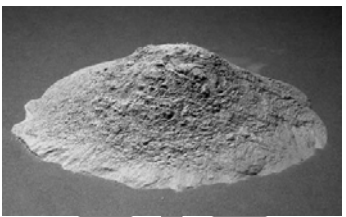


# Investigating, evaluating and classifying material quantities in fly ash from waste incineration: A case study from Vienna

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## Utilisation of MSWI fly ash



### Metal recovery



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### Cement production



Oussama Zrafi, CC-BY-SA, Wikimedia Commons

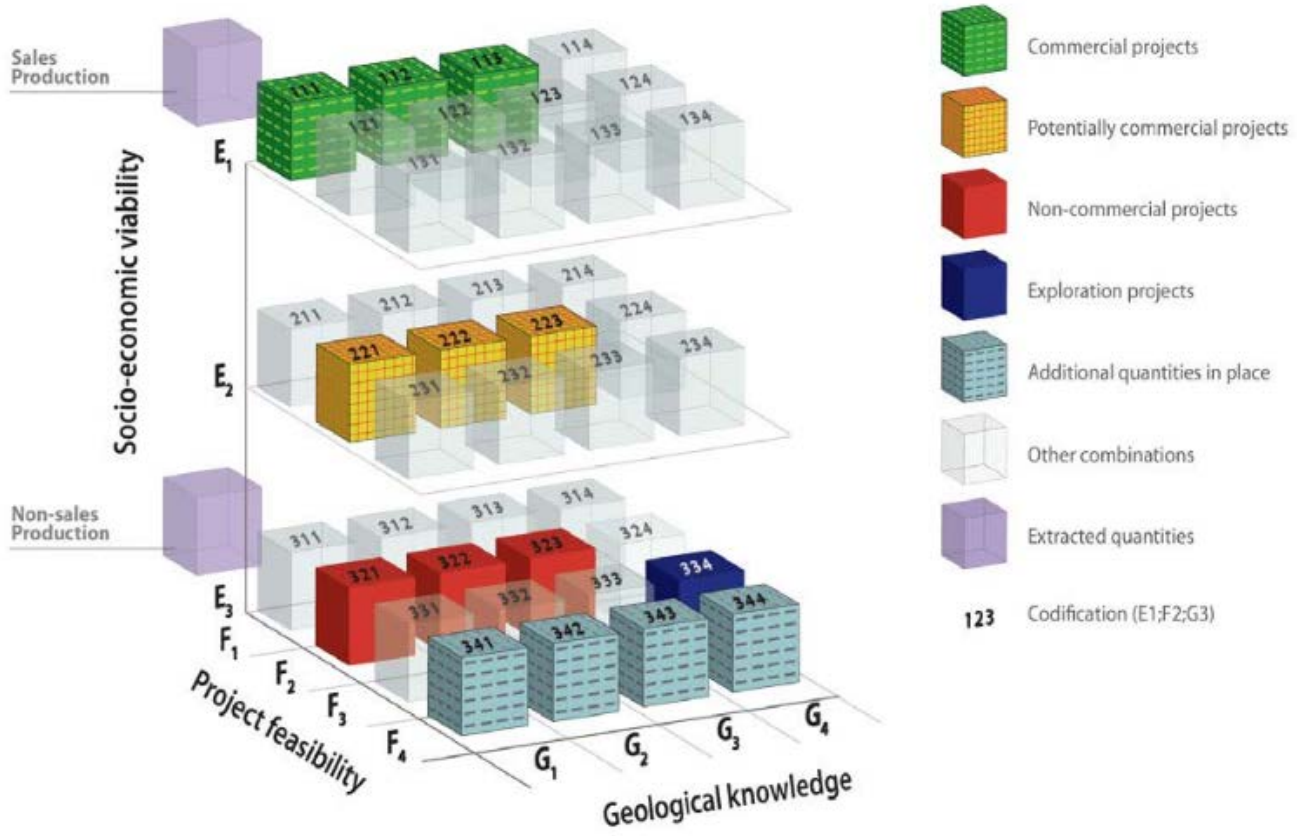
### Salt recovery



Roulex 45, CC-BY-SA, Wikimedia Commons

**Resource potential of MSWI fly ash?**

## Application of UNFC



## System boundary and project lifetime

- Utilisation of 18.000 t/a of MSWI fly ash
- Project lifetime of 20 a
- Establishment of four different utilisation scenarios

