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Feasibility evaluation of Construction and Demolition Waste recycling plants in Vietnam

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Background

Survey objectives

Survey methodology

Survey findings

Conclusions

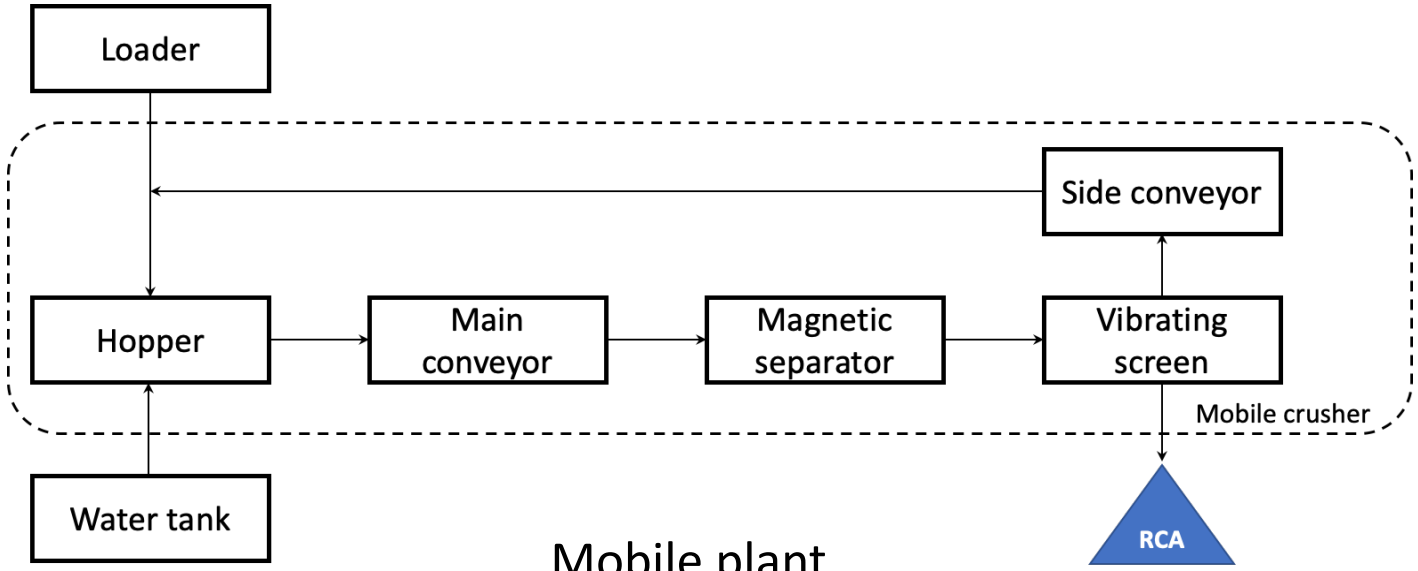
Background

- Increasing amount of CDW generated
- Poor CDW management: illegal dumping and associated issues
- Only about 10% of CDW is reused and recycled
- No CDW recycling plant is in operation in Hanoi, Vietnam
- No study exists on feasibility of CDW recycling industry

