Sustainability in Construction

Shahed Khan

Curtin University, Australia

Formerly Head of Program (Planning/ Environmental Planning) at UWS, Australia

Dealing with Refurbishment

- Many cities have a large stock of ageing buildings:
  - underperforming:
    - high energy consumption
    - sick building syndrome
    - underutilised spaces
- Should we demolish or refurbish/ retrofit?
  - What would be more sustainable?

The Sustainability Angle

- Refurbishing/ Retrofitting conserves material and energy resources, respects embodied energy, etc.
  - promotes Three 'R's – Reuse, Recycle, Repair
  - avoids wholesale demolition and reduces waste generation
- It meets the Sustainability challenge:
  - non-renewable resources including energy resources,
  - waste assimilation capacity
- We need to slow down 'throughput' (Herman Daly's '*Steady State Economy*')

Financially Feasible Sustainability

- Bill Clinton Foundation's $5 billion financing program to retrofit energy-hungry heating, cooling and lighting systems in older buildings in 15 large cities – including **Karachi**.
- Sustainability/ climate change concerns:
  - Urban areas cause 75 % of all energy use and greenhouse emissions
  - Buildings cause 40% to 70% greenhouse emissions and 80 % carbon emissions

The Value in Refurbishment

- The construction industry - high generator of solid waste products.
- Waste minimisation strategies in refurbishment can improve the sustainability of the built environment as a whole
  - the refurbishment process is part of the loop of resource consumption.
  - it extends the useful life of a building - allows continued use of the resources initially used in its construction.

- ‘Demolition’ is not the only way – if we plan ahead during design/ construction
  - Design for ‘deconstruction’ and ‘disassembly’ can ensure future life cycles of building components - ongoing savings
  - A move towards the cyclic processes of systems in the natural world ?
  - This can certainly be aimed for as a worthwhile goal!
- But we need baseline information first …

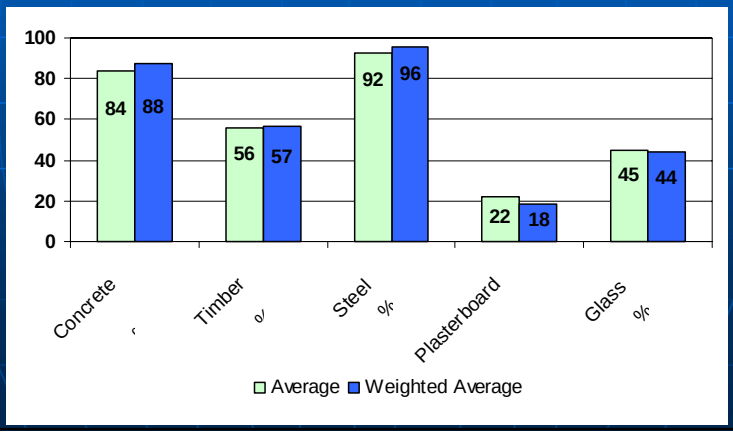
The Study - Why?

- Study of waste minimisation in commercial office building refurbishments in Australia
  - In any refurbishment, are we effectively minimising waste?
- Information vacuum:
  - Scant information is available about the ultimate destination of material removed in refurbishment projects
  - Recycling rates quoted in ‘*Waste Management Plans*’ submitted for approval may have little correlation with the actual rates
- There are no validated benchmarks or targets to use for reference
  - How to identify any areas of underperformance?
  - How to make life cycle evaluations of building materials?

So, what did we find?

Reuse/Recycling Rates

- High average rates specified for concrete and steel, mid level rates for timber and glass and low rates for plasterboard.



