

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 from the development of future recovery projects beyond the Canton of Zurich and provide suggestions for applying the UNFC in the future.

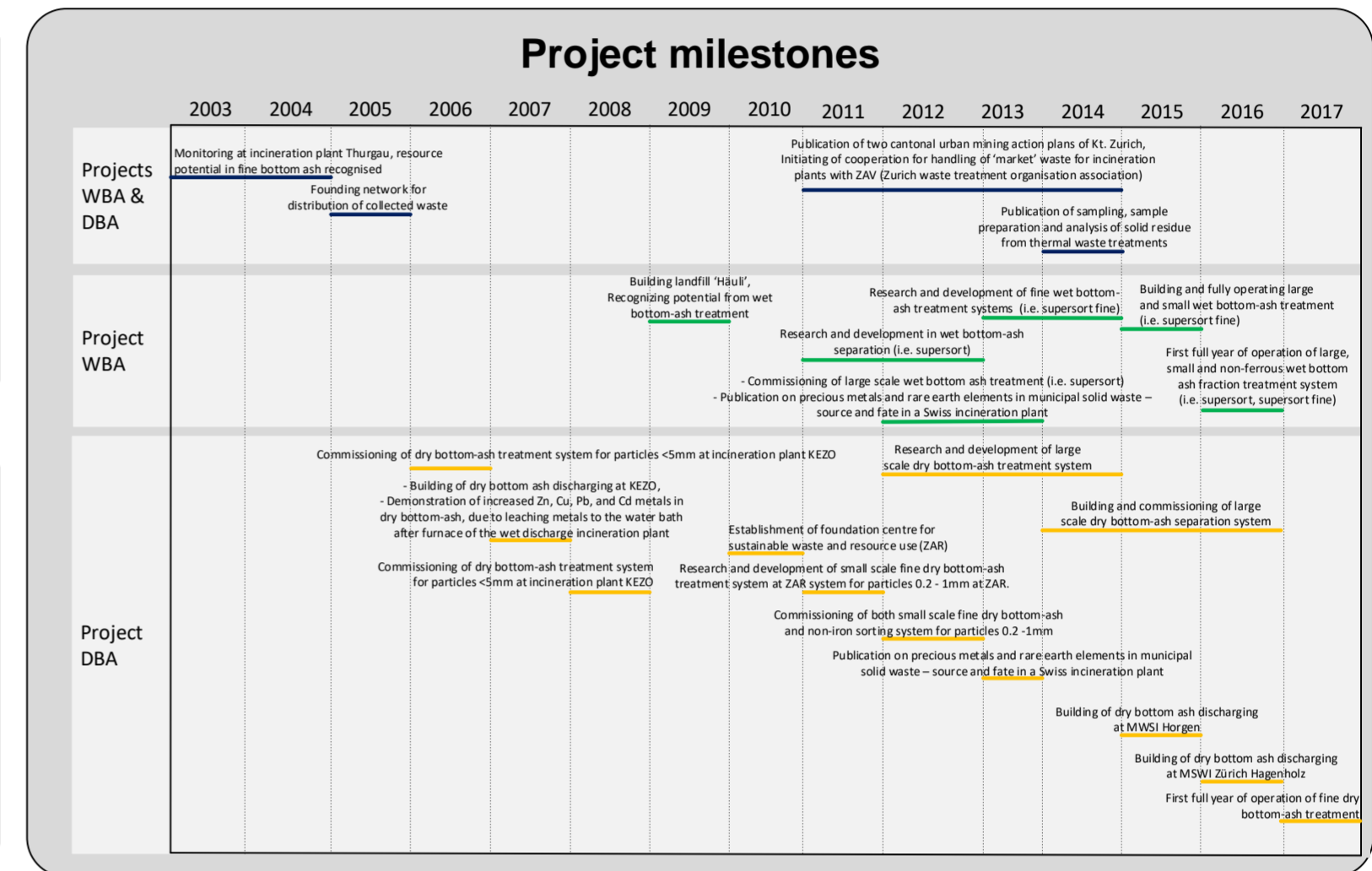
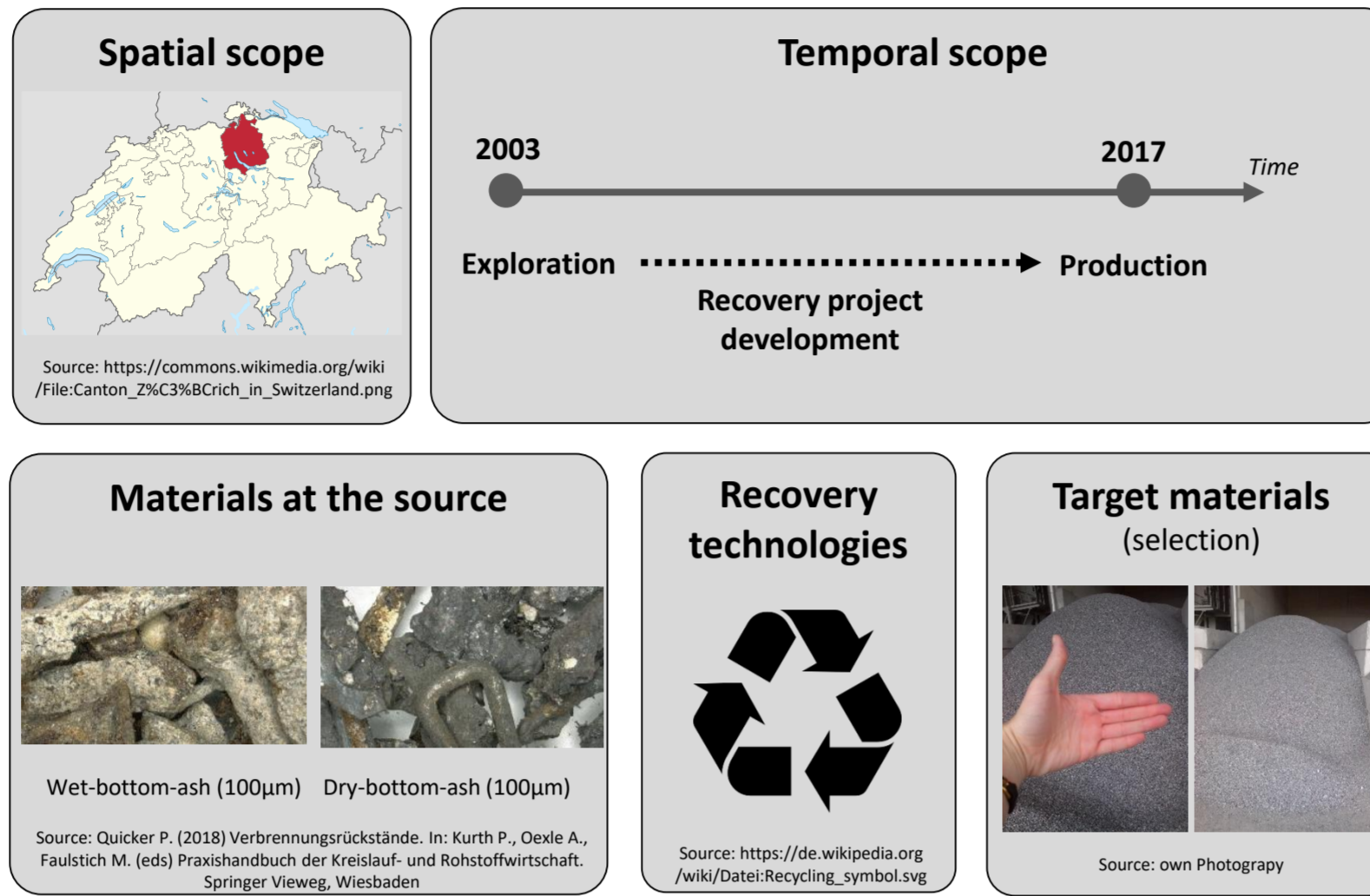
Questions

