

# Developing material recovery projects: Lessons learned from processing municipal solid waste incineration residues

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The production of secondary raw materials requires material recovery projects. The development of material recovery projects is a complex task. Researchers, industry stakeholders, legislators and policy makers join forces to identify recovery potential as well as implement recovery projects in reality. This poster shows the development of real recovery projects from the early stage of exploration to the final stage of production. The retrospective view from 2003 to 2017 identifies challenges and enablers to recover materials from municipal solid waste incineration (MSWI) bottom-ash in the Canton of Zürich. We focus on recovery of wet and dry bottom ash and use the United Nations Framework Classification for Resources (UNFC) to communicate the different phases of recovery project development including the phases exploration, non-commercial, potentially commercial and commercial. The findings of this research disclose the complex interactions during recovery project development. We conclude with lessons learned for the development of future recovery projects beyond the Canton of Zurich and provide suggestions for applying the UNFC in the future.

### Questions

How are recovery projects defined?

How are recovery projects characterised?

How are recovery projects evaluated?

How are recovery projects classified?

### Methods

Defining the scope of the recovery project, which includes: project cornerstones, material flow system, and chronicling a timeline of the project development.

Investigating the characteristics, which includes material quantity (i.e. material flow analysis and (intended) material production data), and quantity.

Evaluating the recoverability with a multi-criteria approach that uses the UNFC as a starting point to identify and assess factors, which affect the viability of recovery projects.

Applying the UNFC to classify the recovery projects based on their maturity level.

### Results

#### Spatial scope

Source: [https://commons.wikimedia.org/wiki/File:Canton\\_Z%C3%BCrich\\_in\\_Switzerland.png](https://commons.wikimedia.org/wiki/File:Canton_Z%C3%BCrich_in_Switzerland.png)

#### Temporal scope

2003 Exploration Recovery project development Production 2017 Time

#### Materials at the source

Wet-bottom-ash (100µm) Dry-bottom-ash (100µm)

Source: Quicker P. (2018) Verbrennungsrückstände. In: Kurth P., Oexle A., Faustlich M. (eds) Praxishandbuch der Kreislauf- und Rohstoffwirtschaft. Springer Vieweg, Wiesbaden

#### Recovery technologies

Source: [https://de.wikipedia.org/wiki/Datel:Recycling\\_symbol.svg](https://de.wikipedia.org/wiki/Datel:Recycling_symbol.svg)

#### Target materials (selection)

Source: own Photography

#### Project milestones

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Projects WBA & DBA	Monitoring at incineration plant Thurgau, resource potential in fine bottom ash recognised														
Project WBA															
Project DBA															

### Conclusions

#### Lessons learned

A) A clear driver for metal recovery projects was the continuous increase of knowledge especially regarding analytical characterization, effectiveness of recovery technology and changes in the legal environment.

B) Central factors for material recovery were identified as (i) ‘knowledge of material regarding quantity and quality’, (ii) ‘supply continuity’, (iii) ‘profitability’, (iv) ‘stakeholder interest’, (v) ‘social license’, and (vi) ‘operating license’.

C) Key milestones were identified as (i) establishment of donor and technical foundation; (ii) technological development and (iii) launch of full operation.

D) Social and environmental considerations are important for material recovery.

#### Suggestions for applying the UNFC

A) Standardised terminology and principles for communicating the development status of physical resource projects for markets.

B) UNFC allows the categorization of entire quantities at the source as ‘sales’ and ‘non-sales quantities’.