



EU TRAINING NETWORK FOR RESOURCE RECOVERY THROUGH ENHANCED LANDFILL MINING

European Training Network for Resource Recovery Through Enhanced Landfill Mining (NEW-MINE)

D6.9 - Policy Brief/Newsletter 3



EU Training Network for Resource Recovery Through Enhanced Landfill Mining



Newsletter



The NEW-MINE Newsletter is integrated in the Newsletter of the EURELCO Mother Network, which provides monthly updates on general EURELCO evolutions and on the specific EURELCO-based projects (NEW-MINE, COCOON etc.).

This Newsletter also provides regular Enhanced Landfill Mining Policy Brief sections, where the policy aspects of ELM are investigated and where suggestions to Policy Makers are provided.

The EURELCO Newsletters can be downloaded through:
<https://www.eurelco.org/newsletter>

You can register for this EURELCO-NEW-MINE Newsletter [here](#).

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This project has received funding from the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721185

Public

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D6.9 - Policy Brief/Newsletter 3

As stated in the Annex 1 and the NEW-MINE project communication strategy, periodic newsletters are sent as part of the overarching EURELCO-network. In this way, the impact of the dissemination on the medium-long term is ensured and contacts with new potential stakeholders are maintained. Generally, the newsletters are sent every 3 to 4 months; special editions can feature important announcements, news or events.

The newsletters contain:

- Various **news** items, including updates of the most relevant news in the field of ELFM;
- **Policy brief sections**, containing targeted information for policy makers (e.g. ERECON report);
- Information on related **projects** like NEW-MINE; and
- Brief **announcements** and upcoming **events**.

Below, an overview is given of the table of content per newsletter of all newsletters published between May and December 2018.

Newsletter #21 (May 2018)

1. EURELCO: Can waste be mined and recycled?
 - 1.1 NEW-MINE: Summer school
 - 1.2 COCOON: Thematic event on LFM
 - 1.3 RAWFILL: Steering committee
2. Publication in the spotlight
3. Upcoming events

Newsletter #22 (June 2018)

1. EURELCO: Seminar in the European Parliament
 - 1.1 NEW-MINE: Animated TED-talk on ELFM
 - 1.2 COCOON: Report on mapping available
 - 1.3 RAWFILL: Steering committee
2. Publication in the spotlight
3. Upcoming events

Newsletter #23 (November 2018)

1. EURELCO: Why ELFM should be politically acknowledged in Europe (Policy Brief)
 - 1.1 NEW-MINE: Successful mid-term review meeting
 - 1.2 COCOON: Financial aspects of LfM projects
 - 1.3 RAWFILL: Workshop at Pollutec 2018
2. Publication in the spotlight
3. Thematic issue on ELFM in Detritus - call for papers
4. Upcoming events



In addition, NEW-MINE published two special **Policy Briefs** at the occasion of the second seminar in the European Parliament on Enhanced Landfill Mining (ELFM):

- Why Enhanced Landfill Mining (ELFM) needs to be politically acknowledged to facilitate sustainable management of European landfills (November 2018).
- 2nd ELFM Seminar in the European Parliament: 5 Lessons Learned. Why we need to develop a broad Dynamic Landfill Management strategy and vision for Europe's 500,000 landfills (December 2018)



All newsletters and policy briefs are added below in full.



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Piet Wostyn

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namens EURELCO <katleen.vandormael@i-cleantechvlaanderen.be>
Verzonden: donderdag 24 mei 2018 9:02
Aan: Piet Wostyn
Onderwerp: EURELCO featured on Euronews, summer school in September, paper about a decision support tool for ELFM

EURELCO Newsletter #21 - May 2018



1. EURELCO: Can waste be mined and recycled?
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1. EURELCO: CAN INDUSTRIAL WASTE BE MINED AND RECYCLED?

Some half a million landfills are scattered around Europe, waiting to be mined, in what researchers say would be a win-win situation for both the economy and the environment. Once sorted, landfill material can be recycled using sophisticated chemical processes. It is a huge ecological challenge and might also be an economic opportunity. European scientists are digging deep in search for answers whether all the plastic and metal can be mined and recycled in efficient, sustainable ways. What is rubbish for most people, waste is seen as a treasure trove to scientists and waste managers.

[Check the video on Euronews >](#)

1.1 NEW-MINE: SUMMER SCHOOL 'TO MINE OR NOT TO MINE'



On September 10-12, 2018, the joint ETN SOCRATES, ETN NEW-MINE & EIT KIC IMAGINE summer school 'To mine or not to mine' will be organised in Leuven, Belgium. The interdisciplinary training programme aims at offering an integral approach for the assessment of landfill mining projects.

[Click for more information >](#)

1.2 COCOON: Thematic event on LFM

The first thematic event of COCOON on 'Environmental aspects of landfill management projects' took place in Spain on February 21-22, 2018. The event was built up on three interesting sessions: Prevention, Impacts and After Care. Also, visits to landfill sites and waste management facilities were organised.

