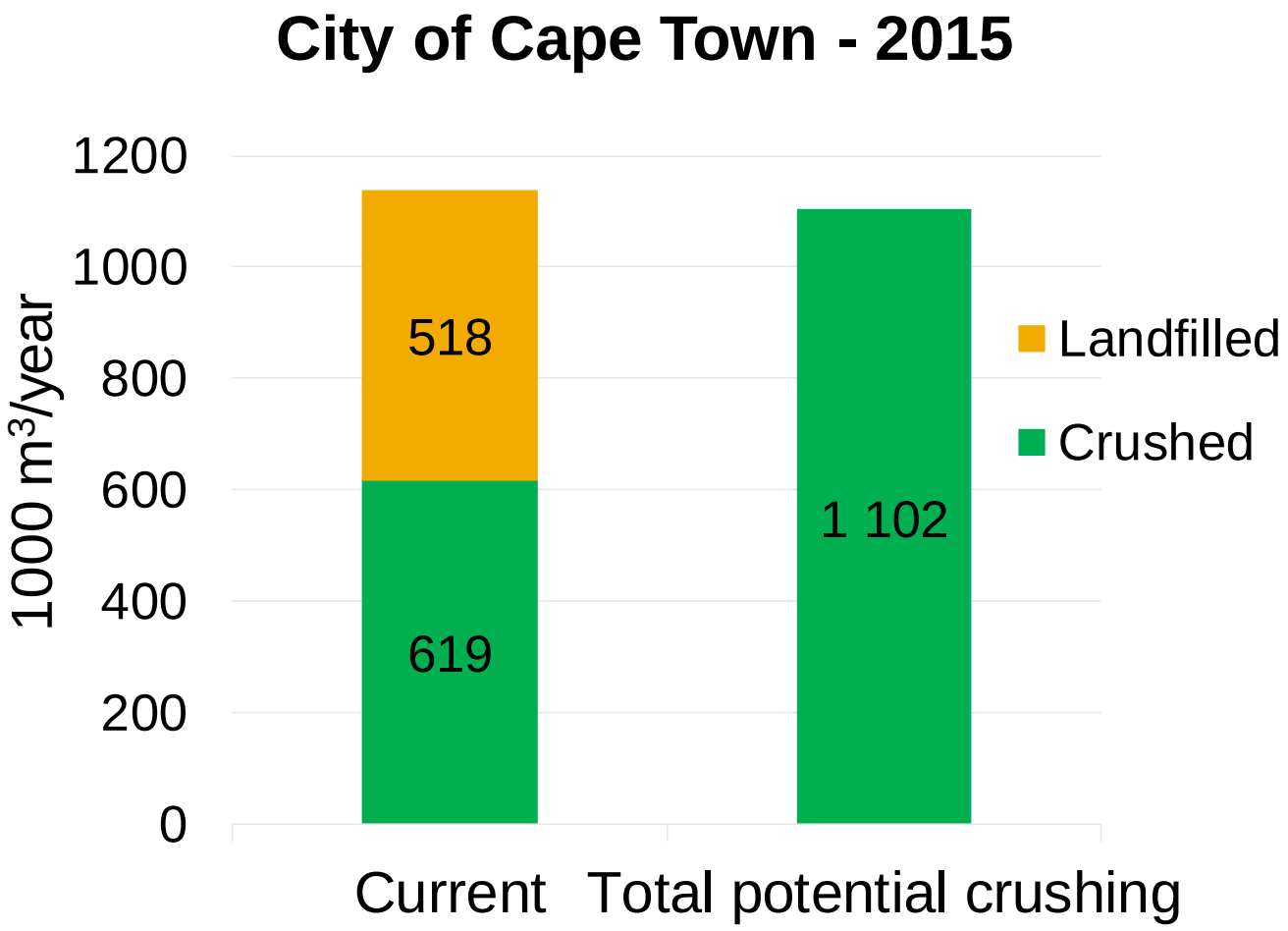
Materials should be used appropriately – according to their properties

- Secondary materials do not come neatly packaged!
  - Have 'baggage' – a history of handling or mis-handling
  - Consistency in supply and quality?

