A secondary materials economy in construction and demolition waste - opportunities and challenges in concrete

Presented by:

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Our journey today

• Nature of secondary materials – pros and cons
• An economy in secondary materials from builders’ rubble
  • Drivers
  • Value chain
• Where are the opportunities for secondary concrete?
  • Matching quality and application
  • Size of opportunity
  • What is being recycled and why?
  • Barriers to recovery, processing and application?
• To what extent do we need to ‘create’ an economy?
• Current and imminent enablers
• Where to from here?
  • Not a one-man/woman job! We need you...
  • What are the successes, and learnings from failures?
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
  - Eg. high clay content in Cape quarries
  - Secondary properties (such as self-cementing) can actually improve performance of secondary materials
Current Drivers of a Secondary Materials Economy

- Increasing cost of virgin materials
- Siting new quarries
- Regulation of waste flows through national, provincial and local legislation
- Landfill airspace – heading for a productive crisis?

![General waste composition, 2011](image)

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

Secondary Materials = an Opportunity

A

Mining

Distance – increasing transport costs

Point of sale

Processing

B

Secondary material generation

Processing

C

Secondary material generation

Processing

Construction

Construction

Virgin Materials

Secondary Materials
What are the opportunities in secondary concrete?

• Re-concrete
  • Crushing concrete to -4mm
  • Inclusion in cement mixes, return to readymix/ precast manufacturing

• Concrete aggregate
  • Appropriate crushing and grading for application
  • In order of decreasing quality
    • Base course, sub-base in roads, foundations, fill
    • Last two applications may successfully include fired clay brick, especially fill material

What about other waste for ‘greener concrete’?

• Additives to cement and concrete – flyash and slag
• M&R zero cement concrete
Matching Quality to Application

  - 3,969,455 tons in 2011
  - Value of R44.1-86.0 million
- Highest value application into material value practical?

<table>
<thead>
<tr>
<th>Quality</th>
<th>Size</th>
<th>Application</th>
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<tbody>
<tr>
<td>High</td>
<td>2 mm</td>
<td>2. Landfill construction: contaminated residues</td>
</tr>
<tr>
<td></td>
<td>5 mm</td>
<td>1. Backfill</td>
</tr>
<tr>
<td>Low</td>
<td>2 mm</td>
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<tr>
<td></td>
<td>5 mm</td>
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Value of R10.4-20.2 million per year

969 455 tons in 2011
Value of R44.1-86.0 million
Sub-base material

Highest value application into material value practical?
What is being recycled and why? Materials

**Cement**
- Client-driven for Green Star rating
- Innovation-driven – reputation for major construction company
- Economics
  - Amended with crushed concrete (rare)
  - Amended with flyash and slag – major cement producers

**Builders’ rubble (focus on concrete)**
- Predominantly private sector
  - Economically driven
    - Internal processing
    - Also acceptance of external
    - Cheaper than virgin
    - Supply and demand dependent on logistics
  - Demand – high in W Cape, growing in Gauteng, limited in KZN
  - Quality – lab testing to COLTO specs in W Cape and Gauteng
    - Repeat clients
  - Application – fill, foundations, roads, limited in re-concreting

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![C&DW Landfilled and Crushed in City of Cape Town](chart.png)

- **Current - Landfilled and Crushed in City of Cape Town**
  - Landfilled
  - Crushed
- **Future - Total crushed**
What is being recycled and why? Applications

Readymix industry (countrywide)

• Waste is inefficiency

• Returned concrete crushed and returned to mix
  • Economically viable where crushers available
    • Internally or
    • Associated quarry

• Limited uptake currently
  • Known recyclers – 1 in each Gauteng, KZN, W Cape
What is being recycled and why? Applications

Roads

• Gauteng
Any info please?!

