

4<sup>th</sup> International Symposium on  
**Enhanced Landfill Mining**

5 - 6 February 2018  
 Belgium



Monday 5 February 2018	
08:30	Registration & welcome coffee
09:00	Welcome and introduction
09:15	<b>Opening speeches:</b> Peter Tom Jones (EURELCO & ETN NEW-MINE) & Hilde Vautmans (tbc) (Member of the European Parliament, ALDE)
<b>Session 1</b>	<b>Geophysics, remediation and preprocessing technologies for Enhanced Landfill Mining</b>
09:30	<b>Keynote Lecture</b> <b>Fred Nguyen</b> (ULG) & <b>Ranjit Ghose</b> (TU Delft), Itzel Isunza Manrique (ULG), Tanguy Rober (ULG) & Gaël Dumont (ULG) <i>Managing past landfills for future site development: A review of the contribution of geophysical methods</i>
10:00	<b>Keynote Lecture</b> <b>Thomas Pretz</b> (RWTH Aachen) <i>The state-of-the-art in sensor based sorting technologies</i>
10:30	<b>Break</b>
11:00	<b>Keynote Lecture</b> <b>Patrick Laevers &amp; Werner Annaert</b> (Go4Circle) <i>Waste Management in the 21st Century: challenges and opportunities</i>

11:20	<b>Christin Bobe</b> (UGent), Ellen Van de Vijver & Marc Van Meirvenne (UGent) <i>Exploring the potential of electromagnetic surface measurements for the characterisation of industrial landfills</i>
11:35	<b>Juan Carlos Hernandez Parrodi</b> (Renewi, Montanuniversität Leoben), Daniel Höllen (Montanuniversität Leoben) & Roland Pomberger (Montanuniversität Leoben) <i>Fine fractions from landfill mining: potential and main challenges to overcome</i>
11:50	Roeland Geurts & <b>Anja Maul</b> (VITO), Kris Broos (VITO), Denis van Loo (XRE), Mattheu Boone (UGCT), Peter Segers (SUEZ), Jo Vanhees (Vanhees Metalen) & Mieke Quaghebeur (VITO) <i>But, is it all dirt!? Advanced characterisation of ELFM material by the Characterise-to-Sort technology</i>
12:05	<b>Poster Pitches:</b> <ul style="list-style-type: none"> <li>• <b>Bart Nevejans</b> (Aertssen Group) <i>The redevelopment of the Eysels Landfill site, Turnhout, Belgium</i></li> <li>• Giovanna Antonella Dino (Università degli Studi di Torino), Piergiorgio Rossetti (Università degli Studi di Torino), Alessio Lorenzi (Minerali Industriali spa. Novara), Ivan Mister (Minerali Industriali spa. Novara), Alberto Cazzaniga (Minerali Industriali spa. Novara), <b>Frederic Coulon</b> (Cranfield University), Zoe Griffiths (Cranfield University) &amp; Stuart Wagland (Cranfield University) <i>Exploiting secondary raw materials from extractive waste facilities: a case study</i></li> <li>• <b>Jeroen Spooren</b>, Jef Bergmans, Frantisek Kukurugya &amp; Liesbeth Horckmans (VITO) <i>In-situ recovery of Cr and Ni from landfilled neutralisation sludge</i></li> <li>• <b>Ulrich Sigmund</b> (Stadler) <i>Sorting with ballistic separators</i></li> <li>• <b>Nerea Rodriguez</b>, Lieven Machiels, Peter Tom Jones &amp; Koen Binnemans (KU Leuven) <i>Towards near-zero-waste recycling of mine tailings and metallurgical process residues through a novel solvometallurgical process based on deep eutectic solvents</i></li> </ul>
12:30	<b>Break – Lunch</b>
Session 2	<b>Thermal valorisation technologies for Enhanced Landfill Mining</b>
14:00	<b>Keynote Lecture</b> <b>Zoran Jovanovic</b> & Aldo Steinfeld (ETH Zürich) <i>Solar gasification of waste: a critical review</i>
14:30	<b>Keynote Lecture</b> <b>Lieve Helsen</b> & Nicholas Agon (KU Leuven) <i>Advanced waste-to-resources by plasma gasification</i>
15:00	<b>Poster Pitches:</b> <ul style="list-style-type: none"> <li>• <b>Marco Gigantino</b>, Zoran R. Johanovic &amp; Aldo Steinfeld (ETH Zürich) <i>Thermochemical heat storage development for 24/7 solar-driven gasification of refuse-derived fuel</i></li> <li>• <b>Nuran Ilman Zaini</b>, Weihong Yang &amp; Pär Jönsson (KTH Royal Institute of Technology) <i>Pyrolysis of solid recovered fuel derived from landfill waste: Gas yield composition</i></li> </ul>
15:20	<b>Break</b>
15:50	<b>Keynote Lecture</b> Renato Sarc (Montanuniversität Leoben), <b>Roland Pomberger</b> (Montanuniversität Leoben), Tanja Wolfsberger (Mayer Recycling) & Josef Adam (Montanuniversität Leoben) <i>Energetic utilisation of high calorific residues from landfill mining</i>
16:20	<b>Keynote Lecture</b> <b>Rolf Stein</b> , Richard Taylor, Andy Cornell (Advanced Plasma Power)