Methods

Results

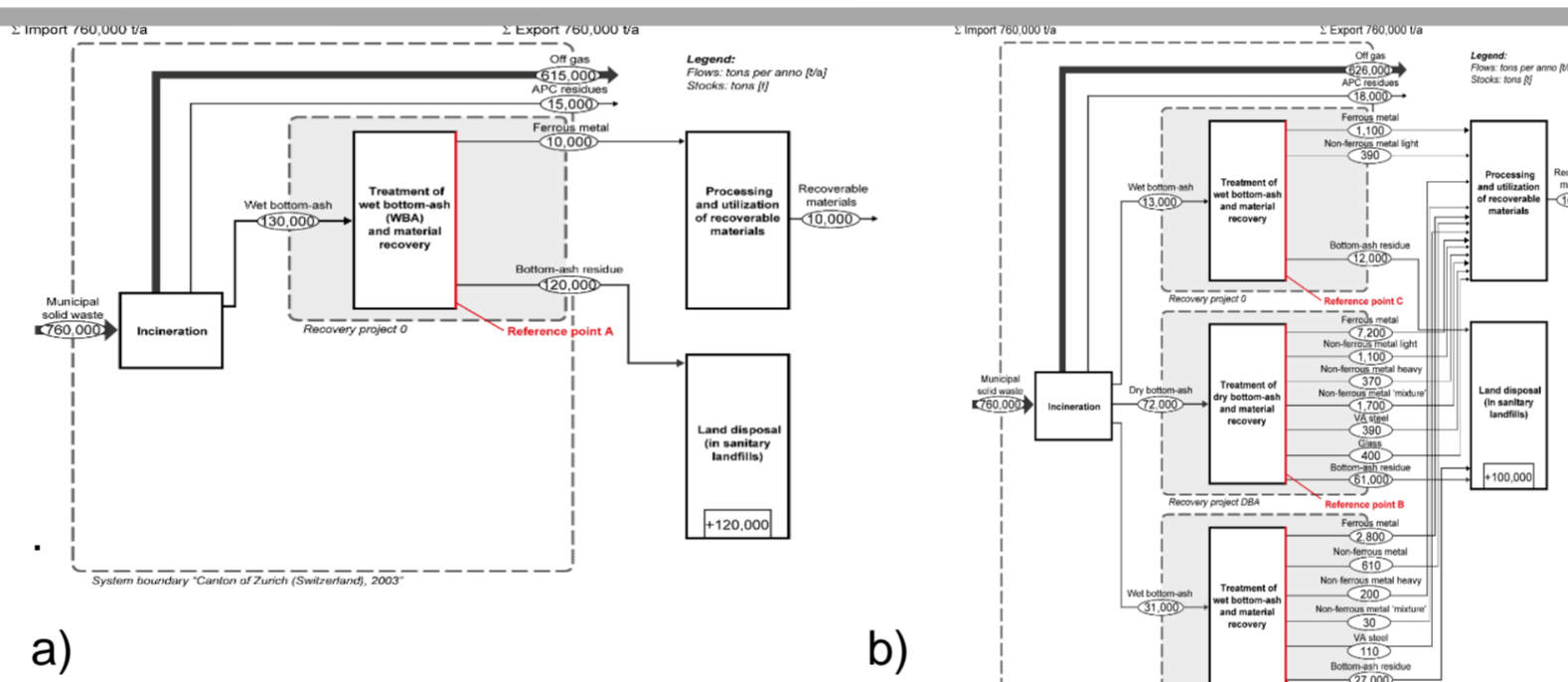
How are recovery projects defined?

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



How are recovery projects characterised?