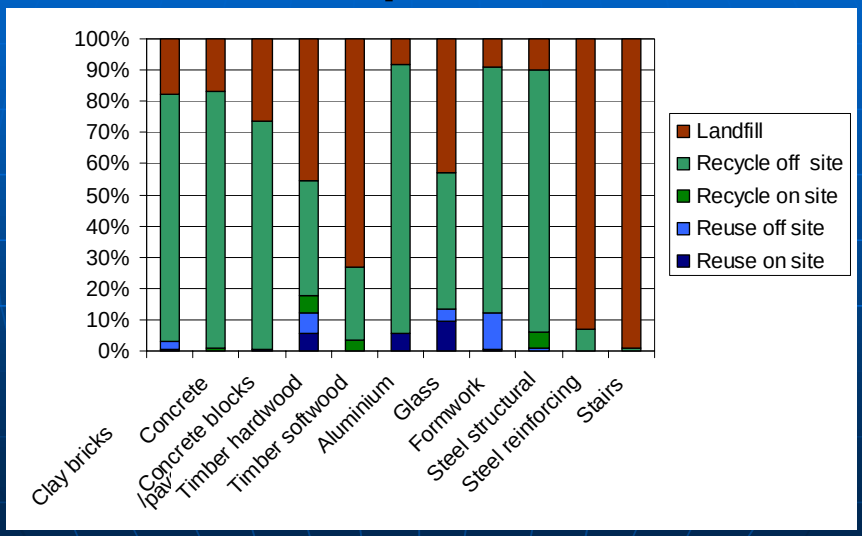
- Now it is standard practice to separate ferrous metal from construction waste
  - only residual amounts in unseparated components end up in landfill.
- Recycling of concrete is driven by the cost of sending bulk waste to landfill
  - systems are now in place to crush and recycle concrete waste
- Timber reuse/ recycle rate is very dependent on section sizes and its quality

On-site sorting of metal

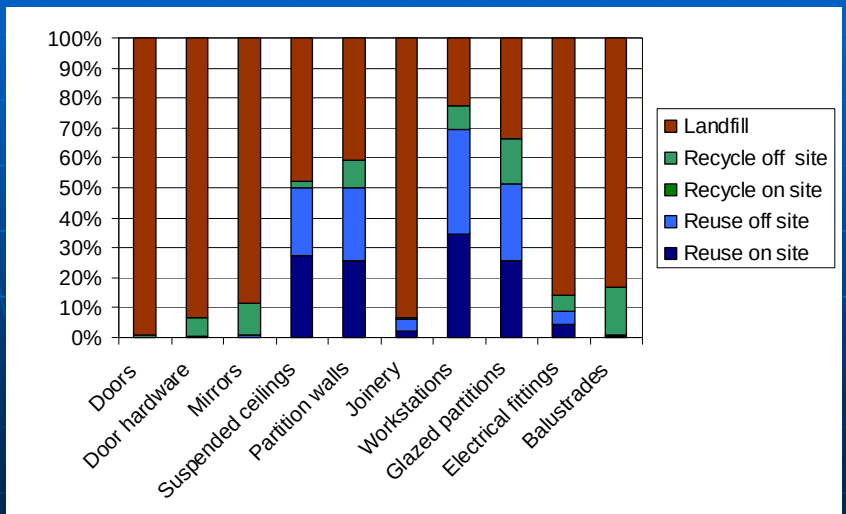
Not the Landfill !

- Landfill sites – the Planners' nightmare!
- Cities are running out of landfill spaces
  - land getting expensive
  - location issue - NIMBY syndrome
- Environmental catastrophe
  - greenhouse gases release - methane gas emitted even 30 years after the tip is closed
  - potentially contaminated land, dangerous surface water runoffs
  - unaesthetic, unpleasant – expensive remediation
- So where does the construction/ demolition waste go?

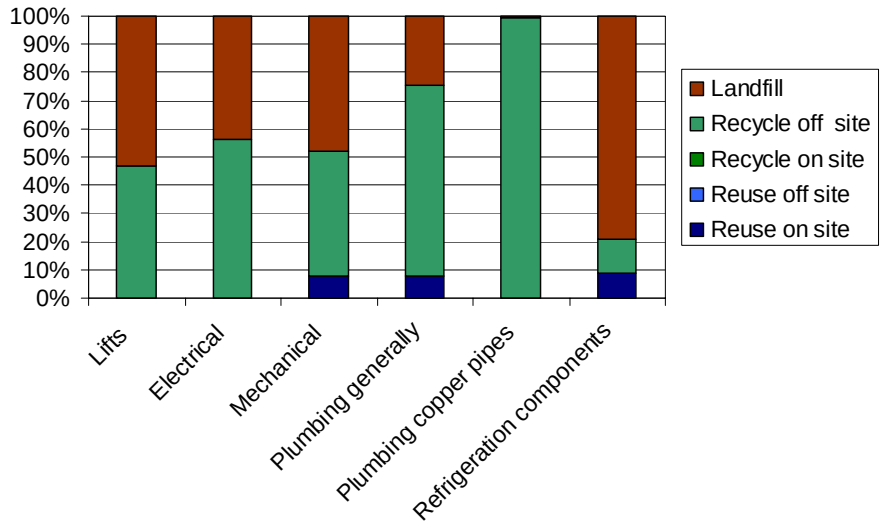
Destination of Building Fabric Components