[Click for more information >](#)



1.3 RAWFILL: Steering committee



The third RAWFILL steering committee took place in Engelskirchen (Germany) on April 17-18, 2018. A first version of the enhanced landfill inventory framework will be available soon on the RAWFILL website, the decision support tool is being build and the geophysical measurements are taking place.

[Click for more information on RAWFILL >](#)

2. PUBLICATION IN THE SPOTLIGHT

Cranfield University published a paper on ELFM in Detritus, the new multidisciplinary Journal for Waste Resources & Residues. The paper presents a decision support tool for ELFM, which aims to reduce the uncertainties with respect to the economic feasibility and environmental and social outcomes of ELFM projects.

[Download the paper >](#)



3. UPCOMING EVENTS

- 05-06/06/2018: COCOON Thematic event on interim landfill use, The Netherlands
- 13-16/06/2018: Sustainable waste management, Greece
- 10-12/09/2018: Summer school 'To mine or not to mine', Belgium
- 15-18/10/2018: Symposium on energy from biomass and waste, Italy
- 07-09/11/2018: Recy & DepoTech, Austria
- 01-05/04/2019: Slag Valorisation Symposium, Belgium

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Piet Wostyn

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Verzonden: vrijdag 6 juli 2018 10:54
Aan: Piet Wostyn
Onderwerp: Second seminar in the European Parliament, report on mapping available, animated TED-talk on ELFM

EURELCO Newsletter #22 - June 2018



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1. EURELCO: SECOND ELFM SEMINAR IN THE EUROPEAN PARLIAMENT & EURELCO GENERAL ASSEMBLY (20 & 21 NOVEMBER, 2018)

In October 2015 EURELCO organised [the first ever ELFM Seminar in the European Parliament](#), together with Belgian MEPs Hilde Vautmans and Mark Demesmaeker. The event created the moment for proposing an Amendment to the EU Landfill Directive. On March 14, 2017, [the European Parliament voted “yes!” to integrate the “ELFM Amendment” in the EU Landfill Directive](#). Unfortunately, this Amendment was later blocked by the European Council during the trilateral meeting between the European Parliament, the European Commission and the European Council. Since then EURELCO has been in dialogue with the Belgian MEP Hilde Vautmans.

EURELCO can now announce that it has been agreed to organise a follow-up ELFM Seminar in the European Parliament on 20 November 2018, where the ELFM Amendment debate will be continued. The second ELFM Seminar in the EP will be followed by a new EURELCO General Assembly on 21 November 2018, at the premises of OVAM, Mechelen, Belgium.

More detailed agenda and invitations will be sent out as soon as possible.

1.1 NEW-MINE: NEW ANIMATED TED-TALK ON ELFM



ETN NEW-MINE coordinator Peter Tom Jones gave a TED-talk (in Dutch) on Enhanced Landfill Mining for the “University of Flanders”, a science dissemination platform uniting all Flemish universities.

The video has now been subtitled in English.

[Watch the video here >](#)

1.2 COCOON: REPORT ON MAPPING OF LANDFILL MANAGEMENT IS AVAILABLE

An inventory on different landfill management issues was filled in by the COCOON partners for their region. The findings on landfill management based on the reactions in the questionnaire were summarised in the report on mapping. On former landfills adequate information is often lacking.

[Check the report here >](#)



1.3 RAWFILL: INTERREG SELECTED RAWFILL FOR SITE VISIT AT ANNUAL MEETING



Interreg selected RAWFILL during its Interreg Annual Event in June. The site chosen is the landfill of Onoz, located in the Walloon Region, Belgium. More than 20 participants from different European institutions among which representatives from the European Commission participated.

[More information >](#)

2. PUBLICATION IN THE SPOTLIGHT

Recently, the International Waste Working Group (IWWG) launched a new Multidisciplinary Journal for Waste Resources and Residues. In its Volume of June 2018 Detritus has just published two articles on (Enhanced) Landfill Mining (ELFM), which were developed through the EU MSCA-ETN NEW-MINE project. [Check the papers here >](#)



3. UPCOMING EVENTS

www.master-suma.eu/summerschool

Leuven

ETN SOCRATES, ETN NEW-MINE & EIT Raw Materials IMAGINE Summer School
10-12 September 2018 at the Novotel Centrum, Leuven, Belgium

To mine or not to mine?
A multi-criteria assessment of the landfill mining of municipal and industrial solid waste deposits

- 13-16/06/2018: Sustainable waste management, Greece
- 10-12/09/2018: Summer school 'To mine or not to mine', Belgium
- 15-18/10/2018: Symposium on energy from biomass and waste, Italy
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Van: EURELCO <sonja.vandenbergh@cleantechflanders.com>
Verzonden: donderdag 15 november 2018 9:59
Aan: Piet Wostyn
Onderwerp: EURELCO NEWS - Why ELFM should be politically acknowledged – Financial aspects landfill management – Call for papers new Thematic Issue on ELFM