…does not necessarily mean virgin materials trump secondary materials

- E.g. high clay content in Cape quarries
- Secondary properties (such as self-cementing) can actually improve performance of secondary materials

# What is the Current Status of the market in processed builders' rubble?




## Feedstock

- 6 major crushers
- Landfill data – clean builders' rubble
- 56% of clean builders' rubble is processed and re-used

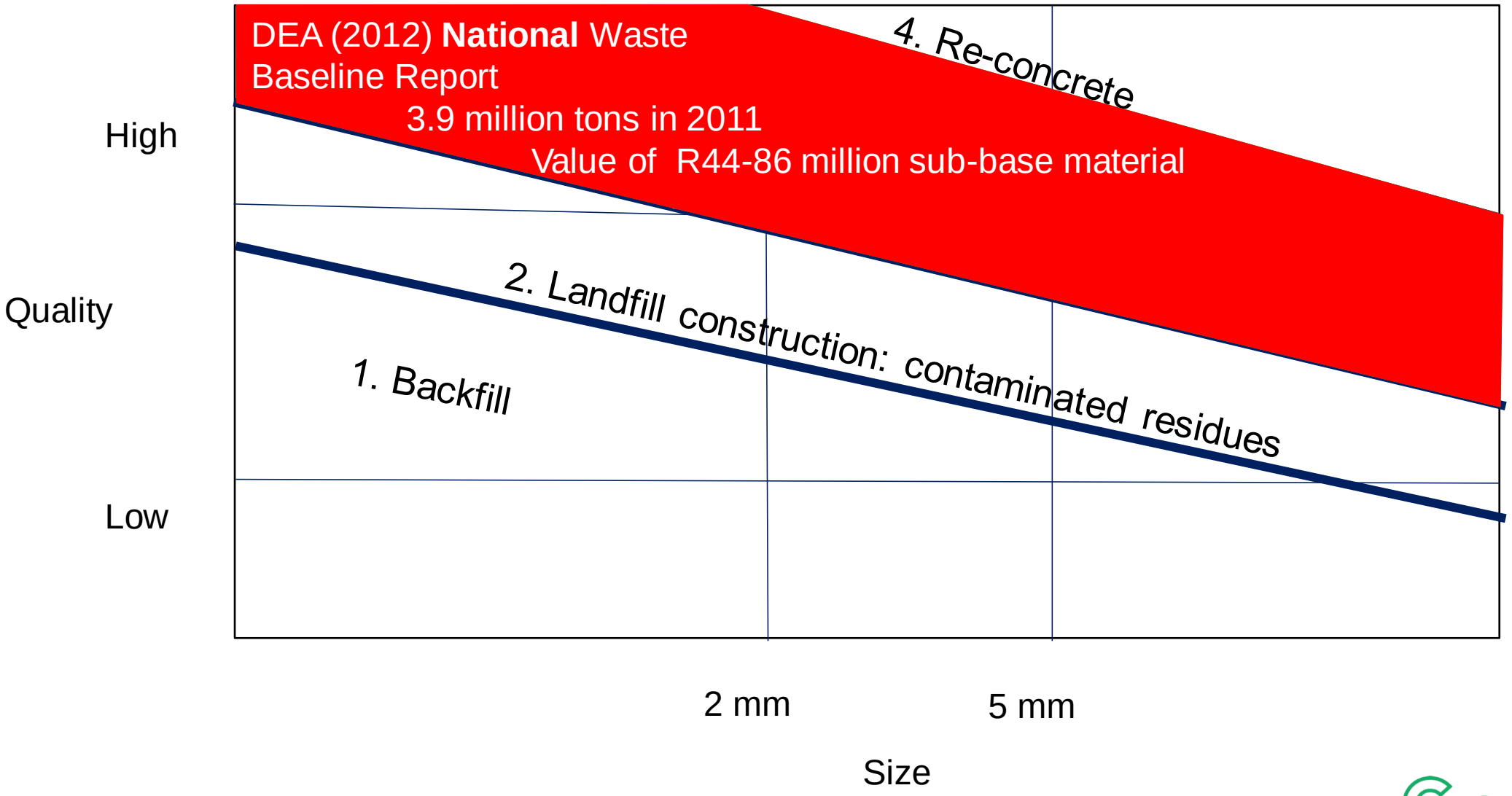
## End Users

- Application: fill, foundations, **roads**
- Repeat customers
- Quality control and testing