• KZN
Pilot eThekwini & UKZN – secondary aggregate in road embankment (successful)

History – successful application in road 25 years old

• Western Cape

SU – performance of secondary aggregate in roads

• very promising results with adequate aggregate processing

• Private sector – high quality material available, successful application (e.g., 20-25 years old)

• 3 main contractors utilise secondary aggregate in sub-base and even base courses
  • Waiting for City to accept secondary aggregate
Barriers to recovery and recycling of concrete? Crushing

**General**
- **Siting of crushers**
  - Prohibitive logistics costs
- **Costing**
  - Landfill generally cheaper
  - High costs of sorting
- **Quality of supply**
  - Quality of ‘waste’ (differs regionally)
    - Lack of consistency
  - Poor sorting at points of generation

**KZN**
- Lack of accurate waste data – what is the size of the opportunity?
- Very limited crushing capacity for builders’ rubble
  - Potential for virgin material crushers to expand into market?
- Purely client-driven, low awareness
- Limited demand side
  - Low availability of secondary streams

**Gauteng**
- Limited infrastructure but growing
- Secondary streams on offer relatively limited but growing

**Western Cape**
- Licensing requirements for crushing tenders
- High costs – mitigation for crushers in highly developed areas
  - Industrial and residential
Barriers to recovery and recycling of concrete?

Application

Cement and Readymix Industry
- Low demand
  - Greater expense to amend with secondary concrete, than flyash or slag
- Low potential to include external wastes
  - Barrier is quality and size of material
- Green Star Rating limited influence (0.1-0.2% of scoring is cement)

Precast concrete manufacturing
- Small volumes of waste per site
- Double crushing to 4mm
- Sufficient demand for other streams

Rocks
- Perception of poor performance of secondary aggregate
- Quality control – lack of best practice guidelines and governance for crushers
- Lack of aggregate standards inclusive of secondary materials
- Risk averse public sector

1st in application quality: Re-concreting
2nd in application quality: Aggregate
Biggest Opportunity; Ease of influence?
Do we need to ‘create’ an economy?

- Value of material > cost - processing & logistics
- Sufficient quality
- Best practice guidelines
- Specs inclusive
- Landfills as processing sites
- Good eggs globally – tipping fees

Public bodies – policy and legislation

- Point of generation
- Point of disposal

Landfill management

Material Supply

Certified quality products

Economic Feasibility

• Value of material > cost - processing & logistics
Enablers – legislation and policy

Legislative (current)
• Norms and standards for storage of general waste (2013)
• National Environmental Management Laws Amendment Act (NEMLAA, No 25 of 2014
  • Supply of secondary aggregates for road building
  • Private and public sector now require EIAs and licences for every borrow pit

Legislative (upcoming)
• Norms and Standards for sorting, shredding, grinding, crushing, screening, chipping or baling of general waste
Enablers – legislation and policy cont.

Legislative (upcoming)

• End of waste – proposed regulations to exclude a waste stream or a portion of a waste stream from the definition of waste (under NEM:WA, in 2014)

Policy and Information

• Reporting to a waste information system
  • National
  • Provincial
  • Local
• Draft Western Cape IWM By-Law
Some helpful initiatives

Free services

- **Waste Economy Project – construction and demolition waste**
  - Contact Kirsten Barnes (kirsten@greencape.co.za)
- **Gauteng Industrial Symbiosis Programme (hosted by the NCPC)**
  - Contact Henry Nuwarinda (HNuwarinda@csir.co.za)
- **KZN Industrial Symbiosis Programme (hosted by the NCPC)**
  - Contact Henry Nuwarinda (HNuwarinda@csir.co.za)
- **Western Cape Industrial Symbiosis Programme (hosted by GreenCape)**
  - Contact Sarah O’Carroll (wisp@greencape.co.za)
- **City of Cape Town – Integrated Waste Exchange (IWEX)**
Where to from here?

Good news!

• DST Waste Roadmap identified builders’ rubble as a valuable stream with a low barrier to development

• An economy in secondary concrete MUST be regional
  • All key players are known in networks and accessible
  • Local experience is vital

The ask…

• Co-design of solutions for our regions

• All role players needed

• Engage re opportunities and barriers
  • What would you like to know? What information in what format can help stimulate this industry?
  • If we can’t assist (outside our mandate) we will provide contacts as far as possible
Thank You

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