Categorieën: Categorie Rood

EURELCO Newsletter #23 - November 2018



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November 2018

**Joakim Krook
Peter Tom Jones
& Steven Van Passel**

1. EURELCO: WHY ELFM SHOULD BE POLITICALLY ACKNOWLEDGED IN EUROPE (POLICY BRIEF)

In preparation of the [2nd ELFM Seminar in the European Parliament](#) (20-11-2018), EURELCO has just published a new Policy Brief in collaboration with the EU Horizon 2020 MSCA-ETN NEW-MINE project. This Policy Brief – [“Why ELFM needs to be politically acknowledged to facilitate sustainable management of European landfills”](#) – highlights the importance to institutionalize ELFM, as the authors concur that “neglecting ELFM in EU policy and regulatory frameworks is not a neutral act but rather an effective way to lock in conventional practices and lock out ELFM”. They state: “ELFM needs to become institutionalized and recognized as a potential option for landfill management and recovery of natural resources. (...) A first step of such a process could be to legally define ELFM and provide this emerging concept with a clear regulatory framing.” Authors are Joakim Krook (Linköping University, Sweden), Peter Tom Jones (KU Leuven, Belgium) and Steven Van Passel (Antwerp University, Belgium).

[Download the Policy Brief here >](#)

1.1 NEW-MINE: SUCCESSFUL MID-TERM REVIEW MEETING



On September 5, 2019, the formal Mid-Term Review meeting took place for ETN NEW-MINE in Leuven. A full review of the project was undertaken and the 15 Early Stage Researcher presented their results after 2 years of work. In the final feedback session the EC Project Officer and the official expert corroborated that the project is well on track.

[A full report can be read here >](#)

1.2 COCOON: FINANCIAL ASPECTS OF LANDFILL MANAGEMENT PROJECTS



The third thematic event on the financial aspects of landfill management (LfM) projects took place in Larnaca and Nicosia (Cyprus) on September 25-26, 2018. Both financing of LfM projects through the OP and financial measures related to LfM projects were discussed. You can find the presentations [here >](#).

1.3 RAWFILL WORKSHOP AT POLLUTEC 2018

POLLUTEC 2018

27 - 30 November 2018 at Lyon Eurexpo

The 28th international trade show for environmental equipment, technologies and services

RAWFILL has the pleasure to invite you to the Conference “Landfills II – the Return : mine old landfills, utopia, or reality?” organised on 30 November during POLLUTEC 2018 (the 28th international trade show for environmental equipment, technologies and services

[For more information click here >](#)

2. PUBLICATION IN THE SPOTLIGHT

A Flemish-Austrian team of ELFM researchers (VITO, OVAM & TU Wien) has just published a landmark paper on decision making guidelines for mining historic landfill sites in Flanders, using the United Nations Framework Classification for Resources (UNFC) system.

[Find more information about the paper here >](#)



3. THEMATIC ISSUE ON ELFM IN DETRITUS – CALL FOR PAPERS

EURELCO and ETN NEW-MINE are delighted to announce that there will be a new Thematic Issue on Enhanced Landfill Mining (ELFM) in the IWWG Journal *Detritus*. The call for papers is now open. Deadline is June 11, 2019. [Detailed information can be found here >](#)



4. UPCOMING EVENTS

- [20/11/2018: Second ELFM Seminar in the European Parliament](#)
- [21/11/2018: EURELCO General Assembly](#)
- [27-30/11/2018: Pollutec 2018](#)
- [01-05/04/2019: Slag Valorisation Symposium, Belgium](#)



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November 2018



**Joakim Krook
Peter Tom Jones
& Steven Van Passel**

Why Enhanced Landfill Mining (ELFM) needs to be politically acknowledged to facilitate sustainable management of European landfills

Executive Summary:

- For a share of Europe's 500,000 landfills, Enhanced Landfill Mining (ELFM) could offer a more sustainable management option than conventional practices by combining remediation with recovery of dormant materials, energy carriers and land resources.
- Developing cost-efficient and societally-motivated ELFM practices relies on extensive investments in know-how and technology innovation, policy support and market interventions.
- Neglecting ELFM in EU policy and regulatory frameworks is not a neutral act but rather an effective way to lock-in suboptimal, conventional practices.
- In order to stimulate investments in the area and enable policy support and market interventions, ELFM needs to become institutionalised and recognised as a potential option for landfill management and recovery of natural resources



This project has received funding from the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721185