## Future Plans

- Next 2-5 years, total of planned + existing capacity is 1.1 million $m^3$ per year

# Matching Quality and Application



# Secondary Materials in Roads

## Application in road rehabilitation and construction

- Secondary material economies e.g. Netherlands and Japan with 90-95% diversion of C&DW from landfill
  - 80-85% of the material diverted finds a ‘home’ in roads.
- Examples from China to the Netherlands, Brazil to the USA, Australia to Japan
  - Differing construction methods
  - Differing parent materials
  - Differing climate and hydrological conditions

**One thing in common**

Successful application of secondary materials in road construction and rehabilitation

# Performance of Secondary Materials in Roads

Stellenbosch University – Chantal Rudman, Kim Jenkins, Martin Van de Ven (Delft)

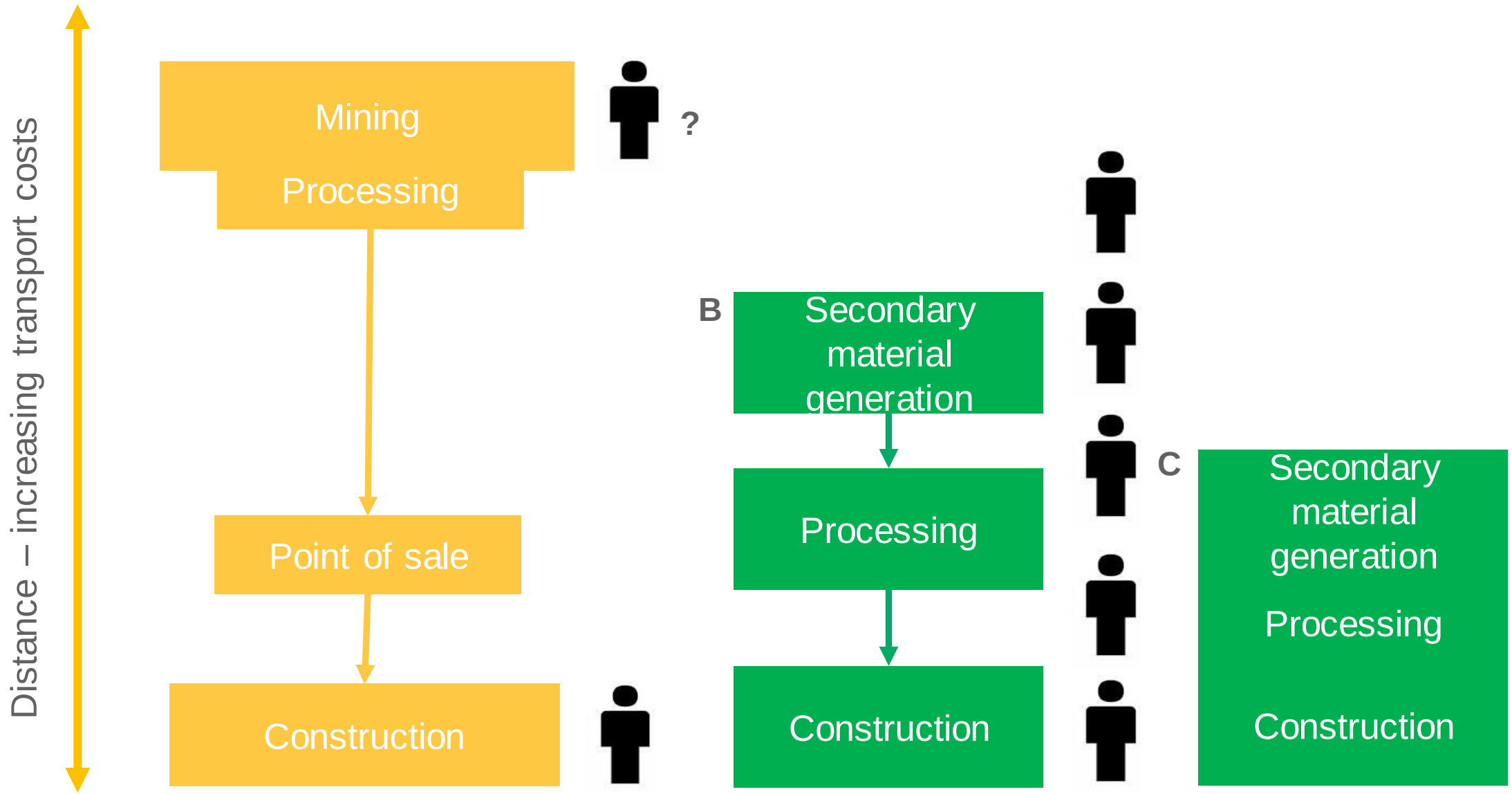
- Performance behaviour
  - Shear, resilient modulus and permanent deformation characteristics = G-materials
- Governing parameters
  - Separation and secondary crushing for quality of recycled materials
  - Composition, compaction and moisture have a significant effect
- Durability issues
  - Self-cementing behaviour prevalent in all secondary material mixes tested
  - Preliminary shrinkage tests: secondary aggregate mixes don't have the micro-cracking issues of cemented materials