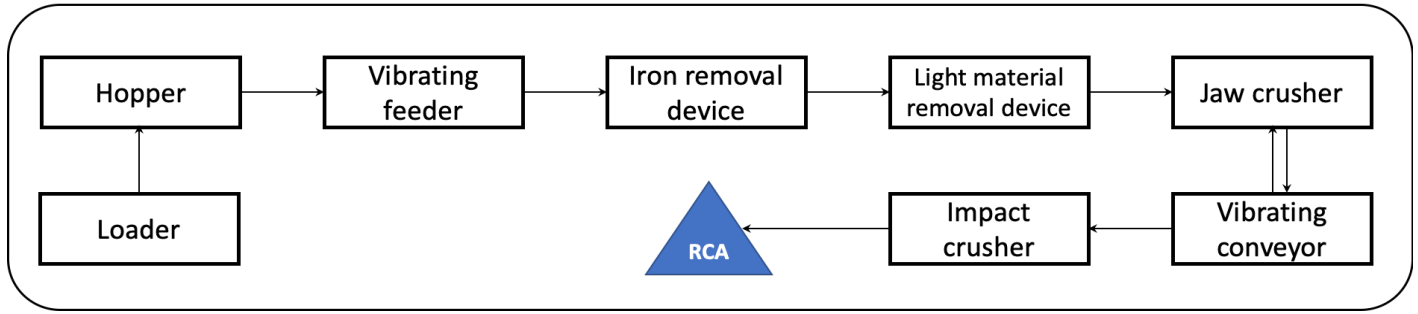
Survey objectives

1. To identify supply and demand for the CDW recycling industry in Hanoi, Vietnam
2. To identify costs and benefits of CDW recycling plants

Methodology



Mobile plant



Stationary plant

- Target products:
  - Concrete waste (CW): feed materials
  - Recycled Concrete Aggregates (RCA): output materials
- Mobile plant (on-site processing) and Stationary plant (off-site processing)

Method (cont.): Supply and demand estimation

- **CW supply:** based on the weight-per-construction-area method
  - $FA_{Di} = TA_{i-1} + FA_{Ci} - TA_i$

    FA_D: Demolition area, FA_C: Construction area, TA: Total area