	<i>The techno-economic viability of upcycling residual waste into advanced biofuels: A commercial demonstration plant case study using Gasplasma® technology to convert to bioSNG</i>
<b>16:40</b>	<b>Luisa Canopoli</b> , Stuart Wagland & Beatriz Fidalgo (Cranfield University) <i>Characterisation of excavated plastics for thermochemical upcycling to platform chemicals and liquid fuels</i>
<b>16:55</b>	<b>Poster Pitches</b> <b>Guilherme Ascensão</b> (Italcementi, University of Padova, KU Leuven), Flora Faleschini University o Padova), Maurizo Marchi (Italcementi), Monica Segata (Italcementi), Yiannis Pontikes (KU Leuven) <i>Influence of microstructure on mechanical strength of alkali activated Fe-Si-Ca rich materials</i> <b>Patricia Rabelo Monich</b> (Padua University), Daniel Höllen (Montanuniversität Leoben) & Enrico Bernardo (Padova University) <i>Development and characterisation of dense waste-derived glass-ceramics</i>
<b>17:00</b>	Closing remarks 1st day by <b>Henny de Baets</b> (General Administrator OVAM, Flemish Public Waste Agency)

Tuesday 6 February 2018	
<b>09:00</b>	Welcome and introduction; overview agenda
<b>Session 3</b>	<b>Upcycling technologies for Enhanced Landfill Mining</b>
<b>09:15</b>	<b>Keynote Lecture</b> Aneeta Mary Josphe (UGent, SIM), Ruben Snellings (VITO), Steffen Grünewald (UGent,CRH), Stijn Matthys (UGent) & <b>Nele De Belie</b> (UGent) <i>Valorisation of municipal solid waste incineration residues in concrete products</i>
<b>09:45</b>	<b>Keynote Lecture</b> <b>Yiannis Pontikes</b> , Lukas Arnout, Tobias Hertel, Silviana Onisei (KU Leuven) <i>Possibilities to transform (landfilled) urban solid waste and industrial residues towards new materials</i>
<b>10:15</b>	<b>Keynote Lecture</b> Acacio Rincon Romero, Patricia Rabelo Monich, <b>Enrico Bernardo</b> (Padova University) <i>Recycling of inorganic waste in monolithic and cellular glass-based materials for structural and functional applications</i>
<b>10:35</b>	<b>Break</b>
<b>11:05</b>	<b>Keynote Lecture</b> <b>Jonas Cautaeerts</b> (Colruyt) <i>An industry perspective on syngas-to-hydrogen conversion – Building and operating fuel stations for hydrogen</i>
<b>11:25</b>	<b>Charlot Tanghe</b> (DEC-DEME), Stany Pensaert (DEC-DEME) Peter Van den Bossche (Witteveen+Bos), Tom Behets (OVAM) & Luk Umans (OVAM) <i>Pilot on innovative separation and valorisation techniques in case of ELFM</i>
<b>11:40</b>	<b>Hugo Lucas</b> , Bernd Friedrich (RWTH Aachen) <i>Metallurgical concepts for recycling of bottom ashes from municipal waste incinerators</i>
<b>11:55</b>	<b>Poster Pitches:</b> <ul style="list-style-type: none"> <li><b>Dirk Paulus</b> (Tauw), Herwig de Wilde (Tauw), Peter Van den Bossche (Vitteveen + Bos) &amp; Tom Behets (OVAM) <i>Principles of ELFM introduced in the Flemish multicriteria analysis (MCA) for soil remediation projects of landfills</i></li> </ul>

- **Lotta Juusti** (University of Eastern Finland)  
*Legal basis for an enhanced landfill mining framework in the EU circular economy legislation*
- **Andrea Di Maria**, Lieven Machiels & Karel Van Acker (KU Leuven)  
*Approaching zero-waste metallurgy through plasma fuming and inorganic polymerisation of residues from zinc production: environmental evaluation based on Life Cycle Assessment*
- **Giovanna Sauve**, Karel Van Acker (KU Leuven)  
*To mine or not to mine: a review of the effects of waste composition, time and long term impacts of landfills in the decision making for ELM*
- **John Laurence Esguerra** (Linköping University), Niclas Svensson (Linköping University), Joakim Krook (Linköping University), Steven Van Passel (University of Antwerp, Hasselt University) & Karel Van Acker (KU Leuven)  
*The economic and environmental performance of a landfill mining project from the viewpoint of an industrial landfill owner*