Masters Thesis: Sunscholar_Barisanga, Semugaza

Masters Projects: On request_Cleghorn, Fourie

Other Projects: On request_Van Zyl,Du Toit, Ashlager

# Secondary Materials – what benefits?



# Benefits – Job Creation

## Key national goal

- National Development Plan
- Industrial Policy Action Plan of dti (2014/2015-2016/2017)

## From 6 major crushers surveyed

- Average of 9.7 jobs per 1000m$^3$ processed
  - Large range from 1,2 (fill) to 30 jobs (higher quality material) per 1000m$^3$
- Lowest skill levels
- Substitution of labour for energy
  - Especially for high quality material

# Benefits to Municipalities

## Benefits to municipalities

- Cost savings re landfill operating costs and landfill airspace
  - E.g. CoCT at cost of landfilling at R400/t, cost savings will be R224 million from diverting 60% of material from 2015 baseline data in 1 year
    - The capex for CoCT 2016/17 = R237 million
    - Cost savings could be 95% of capex budget for 2016/17
- Illegal dumping – R350 million per year
  - Data mimics infrastructure gaps

# Benefits – the Business Case

- Landfill fees are low
- Limited legislation incentivising diversion

Yet the secondary materials economy accounts for 56% of clean builders rubble in the City of Cape Town

Primary importance

LOCAL economy: transport key factor in business case

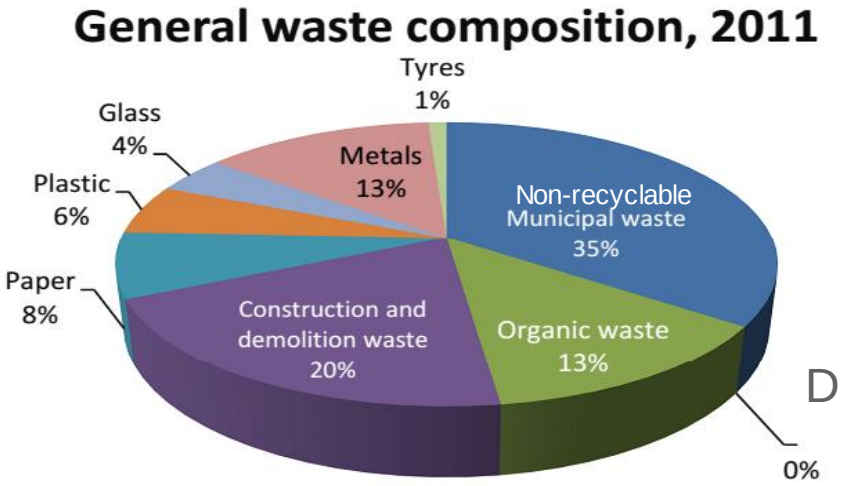
# Drivers of a Secondary Materials Economy

Current

- Increasing cost of virgin materials
- Siting new quarries and borrow pits

Future

- Landfill airspace – heading for a productive crisis?
- Regulation of waste flows through national, provincial and local legislation