1. Introduction

During the 20th century, Europe has placed massive amounts of obsolete materials in landfills. The majority of these by now 500,000 waste deposits constitutes non-sanitary municipal solid waste (MSW) landfills, predating the EU Landfill Directive (1999). Although these poorly equipped sites are associated with local, regional and global environmental impacts, as well as significant land use restrictions, Europe does not yet have any coherent strategy for their future management. When it comes to traditional remediation measures for avoiding environmental and health effects from these sites, the available public funding is also largely insufficient in the EU member states. For a share of all these landfills, Enhanced Landfill Mining (ELFM) could offer a more sustainable management option than traditional remediation and aftercare. ELFM is *“the integrated valorisation of landfilled waste streams as materials and energy, using innovative transformation and upcycling technologies and respecting the most stringent social and ecological criteria”* (Jones et al, Journal of Cleaner Production, 2013). The potential of this emerging concept lies in its integrated

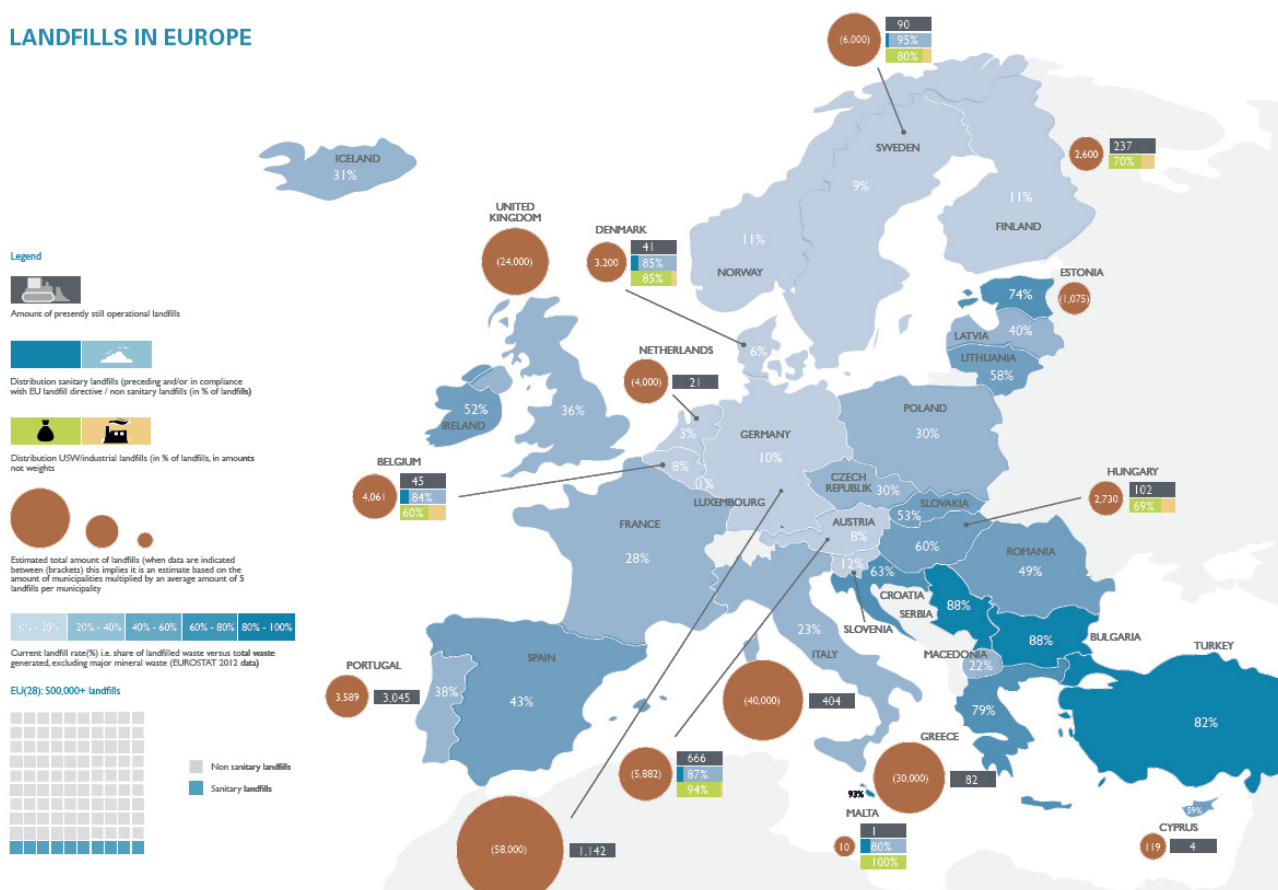
approach where remediation is combined with the excavation, processing and recovery of deposited materials and energy resources. Recent research shows that such a strategy could be a potential way to facilitate remediation of malfunctioning landfills, reclaim valuable urban land for purposes that are more sustainable and bring significant amounts of dormant metals, minerals and energy carriers back to use in society. Besides a few pilot trials, however, there is up till now a general lack of real-life, full-scale projects validating the feasibility of ELFM. The further development of the concept therefore circulates around the key challenge of how such projects could be executed cost-efficiently together with clear environmental and societal benefits.