<b>12:30</b>	<b>Break – Lunch</b>	
<b>Session 4</b>	<b>Multi-criteria assessment for Enhanced Landfill Mining</b>	
<b>13:45</b>	<b>Keynote Lecture</b> <b>Joakim Krook</b> (Linköping University), Niclas Svensson (Linköping University), Karel Van Acker (KU Leuven) & Steven Van Passel (University of Antwerp, Hasselt University) <i>How to evaluate (Enhanced) Landfill Mining? A critical review of recent economic and environmental assessments</i>	
<b>14:15</b>	<b>Keynote Lecture</b> <b>Ilse Bilsen</b> (VITO), Patrick Berghmans (VITO), Jan Peters (VITO) & Yves Tielemans (Group Machiels) <i>Development of an Early Warning System for the Closing the Circle project at the Remo landfill site</i>	
<b>14:45</b>	<b>Keynote Lecture</b> <b>Andrea Winterstetter</b> (VITO), Eddy Wille (OVAM), Peter Nagels (OVAM) & Johan Fellner (Vienna University of Technology) <i>Integrating Landfilled Material Stocks Into Modern Resource Classification Frameworks</i>	
<b>15:15</b>	<b>Keynote Lecture</b> <b>Maurice Ballard</b> (CleanTechPunt, De Locals), Jürgen Becherer (CleanTechPunt, De Locals), Kevin Coeymans (De Locals), Evy De Block (CleanTechPunt, De Locals), Geert De Bruyn (De Locals), Louisa De Coster (CleanTechPunt, De Locals), Jean De Schutter (CleanTechPunt, De Locals), Johan Lemmens (De Locals), Ludo Philipsen (CleanTechPunt, De Locals), Felix Schroeyers (De Locals), Herman Timmers (CleanTechPunt, De Locals), Geert Vandebek (De Locals), Peter Vanhemel (De Locals) & Greta Vannuffelen (De Locals) <i>A 'locals' perspective towards social acceptance of the Closing-the-Circle project in Houthalen-Helchteren</i>	
<b>15:35</b>	<b>Break</b>	
<b>15:50</b>	<b>Eddy Wille</b> (OVAM) <i>Flooding risks at old landfill sites. Linear economy meets Climate change</i>	
<b>16:05</b>	<b>Paul Einhaupl</b> (Linköping University, University of Antwerp), Joachim Krook (Linköping University), Niclas Svensson (Linköping University), Karel Van Acker (KU Leuven) & Steven Van Passel (University of Antwerp, Hasselt University) <i>Enhanced landfill mining at the REMO site: Assessing stakeholders' perspectives for implementation</i>	
<b>16:20</b>	<b>Closing Debate: Challenges and Opportunities for Enhanced Landfill Mining</b> <b>Panel contributors (confirmed):</b> <ul style="list-style-type: none"> <li>• <b>Derek Greedy</b> (ISWA National Members Representative, ISWA Board)</li> <li>• <b>Claudia Neculau</b> (SpaQue, coordinator Interreg RAWFILL)</li> <li>• <b>Yves Tielemans</b> (Group Machiels)</li> </ul>	

- **Mieke Quaghebeur** (VITO)

Moderator: **Victor Dries** (Policy Advisor for Flemish Government, Cabinet Liesbeth Homans)

**Scope:** Over the past few years Enhanced Landfill Mining (ELFM) has gained considerable momentum, as corroborated by the initiation of three EU-funded ELFM-related projects (ETN NEW-MINE, Interreg RAWFILL and COCOON), the rise of EURELCO, widespread press attention and the recent endorsement of the ELFM concept in the “waste package”, which was formally approved by the European Parliament on March 14, 2017. The justification for this paradigm change is that ELFM does not only enable the recovery of valuable materials which can be brought back into the cycle, but also allows for recovering land area, taking into account that a large part of the EU’s 500.000 historic landfills are situated in a (semi-) urban environment. Nevertheless, the first, full-scale industrial, resource-recovery driven ELFM project still hasn’t occurred yet in Europe. Multiple barriers seem to persist, varying from social acceptance issues to delays in permits. In this closing ELFM IV debate the challenges and opportunities for the industrialisation of ELFM will be discussed by an expert panel of industrial players, research experts and EC affiliates.