  - WGR of WC: 353 kg/m^2 and 204 kg/m^2 for large and small-scaled demolition; 2.88 kg/m^2 and 62.8 kg/m^2 for construction
- **RCA demand:** amounts of virgin aggregates needed for road base and sub-base
  - R = L x W x T x D

    R: Potential demand, L: Length of newly constructed road, W: Average road width, T: Thickness of road base and subbase, D: Aggregate dry intensity.

Method (cont.): Cost and Benefit Analysis

	Financial eva.	Economic eva.
Financial benefits	✓	✓
Socio-environmental benefits		✓
Capital costs	✓	✓
Operating costs	✓	✓
Tax	✓	

- Financial and economic evaluation

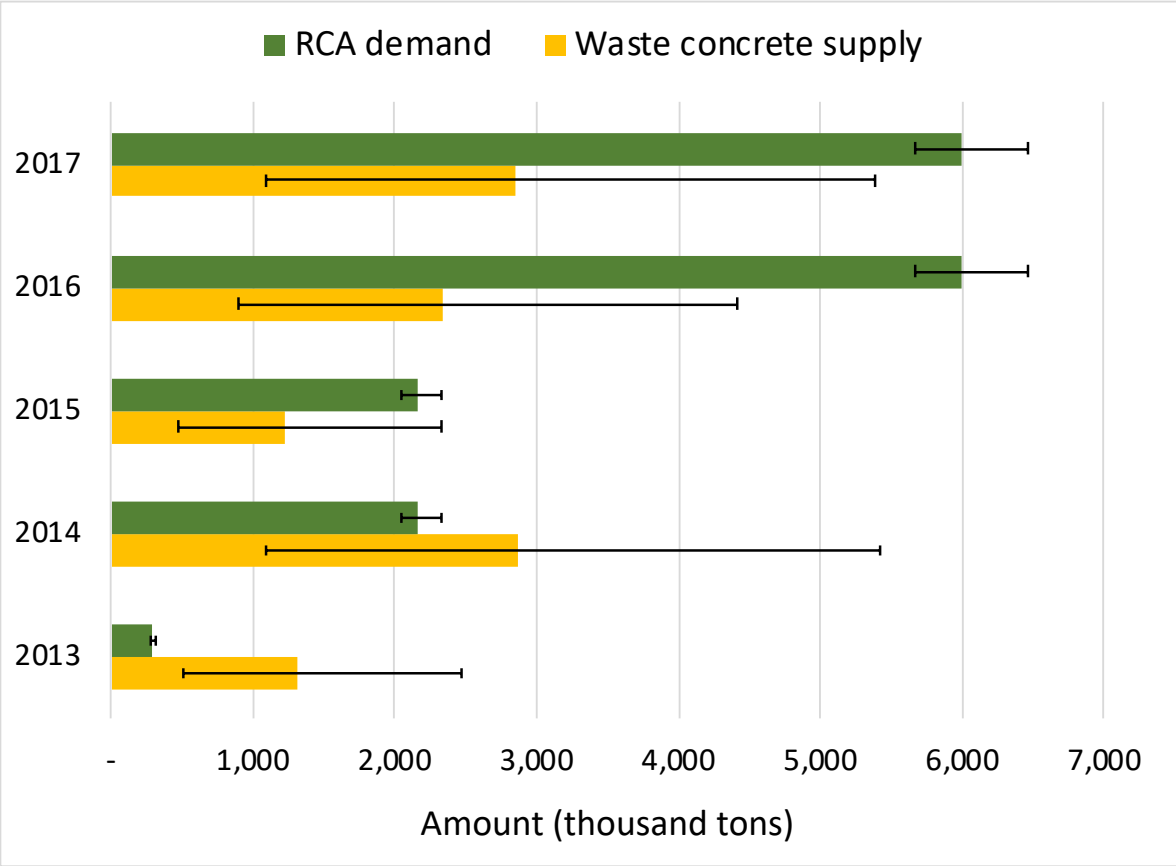
  - Financial eva.: investors' perspectives