2. Is ELFM economically feasible?

As for most emerging environmental innovations, ELFM often experiences a hard time when exposed to current market conditions. However, whether or not ELFM could become an economically feasible option is reliant on multiple factors and on which objectives and values that are realised in such projects. So far, conducted economic assess-

For a share of Europe's 500,000+ landfills, Enhanced Landfill Mining (ELFM) could offer a more sustainable management option than traditional remediation and aftercare.

LANDFILLS IN EUROPE



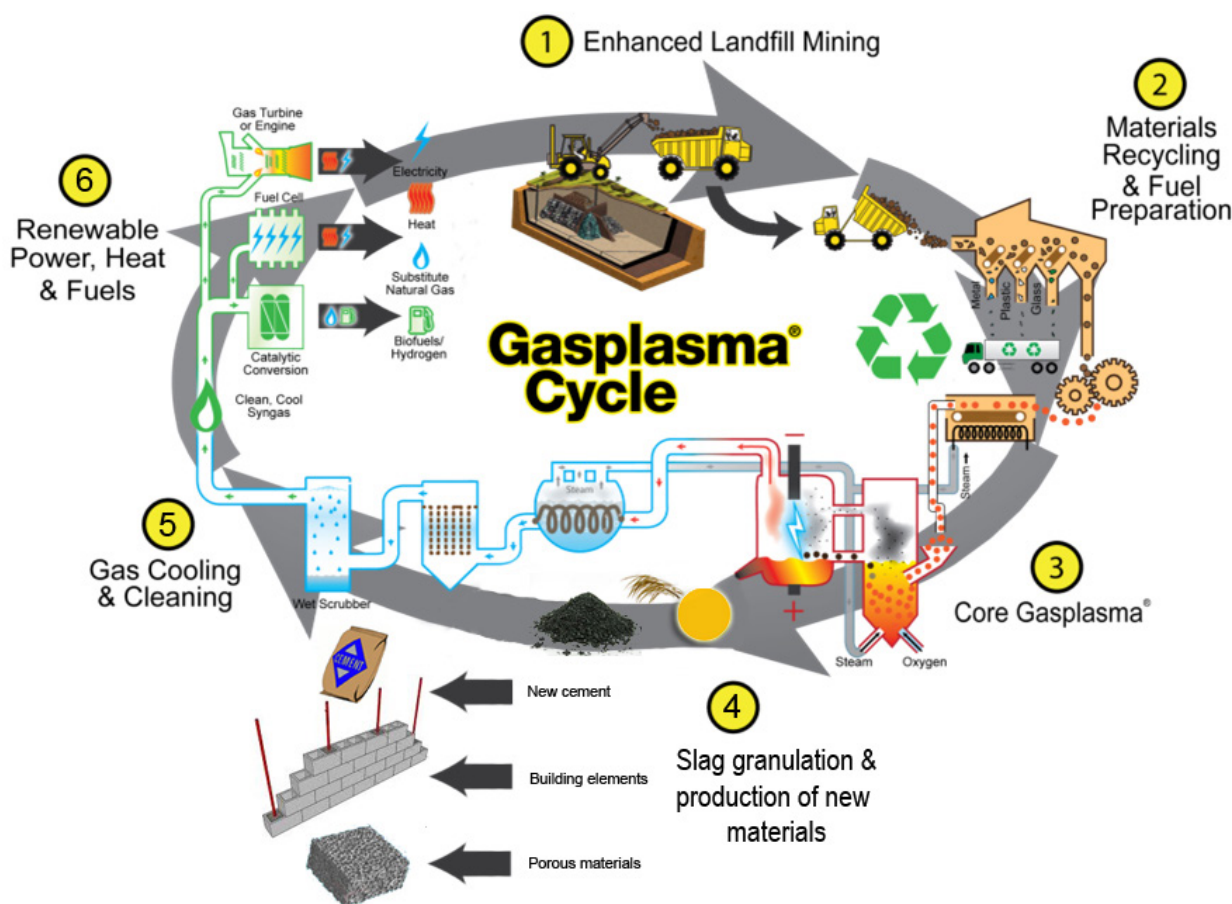
For the majority of Europe's landfills, having no or poor gas management systems in place, ELFM will virtually always result in net avoided climate emissions.

ments have mainly addressed the objective of resource recovery from landfills. Virtually all of these studies conclude that the process (e.g. investment and operational costs for the ELFM processing line) and material-flow-related (i.e. costs for transportation and disposal of exhumed materials) expenditures exceed the perceived revenues for recovered materials and energy carriers. A key challenge here is that in current waste markets only a minor share of the processed materials will generate any significant income (e.g. metals) while the remains will involve low revenues or disposal costs (e.g. aggregates, waste fuel and residues). In such a context, the economy of resource extraction from landfills mainly become a matter of regional cost settings for waste disposal while investing in improved sorting schemes to maximise metal revenues do not pay off. This is one prime reason for why the most recent ELFM research involves development of innovative technologies aiming to transform and upcycle the separated materials and energy carriers to more high-value commodities such as syngas, fuel-grade H_2 and low-carbon build-

ing materials (e.g. inorganic polymers).