C&DW in 2011 – 4 725 000t
16% recycled

DEA, 2012 National Waste Information Baseline Report

# Barriers

## Public sector perspective

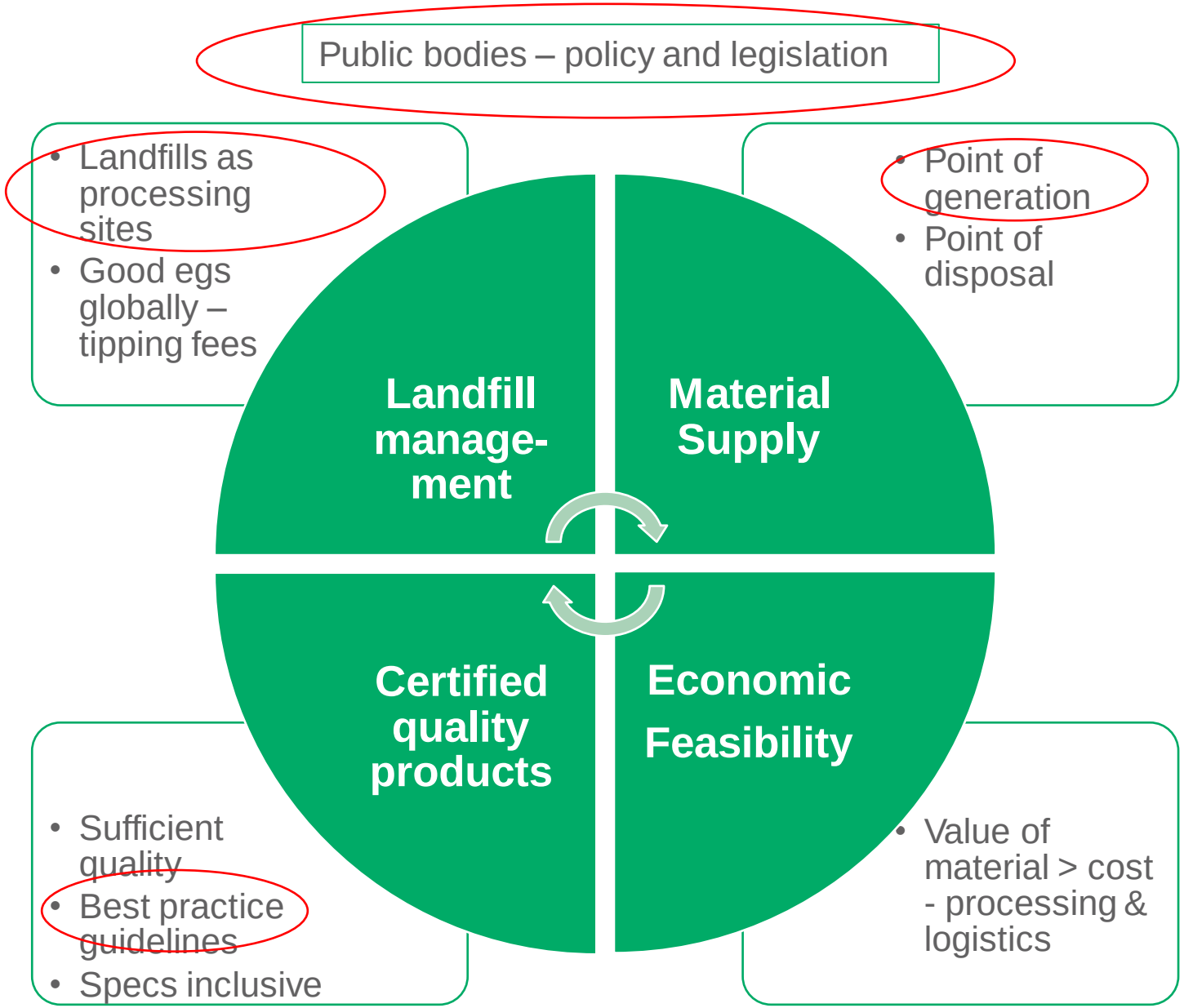
- Lack of infrastructure
- Lack of quality control for crushing industry
- Specs for road building aggregate exclusive of secondary materials

## Private sector perspective

- Lack of infrastructure – limiting feedstock supply
- Requirement of a waste licence for crushing sites
- Perceptions – usefulness of secondary material in roads specifically – extremes of responses from construction industry
- Municipalities refusal to accept secondary materials for roads