  - Economic eva.: society's perspectives (social CBA)

- Discounted cash flow method
- Net Present Value (NPV), Internal Rate of Return (IRR), Equivalent Annuity Cash Flow (EACF)

The higher, the better

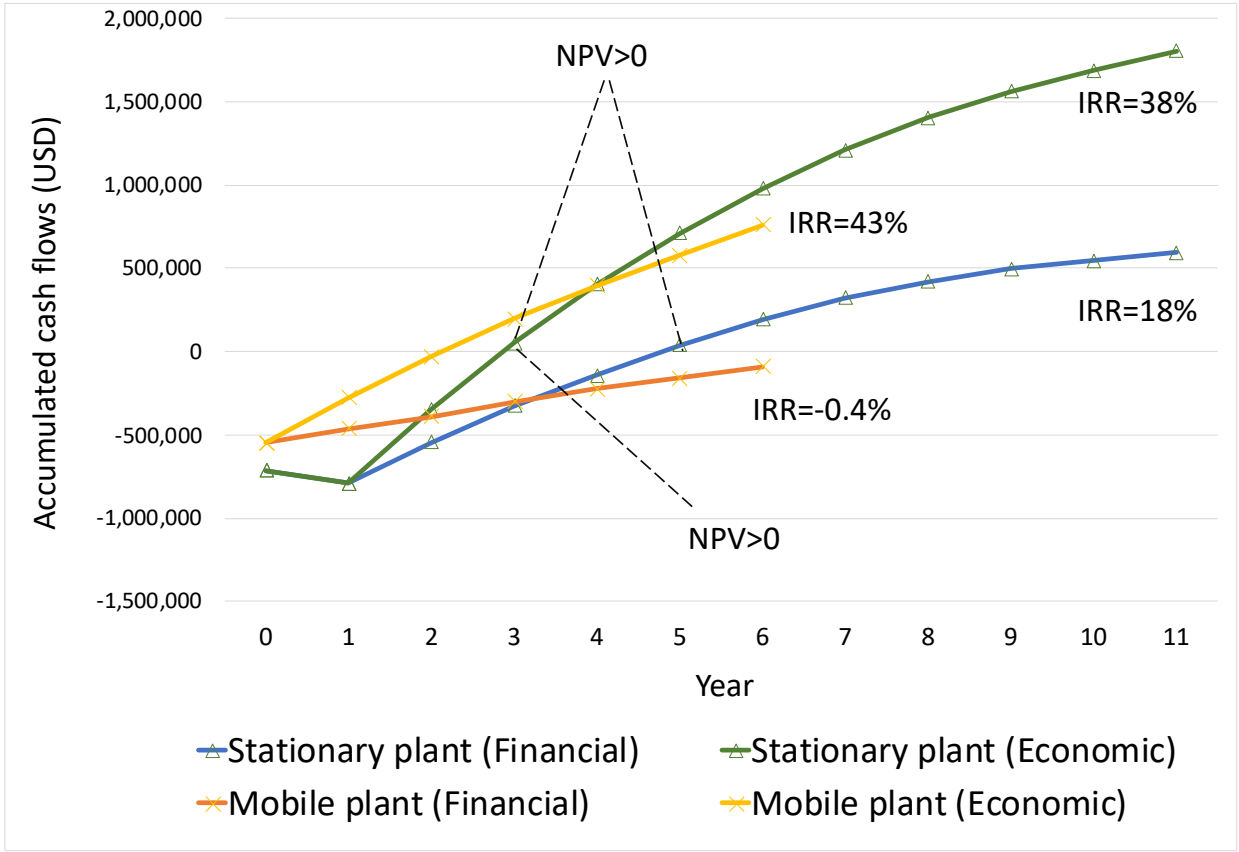
Results: Estimated supply and demand



- The supply - demand gap of waste concrete was remarkable after 2016 due to the Hanoi road expansion program.
- Estimation variations derive from differences in construction techniques, worker skills, etc.