Although technology innovation, increasing raw material prices and demands for secondary resources might change the conditions for resource recovery from landfills over time, this objective alone will presumably – in the short term – not provide sufficient economic incentives for ELFM implementation. Instead, research shows that obtaining cost-efficiency will also rely on the realisation of other objectives and values such as avoidance of high landfill remediation and aftercare costs as well as reclamation of valuable urban land or landfill void space. The current lack of economic incentives for ELFM is also partly related to EU waste policy, which directly influence market conditions for disposal, treatment and recycling practices. A denominator for this waste policy has been to re-direct (fresh) waste from landfills to more preferable recycling options by introducing bans, high costs and increasing disposal taxes. When it comes to ELFM, however, these very same instruments cause disincentives for recovery of deposited resources by inferring

ELFM flowsheet



Neglecting ELFM in EU policy and regulatory frameworks is, therefore, not a neutral act but rather an effective way to lock in conventional practices and lock out ELFM.

significant project costs for the inevitable re-deposition of unrecoverable material fractions. These policies have also contributed to market failure where, for instance, waste incinerators can charge significant gate fees for accepting high quality waste fuel. Given the large amounts of waste fuel contained in many MSW landfills, such market structures have a decisive negative impact on the economic motives for ELFM. Recent economic assessments of ELFM also conclude that there is a lack of economic policy instruments for internalising environmental externalities into the project economy. In practice, this means that remediation of malfunctioning landfills and re-circulation of previously abandoned materials and energy resources become a matter of contributing to the common good of the society rather than key business aspects.

3. ELFM & sustainability

The fact that ELFM involves several objectives and values adds complexity to the evaluation and governance of its contribution to sustainability. When it comes to the environmental consequences of such projects, the only impact that has been comprehensively studied is global warming. Here, recent findings conclude that the climate impact can vary considerably from case to case, ranging from large emission savings to significant net contributions to global warming. These variations in climate impact depend on if and to what extent ELFM contributes to avoided emissions from long-term landfill gas generation and replaced energy and material production. In principle, the

potential for global warming mitigation is driven by projects on MSW landfills with poor landfill gas management that also are rich in organics (and metals). In order to obtain as much avoided climate emissions as possible, ELFM should also be executed by advanced technologies for separation and resource recovery, preferably in regions where the prevailing energy systems have a moderate to high fossil share. For the majority of Europe's landfills, having no or poor gas management systems in place, ELFM will virtually always result in net avoided climate emissions.

When it comes to other types of environmental impacts of ELFM, our knowledge is still limited. This deficit in understanding is problematic given that the realisation of such projects will presumably generate both positive and negative environmental consequences. Although the overall benefits of remediation of non-sanitary landfills and circulation of natural resources are well established, the excavation and processing of deposited masses will for instance cause temporary local environmental impacts and risks. In addition, pollution concerns related to various materials and energy recovery routes may emerge due to risks for co-recycling of hazardous substances contained in the landfill. If we then turn to the broader societal impacts of ELFM, a few studies outline several benefits such as improved regional material autonomy, liberation of valuable land resources and strengthened local economies through job creation and spillovers to other cleantech and recycling sectors. All current frag-

ELFM excavation at the Remo landfill site in Belgium, where the benchmark Closing the Circle ELFM project is developed



mented ELFM impact assessments are primarily focused on the environmental and/or techno-economic aspects, while social aspects are not yet considered. Given the lack of real-life projects, however, these benefits are only potentials and there is not yet any balanced and well-supported understanding of the positive and negative societal impacts of ELFM implementation.

4. Development of ELFM know-how and technology

Although ELFM displays a significant societal potential, developing cost-efficient and sustainable practices for such projects rely on extensive and long-term investments in know-how and technology innovation. According to recent research reviews, the following R&D topics are fundamental in this respect and address important knowledge deficits throughout the ELFM value chain:

- What site and local settings constitute landfills suitable for mining? So far, ELFM case studies have involved more or less randomly picked landfills. There is thus a need for systematic prospecting methods enabling a strategic selection of landfills suitable for mining. Such method development can depart from existing landfill surveys but needs to be complemented by additional landfill mapping efforts as well as the establishment of a systemic understanding of how different site and local settings jointly contribute to ELFM feasibility and performance.
- Which materials and energy resources can actually be recovered from deposited waste? In order to develop a sound understanding of what is technically and economically feasible to separate out and recover, there is no real alternative than to go from the often-seen laboratory studies and small-scale trials to practice. More specifically, there is a need for well-planned pilots in which the efficiency, capacity and performance of different separation, transformation and upcycling technologies and processing lines are assessed and continually improved in a scale comparable to real-life projects. Areas with restricted policy rules can support further development.
- What is the quality level and marketability of resources exhumed from landfills? Given its large impact on both the economic feasibility and societal motives for ELFM, the issue of resource quality and marketability of extracted materials and energy carriers from landfills needs to be more strongly emphasized in upcoming research. Worth noting is that this need is not just about performing detailed characterisation of the outputs from different separation, transformation and upcycling technologies. But in order to develop an increased understanding of viable recovery routes for such ELFM commodities, knowledge about existing market structures, supply and demand dynamics, competition and policy implications is of equal importance. Next, the development

The development of ELFM policy support and market interventions requires that authorities recognise such activities as societally-motivated.