17:10

Reception

## Poster contributions

(cf. poster/break sessions)

- Alexander Muras (FCC Environment), **Bastian Küppers** (Montanuniversitaet Leoben), Daniel Höllen (Montanuniversitaet Leoben) & Robert Rothschedl (FCC)  
*Landfill Mining of a Mixed Municipal Solid Waste and Commercial Waste Landfill: Application of Existing Processing Technology – Opportunities and Limitations*
- **Christian Mielke** (Stadler)  
*Heavy duty ballistic separators*
- **Cristina Garcia Lopez** (RWTH), Juan Carlos Hernández Parrodi (Renewi, Montanuniversitat Leoben), Bastian Küppers (Montanuniversitat Leoben), Adele Clausen (RWTH) & Thomas Pretz (RWTH)  
*The potential of the ballistic separator Type STT6000 as a first step for the recovery of Refuse Derived Fuel from landfill material: A case study at Mont Saint Guibert Landfill (Belgium)*
- **Mercedes Regadío** & Koen Binnemans (KU Leuven)  
*Solvoleaching of (Landfilled) industrial residues and a low-grade laterite ore with diluted HCl in the ionic liquid Aliquat 336*
- Lourdes Yurramendi (Tecnalia), **Federica Forte** (KU Leuven), Carmen Del Río (Tecnalia), Rocca Lagioia (ITRB Group), Ana Claudia Nioac de Salles (Fraunhofer Institute for Chemical Technology), Torsten Müller (Fraunhofer Institute for Chemical Technology), Serena Sgarioto (Relight) & Koen Binnemans (KU Leuven)  
*Recovery of Rare Earths from E-Waste residues by an integrated approach*
- **Thupten Palden**, Mercedes Regadío & Koen Binnemans (KU Leuven)  
*Selective solvometallurgical leaching of lead and zinc from jarosite residues from the zinc industry*
- **Gael Dumont** (ULG), Nicolas Mark (BOVA ENVIRO+), Tanguy Robert (ULG) & Frédéric Nguyen (ULG)  
*Assessment of multiple geophysical techniques for the characterisation of municipal waste deposit sites*
- **Richard Mutafela** (Linnaeus University), Fabio Kaczala (Linnaeus University), Yahya Jani (Linnaeus University), Graham Aid (Ragn-Sells) & William Hogland (Linnaeus University)  
*Methods for investigation of old glass waste dumpsites*
- **Yamid Gomez Rueda**, Nicholas Agon & Lieve Helsen (KU Leuven)  
*Cold plasmas for gaseous pollutant control as a benchmark for their use in tar abatement in syngas*
- **Georgia Flesoura** (KU Leuven), Beatriz García-Baños (Universitat Politècnica de Valencia), José-Manuel Catalá-Civera (Universitat Politècnica de Valencia), Jozef Vleugels (KU Leuven) & Yiannis Pontikes (KU Leuven)  
*Dielectric properties measurements of municipal solid waste incinerator bottom ash at high temperatures*
- **Joris Roosen** (KU Leuven, SIM), Cadiam Mohan Babu (KU Leuven, SIM) & Koen Binnemans (KU Leuven)  
*Functionalised Activated Carbon for the Adsorption of Rare-Earth elements from Aqueous Solutions*

- **Simon De Corte** (Ghent University), **Kris Broos** (VITO), **Anja Maul** (VITO), Wouter de Soete (Ghent University), Päivi Kinnunen (VTT), Dimos Paraskevas (KU Leuven), Jeroen Jordens (KU Leuven) & Joost Helsen (VITO)  
*EIT Raw materials ZeroWaste Cluster Networks of Infrastructure: offering research and pilot infrastructure in a zerowaste metallurgical toolbox*
- **Renaud De Rijdt** (Atrasol), **Claudia Neculau** (SPAQuE) & **Eddy Wille** (OVAM)  
*The RAWFILL concept – an integrated methodology and toolbox for selecting and launching enhanced landfill mining (ELFM) projects*
- **Vincent Dunon** (ARCHE Consulting), Ann van der Linden (VITO), Eero Kolehmainen (Outotec), Helene Söreljus (RISE), Yoko Dams (VITO) & Koen Oorts (ARCHE Consulting)  
*Integrated economic and environmental assessment as driver for innovation of metallurgical systems for the valorisation of low-grade input materials*
- **Annele Ronkainen** (Aalto University)  
*Technical and economic factors affecting ELFM in Finland*
- **Peter Van den Bossche** (Witteveen+Bos), **Hilde Goovaerts** (Campine), Herwig Dewilde (Taww België NV); **Tom Van Gerven** (University of Leuven), **John Joseph Jinu** (KU Leuven), **Dirk Van Mechelen** (Orbix) & **Kurt Jacobs** (Jacobs Beton) – MIVAMIL  
*Mining and Valorisation of critical Metals at former Industrial Landfills*
- **Koen Sips** (POINT Consulting Group)  
*Multi-level governance for ELFM: from a local technical problem to a EU policy domain*

## ORGANISERS



## CO-ORGANISERS