**From "No brainer" to "No ways"!**

# Points of intervention



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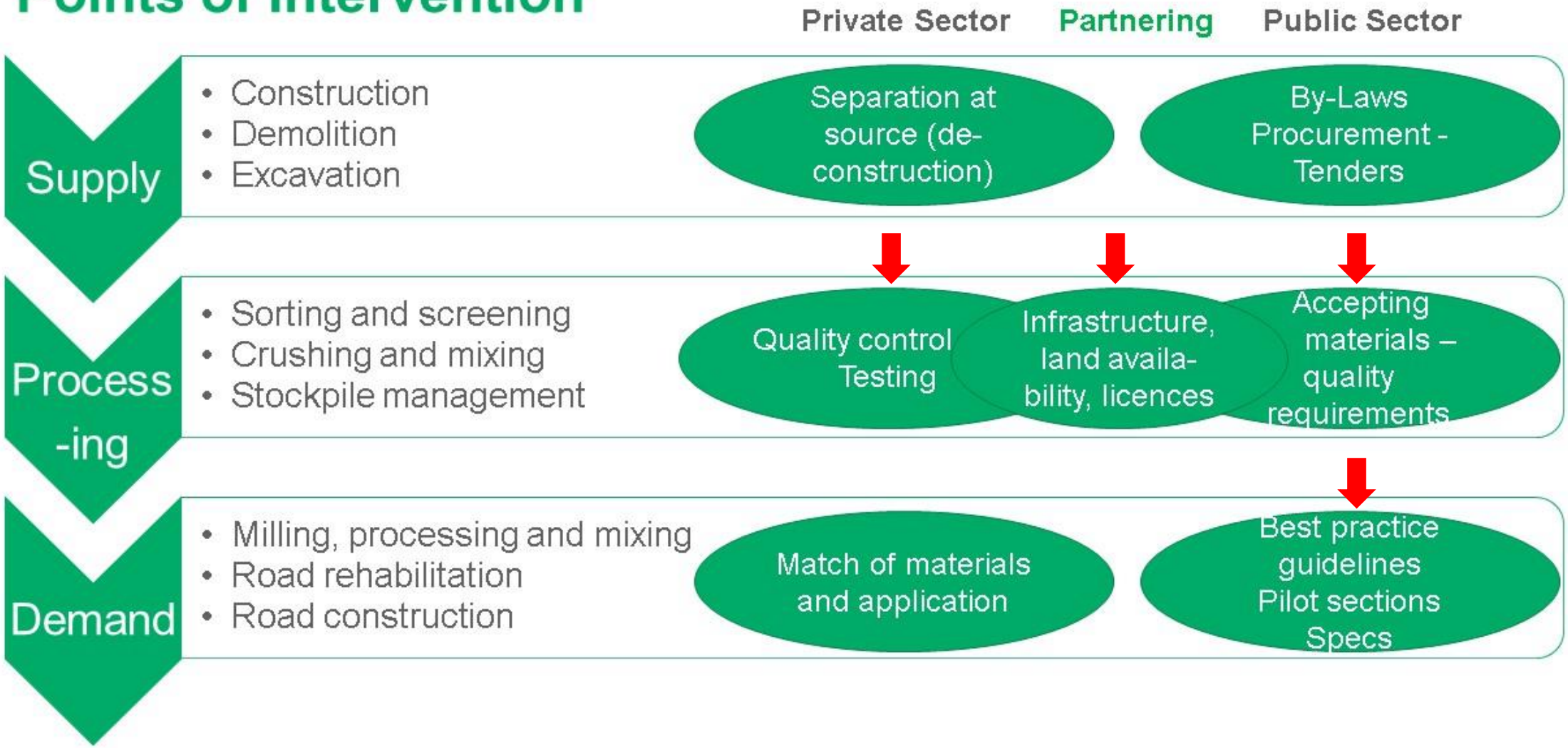

# Thank You

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# Potential in secondary materials industry

## Growth in feedstock expected

- Outlook construction in SA
  - Planned infrastructure investment
  - Increasing demand for
  - With planned infrastructure investment, and increasing demand for residential developments, as well as City densification strategies, the volumes of builders' rubble will increase
  - Addressing illegal dumping and separation of material at source will release more feedstock into the market
  - Developed countries average 8-9 t aggregate per capita per year, SA is 2-3 t per capita per year – trajectory towards 8-9 t.
- European estimate – only 10-15% of market demand can be satisfied by secondary materials