ELFM IV closing debate video

From left to right: Victor Dries (moderator, Policy Advisor Flemish Government), Magnus Gislev (EC DG GROW), Derek Greedy (ISWA), Yves Tielemans (Group Machiels), Claudia Neculau (SpaQue, Interreg NEW RAW-FILL), Jan Frank Mars (RWS, Interreg Europe COCOON) and Mieke Quaghebeur (VITO): [view here](#)

Joakim Krook is Associate Professor in Industrial Ecology at the Division Environmental Technology and Management, Linköping University (Sweden). He is specialised in multidisciplinary systems analysis research on recycling strategies and landfill and urban mining. He is Steering Committee Member of EURELCO and editor of the special issue entitled “Urban and Landfill Mining: emerging global perspectives and approaches” in *Journal of Cleaner Production* (2013). He is Principal Investigator for Linköping University in the EU MSC-ETN NEW-MINE project.



of a wide range of new business cases can foster ELFM development. Beyond such practically oriented R&D, which address specific knowledge gaps along the ELFM value chain, there is also a need for developing a better systemic understanding of which site-specific factors, project settings and system conditions that are most critical for feasibility and performance. Apart from that such system-oriented research could constitute a powerful learning tool for facilitating development of applicable prospecting methods and tailored ELFM processing lines; it is also indispensable when it comes to specifying needs for policy and market interventions. In order to better support policy-making, however, broader assessment frameworks are needed covering local to global environmental impacts as well as the most relevant socio-economic consequences of ELFM.

5. The essential role of policy support and market interventions

By learning from the evolvement of other sustainability-driven innovations (e.g. renewable energy), the transformation of emerging concepts to conventional practices relies on a clear political direction and support. This is because existing policies, markets and governance structures are adjusted to the needs of established industries – conditions under which early stage environmental innovations are seldom competitive. Neglecting ELFM in EU policy and regulatory frameworks is, therefore, not a neutral act but rather

an effective way to lock in conventional practices and lock out ELFM.

In order to stimulate investments in know-how and technology innovation and enable policy support and market interventions, ELFM needs to be institutionalised. In 2017 there was a first attempt to do so. The European Parliament adopted its Waste Package on March 14, 2017, which included “Article 5”: *“The Commission shall further examine the feasibility of proposing a regulatory framework for enhanced landfill mining so as to permit the retrieval of secondary raw materials that are present in existing landfills. By 31 December 2025 Member States shall map existing landfills and indicate their potential for enhanced landfill mining and share information.”* Unfortunately, this ELFM Amendment to the Landfill Directive was later blocked by the Council during the trilateral meeting. We consider this as a missed opportunity. A second attempt to institutionalise ELFM should be better explained in terms of the potential environmental, social and economic improvements that the ELFM concept can bring to Europe. A first step of such a process could be to legally define ELFM and provide this emerging concept with a clear regulatory framing. At present, authorities are ambivalent to how ELFM, with its multiple objectives (e.g. remediation and recycling), should be handled in relation to existing regulatory frameworks, which are developed for conventional activities and the realisation of one purpose at a time (e.g. remediation or recycling). For unconventional practices such as

Three years after the first ELFM Seminar in the European Parliament, a follow-up Seminar will take place on November 20, 2018, in the European Parliament (Brussels). The scope for the 2nd ELFM Seminar in the EP is broadened from landfill mining only to the development of a dynamic landfill management and mining strategy for Europe's 500,000+ landfills. An impressive programme has been developed. The event is a co-organisation of MEP Hilde Vautmans, SIM² KU Leuven, CTF, EURELCO and 3 EU-funded landfill management/mining-related projects: NEW-MINE, COCOON and RAWFILL. More info [here](#).

2nd ELFM Seminar in the European Parliament November 20, 2018



ELFM, such conditions for governance create uncertainties regarding the playing rules especially so since remediation and recycling activities involve significantly different regulatory frameworks. This situation makes it difficult for actors to foresee the outcome of their investments – something that effectively constrain their will to engage in the area. The lack of market advantage means that the success of environmentally-driven innovations depends on political support and interventions, at least initially. Such inducement mechanisms could take many different forms such as investment support, governmental grants and loans and tax anomalies. When it comes to ELMF, investment support or specific research grants for establishing costly large-scale pilot and demonstration projects would be particularly important at this stage. So would funding of regional landfill surveys and mapping exercises that specifically address the resource aspects of such deposits.