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

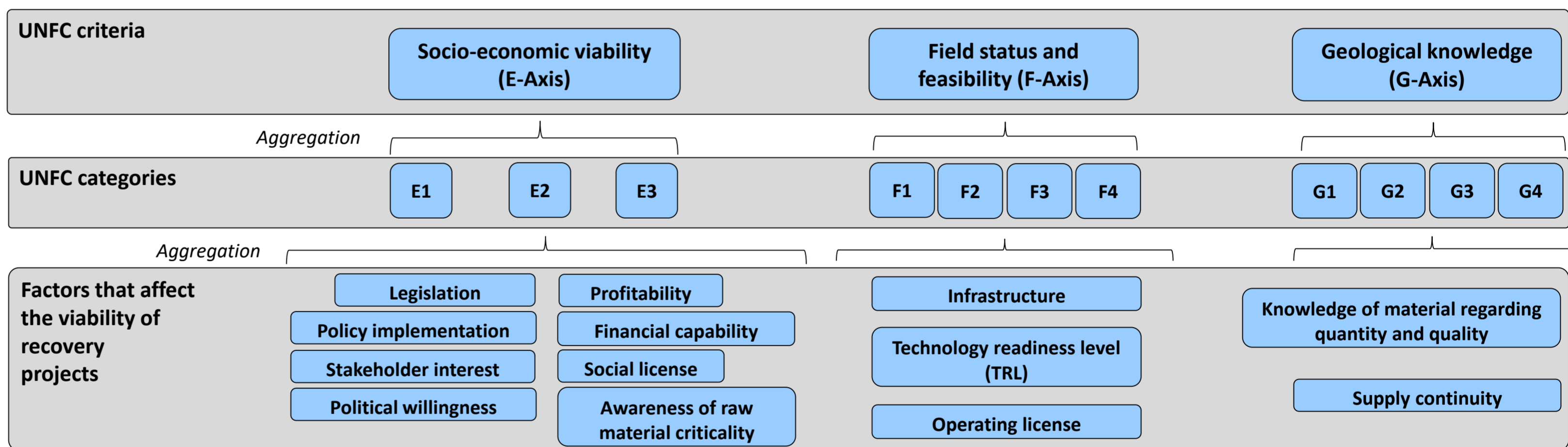


In the Canton of Zürich, the recovered MSWI bottom-ash were:
 a) 6,900 tons ferrous and 0 tons non-ferrous metals in 2003.
 b) 11,100 tons ferrous and 4,400 tons non-ferrous metals in 2017.

Note that the numbers are given as dry matter content and rounded to two significant digits. Abbreviation APC residues = Air pollution control residues. The imports and exports to and from the Canton of Zurich are not considered.

How are recovery projects evaluated?

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.



How are recovery projects classified?

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

Project maturity (technology: wet-bottom-ash)						Project maturity (technology: dry-bottom-ash)							
UNFC Axis	UNFC Categories	UNFC Sub-Categories	UNFC Classes				UNFC Axis	UNFC Categories	UNFC Sub-Categories	UNFC Classes			
			Exploration	Non-commercial	Potentially commercial	Commercial				Exploration	Non-commercial	Potentially commercial	Commercial
Geological knowledge (G-axis)	G1	No Sub											
	G2	No Sub											
	G3	No Sub											
Socio-economic viability (E-axis)	E1	E1.1											
	E2	No Sub											
	E3	E3.1											
Field status and feasibility (F-axis)	F1	F1.1											
	F2	F2.1											
	F3	No Sub											
	F4	No Sub											
Year			2003, 2004, 2005	2007, 2008	2010	2011	2011, 2012, 2014	2012	2013, 2014	2012, 2013, 2014	2014, 2015, 2016	2017	

Conclusions

Lessons learned

- 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.
- 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'.
- Key milestones were identified as (i) establishment of donor and technical foundation; (ii) technological development and (iii) launch of full operation.
- Social and environmental considerations are important for material recovery.

Suggestions for applying the UNFC

- Standardised terminology and principles for communicating the development status of physical resource projects for markets.
- UNFC allows the categorization of entire quantities at the source as 'sales' and 'non-sales quantities'.