### Metal recovery

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**4,680 t Zn**  
**820 t Pb**  
**280 t Cu**  
**60 t Cd**

### Cement production

Oussama Zrafi, CC-BY-SA, Wikimedia Commons

**64,260 t gypsum**  
**37,360 t limestone**  
**123,800 t clay**  
**32,240 t quartz**  
**5,900 t iron ore**

### Salt recovery

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**67,640 t de-icing salt**

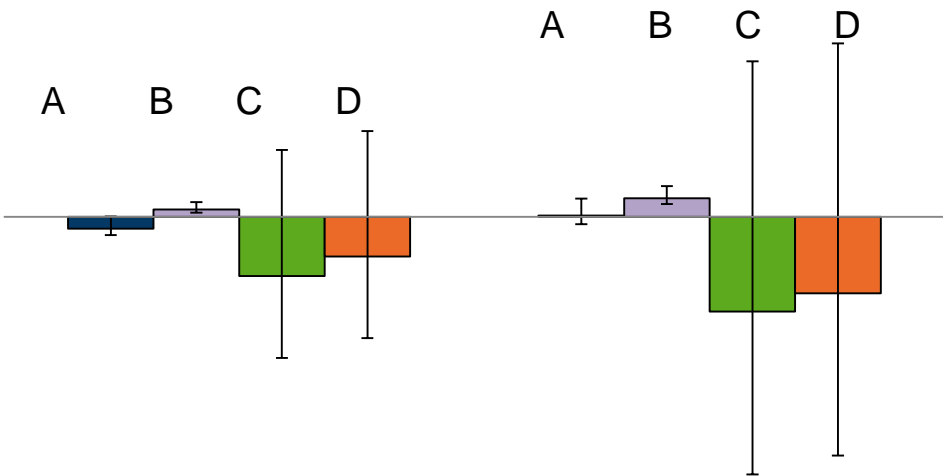
## Assessment of socio-economic viability

- Economic viability is important, but there are also important non-economic factors
- Discounted cash flow analysis for calculation of net present value
- Life cycle assessment to determine environmental impacts
- Monetary valuation of LCA results and subsequent addition with DCF analysis results
- Distinction between private investor's micro perspective and public entity's macro perspective