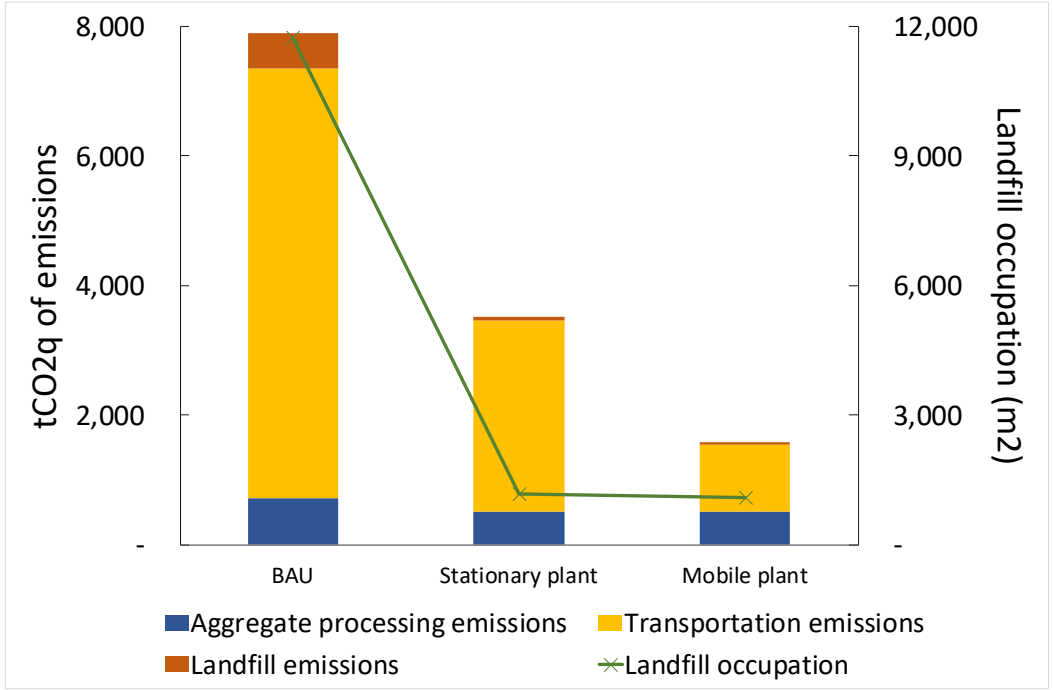
Discounted cash flows

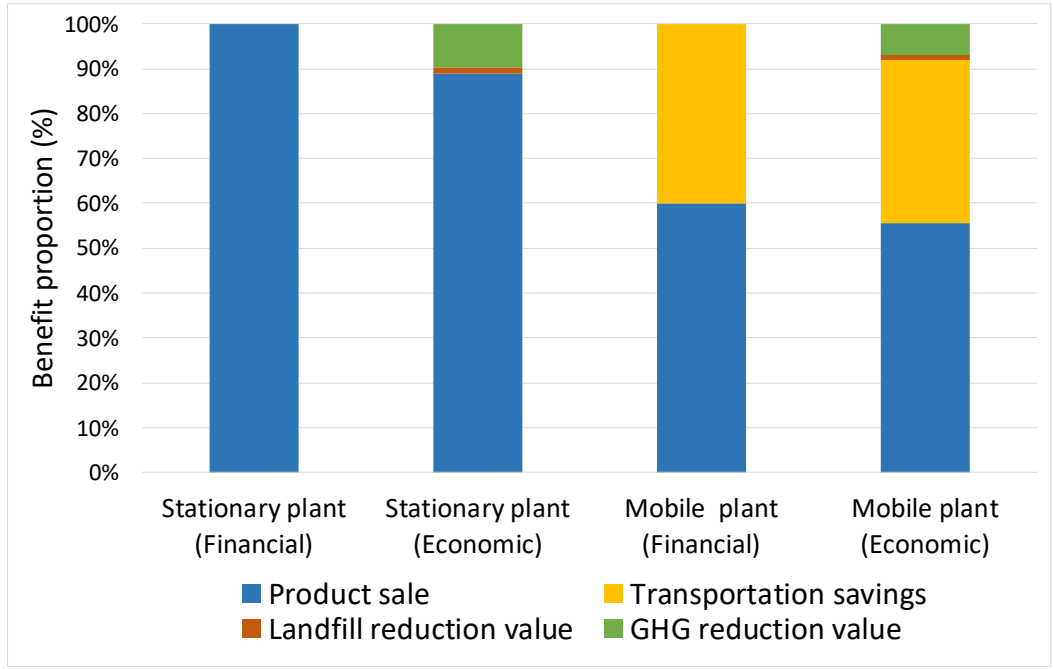
- **Stationary plant:** viable in both financial and economic evaluation.
- Unit cost: $3.86/ton
- $EACF_f$: $76,841, $EACF_e$: $233,767
- **Mobile plant:** only feasible in society's perspective.
- Unit cost: $6.72/ton
- $EACF_f$: $-17,875, $EACF_e$: $149,635



