Can Construction & Demolition Activities Be Material Recovery Projects?

Data Requirements for Deployment of the UNFC

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Sankey Diagram of Material Flows Through the Global Economy (Gt in 2005)

- Total extraction
- Materials processed
- Material use
- End-of-life waste
- Processed output to the environment

~28 Gt in 2005 → 45 Gt in 2014 → ~80 Gt in 2025?

CIRCULAR RESOURCE FLOWS IN THE CONSTRUCTION MATERIAL LIFE CYCLE

- **Natural Deposit**
- **Land Disposal**
- **Natural Resource Extraction**
- **Anthropogenic Resource Mining**
- **Material Processing**
- **Off-site Manufacture**
- **On-site Construction / Refurbishment**
- **Service stock**
- **End-of-service**
- **Demolition stock**
- **Treatment eg, sorting de-contamination repair**
- **Other Systems stock**

**Key Elements:**
- **BY-PRODUCTS & RESIDUALS**
- **GOODS**
- **material recycling**
- **component re-use**
- **structure re-use**
- **industrial symbiosis**
- **losses**

**Legend:**
- life cycle stage
- material stock
- extraction from stock
- return to stock
- raw material flow
- by-product flow
- system boundary
UKRI Interdisciplinary Circular Economy Centre for Mineral-based Construction Materials

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Case Study: Material recovery from 2021 basement demolition & sustainable office building construction

JJ Mack Office Building, London, UK

Aggregation of Material Recovery Subprojects:
1. Concrete
2. Brick
3. Tiles & ceramics
4. Mixed stony waste
5. Mixed metal
6. Timber

Acknowledgement: Mace Group
G-axis: Degree of confidence

- Case study uses company records of construction waste and demolition material quantities → high confidence for mixed material categories (G1)
- Lower confidence for separated higher quality materials, e.g., Cu from Al and steel, or cement powder from crushed concrete

Better Data Sources: pre-demolition audits, building information management (BIM) systems

F-axis: Technical feasibility

- Identification of technologies for recovery of each material at the desired quality
- Different technology readiness levels for common practice vs potential for better products
- Transfer coefficients for all materials to enable assessment of product quality
- Existence of infrastructure: transport, energy, water, etc.
**E-axis: Environmental-social-economic viability**

**Economic Viability**
- Capital and operating costs of recovery of the target material streams, e.g.,
  - market prices (usually costs) for recovered materials
  - costs and payback period for equipment to internally process materials for higher value recovery
  - labour and costs for management of residual materials and externalities, etc.

**Environmental and Social Viability**
- Compliance with the UK planning regime
  - Public consultation
  - Environmental Impact Assessment (EIA)

**Additional aspects:**
emissions savings, worker safety, jobs and economic opportunities, community stability …?
Thank you!

Please get in touch if you have a UNFC case study for a construction material recovery project …

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