## Assessment of project feasibility

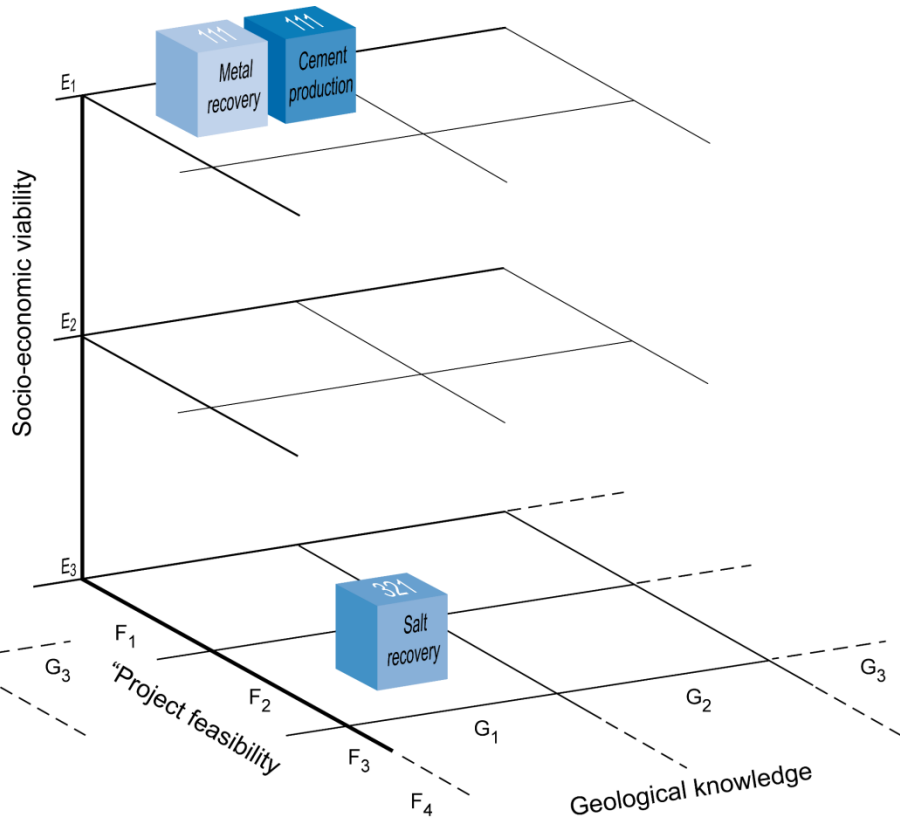
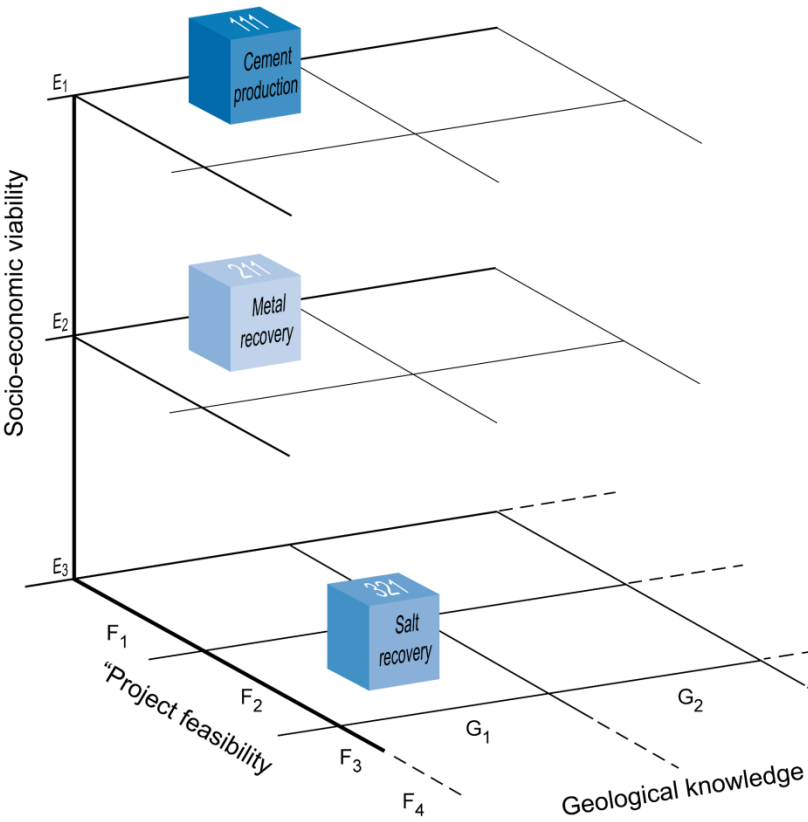
## Assessment of level of confidence in the potential recoverability of the quantities

## Economic and environmental assessment



[EUR]	NPV micro	NPV macro
■ Metal recovery (A)	-27'957'570	2'733'200
■ Cement production (B)	17'620'770	43'917'484
■ Metal and salt recovery (C)	-138'845'506	-222'201'389
■ Cement production and salt recovery (D)	-92'860'050	-179'333'308

## Categorisation within UNFC framework



## Classification within UNFC framework

- Private investor's micro view
  - Metal recovery – other combination
  - Cement production – commercial project
  - Salt recovery – non-commercial project
- Public entity's macro view
  - Metal recovery – commercial project
  - Cement production – commercial project
  - Salt recovery – non-commercial project





- Material quantities of heavy metals, clinker raw materials and chloride salts in MSWI fly ash in Vienna could be determined
- LCA with monetary valuation enables the combination of two aspects of socio-economic viability and thereby decreases the complexity of categorisation
- Further efforts are still necessary to establish valid weighing factors for monetary valuation
- Consideration of external costs (macro view) can improve the socio-economic viability of a specific material flow
- Salt recovery is classified as non-commercial project; therefore, further endeavours are necessary to improve the classification result



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