Estimated benefits

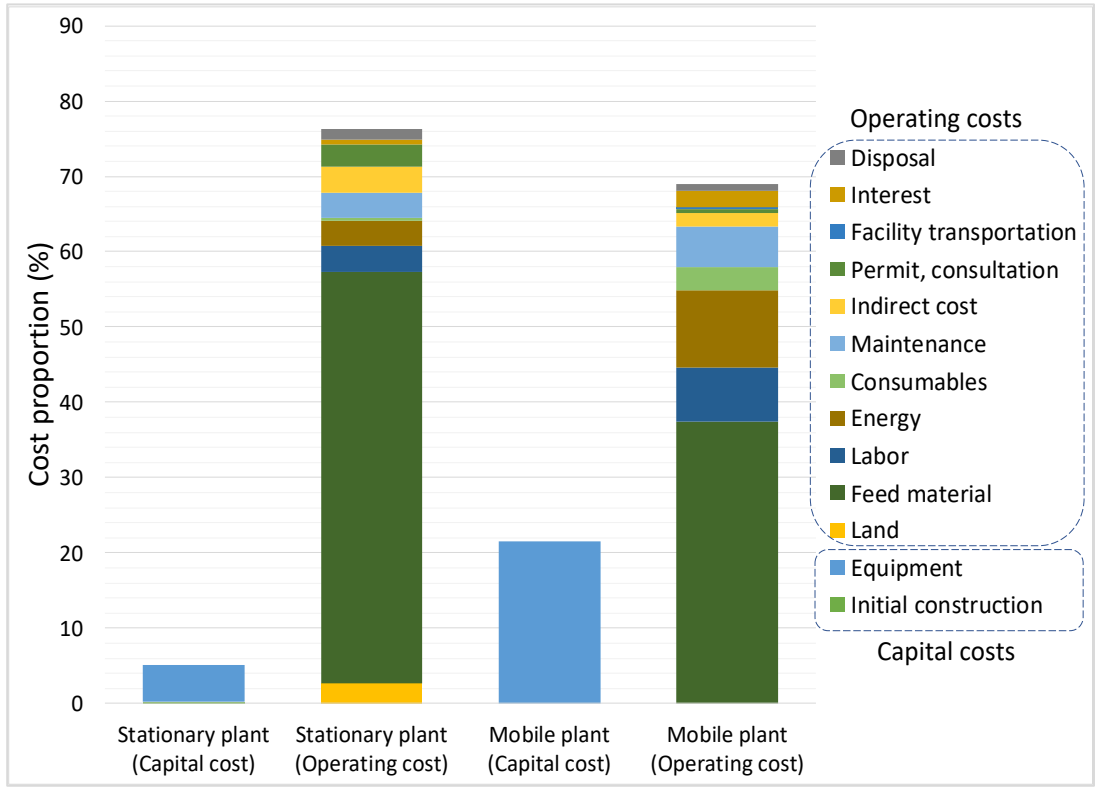
- RCA sales are the main income source.
- Transportation savings account for ~36% of mobile plant's benefits.
- When considered, positive externality values are ~8%.
- GHG reductions are 83% and 54% compared with BAU.