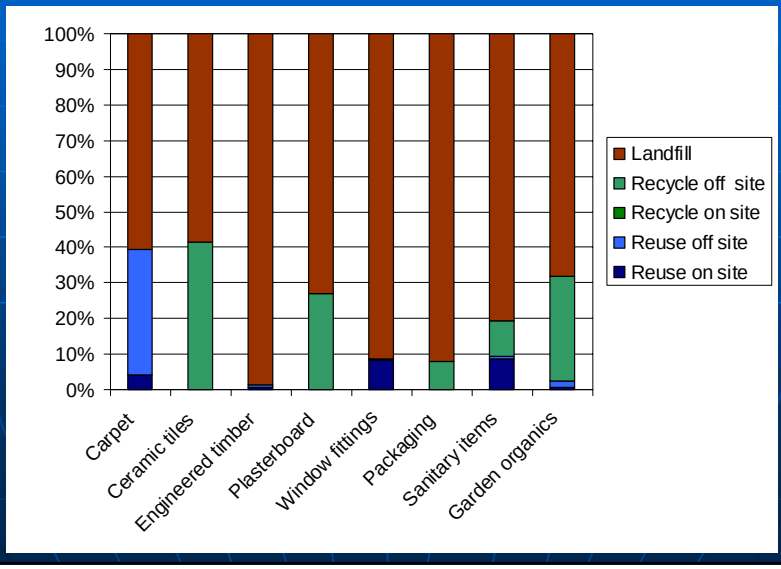
Destination of Fittings Components



Destination of Services Components



Destination of Finish Components



Some Other Findings of the Study

Regulations and Controls ?

- Regulatory tools must be effective
- Current ‘Waste Management Plans’ do not seem to deliver
- Regulations are good when they are enforceable
  - Enforcement of regulations need monitoring
  - Effective monitoring needs information to set scales/ measures/ standards for assessment
- The study sought to create that information

Waste Management Plans

- Waste Management Plans (development control requirement) OR in-house reporting requirement?
  - Anecdotal evidence suggests that sometimes one WMPlan is "recycled" for another project
  - *"Most references to environmental management are cosmetic, the paperwork just has to be done".*

The reality in Australia :

- Generally a broad statement relating to waste minimisation is included in both *Head Contracts* and *Subcontracts*
- Rarely, however, is waste minimisation addressed at the level of *Bill of Quantities*.

Barriers to recycling/ reuse

- Cost is the most significant factor in decision making about waste outcomes – do they go to landfill or get recycled/ reused
  - however, environmental issues are also considered by some
  - *"We will pay a little more to do the right thing".*
- There is no standard method of actually measuring waste on a commercial refurbishment
  - by volume – concern for onsite sorting, number of bin movements to landfills
  - by weight – tip fees, levies calculation
- Makes decision-making difficult – intuitive not scientific
- Makes recording of waste destinations difficult – which limits the information availability

Recommendations

- Industry (private sector) and regulators (government) need to develop - in partnership with universities/ research institutes) - a more systematic approach to documenting Best Practice ideas in construction waste management.
- We need to train personnel to carry out waste management tasks on construction sites
- We need to train personnel in retrofitting of old buildings

- Studies such as this need to be commissioned to fill up the information vacuum – so we can set directions and standards
- Karachi must capitalise on Clinton Foundation's program
- Private sector and the City government should
  - assemble sufficient scale projects
  - minimise contractual and other bureaucratic processes
  - match interest of providers
  - build up local skill base

End of Presentation