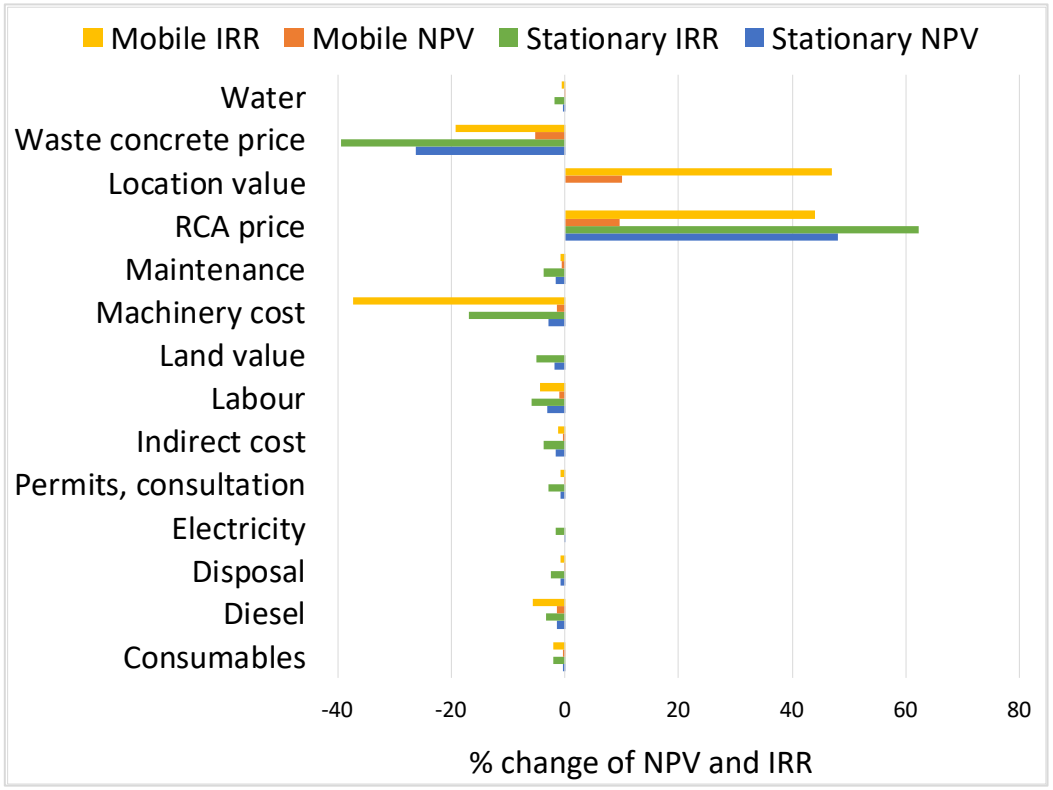




Estimated costs

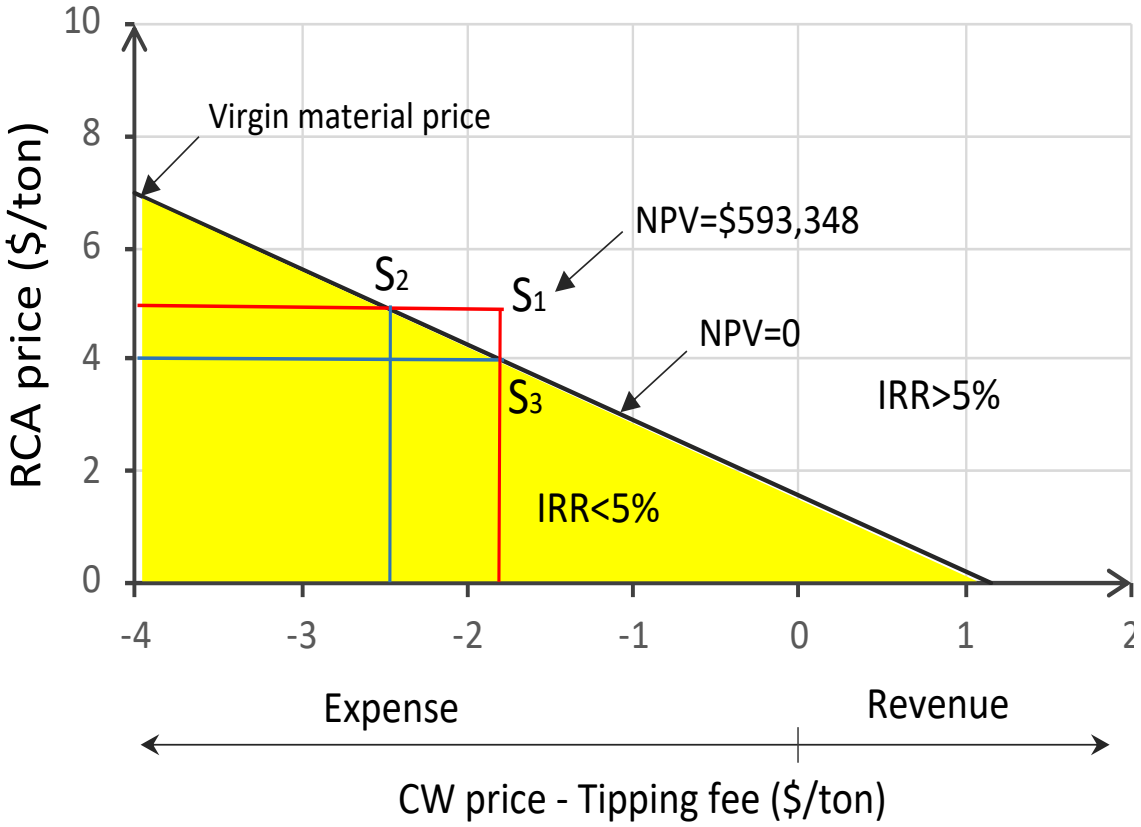
- The mobile plant is more capital intensive than the stationary plant → used machinery
- Feed material, labor, and energy are the most significant operating cost components.



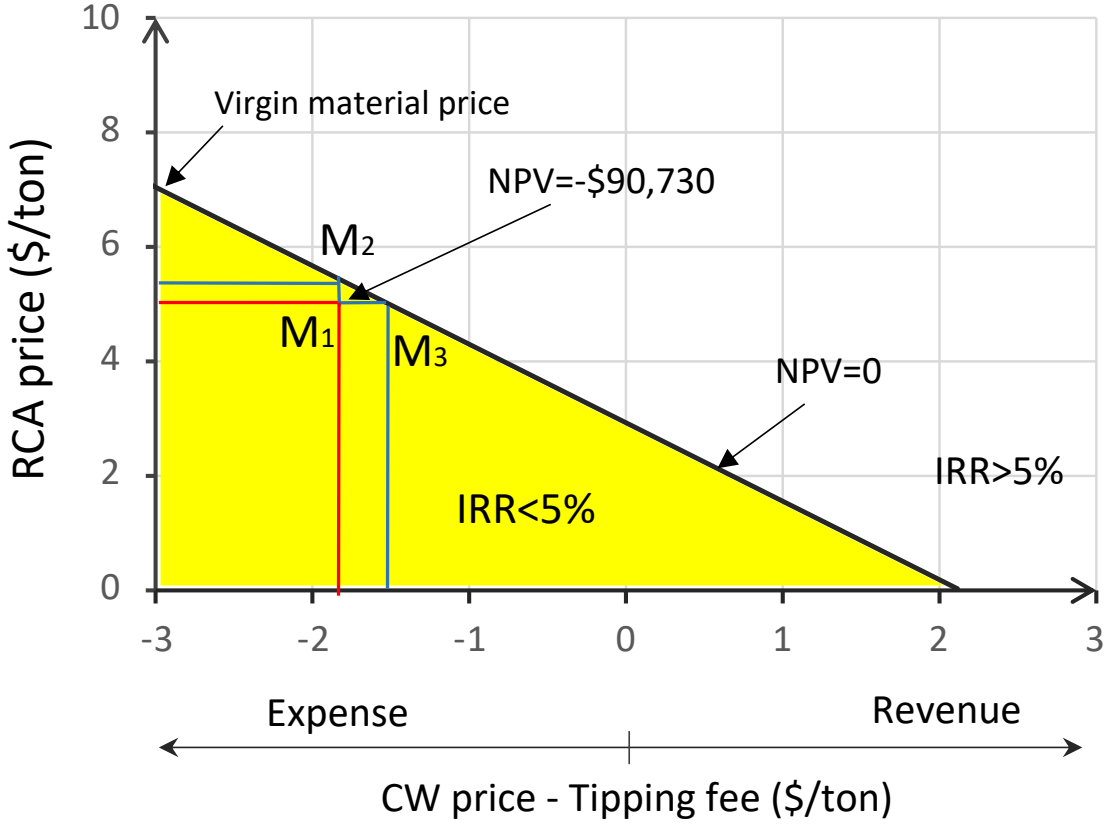


Sensitivity analysis

Stationary plant



Mobile plant



M_1, S_1: current assumptions

Conclusions

- There is a **promising** market for RCA.
- Both stationary and mobile plant are **feasible** investment options in social perspectives.
- Prices of CW and RCA are driving factors of their feasibility.
- Policy intervention to **internalize** positive externalities: carbon tax, virgin material tax, subsidy
- Quality of input materials
- Develop **standards** for recycled CDW products

SATREPS
Science and Technology Research Partnership for Sustainable Development Program

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CESS

ĐẠI HỌC XÂY DỰNG

ĐẠI HỌC BÁCH KHOA

Iponre Viet Nam

Thank you very much!