However, it needs to be said that just supporting development of know-how and technology innovation is not enough for establishing cost-efficient and sustainable ELMF practices. Correcting current market failures is most likely also required, thereby enabling adequate revenues for extracted materials and energy carriers and avoiding high re-deposition costs and taxes for the share of the residual waste fractions that cannot be recovered. Economic instruments that internalise positive and negative ELMF externalities into the project economy is another example of potential policy interventions that would change economic boundary conditions and stimulate societally-motivated practices. Obviously, the development of ELMF policy support and market interventions requires that authorities recognise such activities as societally-motivated.

Given the early stage of development, such recognition could be challenging to obtain due to significant uncertainties and needs to capture the multiple objectives of ELMF (e.g. various materials recycling, recovery of energy carriers, remediation of malfunctioning landfills and land reclamation). A recent government commission in Sweden reveals that existing authorities lack institutional capacity for governing such complexity and uncertainties of emerging innovations. By more or less considering only one objective of ELMF, i.e. metals recycling, the Swedish EPA concluded that political support is not societally justified and stated that *“The EPA believes that the important remediation work shall not be jeopardised by uncertain possibilities for recycling of disposed resources”*. To facilitate emergence of ELMF as well as other circular economy innovations, institutional change, breaking up current structures, might therefore be needed because at present such multi-value concepts do not seem to have an institutional affiliation capable of governing their emergence in a complex and uncertain world.

What evolutionary economics tells us is that it is often hard to foresee which innovations that in the end will prove most viable. From a policy perspective, this means that there needs to be an openness for allowing and supporting the emergence of several options. Given the lack of coherent strategies for how Europe should manage its 500,000 landfills as well as how a circular economy could be established, we therefore urge politicians and authorities to also consider ELMF as a potential future business line.

Want to react? Send your comments to peter.jones@kuleuven.be.



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Steven Van Passel is Professor Environmental Economics at the University of Antwerp. His research concentrates on the economic and sustainability assessment of micro-systems (e.g., firm level or system level). As an ecological and environmental economist, he is specialised in conceptual and methodological aspects of assessing sustainability, clean technologies and climate change. He is Principal Investigator for the University of Antwerp in the EU MSC-ETN NEW-MINE project.



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**Key project information:**

Project type: H2020 MSCA-ETN

Project duration: 4 years

(01/09/2016 to 31/08/2020)

Website: <http://new-mine.eu/>

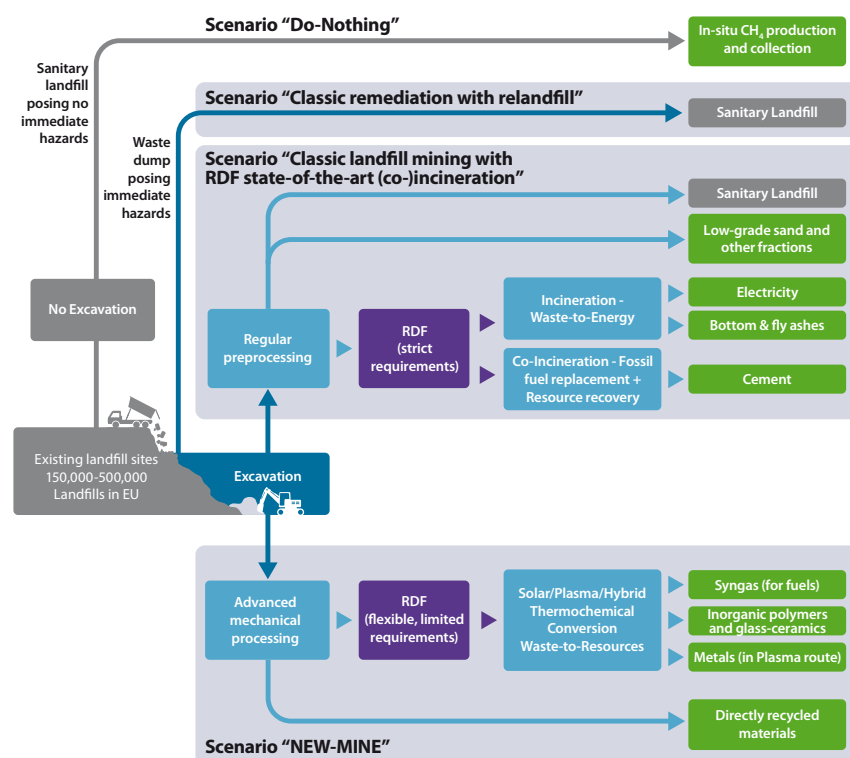
EU contribution: €3.85 m

Coordination: KU Leuven

Europe has somewhere between 150,000 and 500,000 landfill sites, with an estimated 90% of them being “non-sanitary” landfills, predating the EU Landfill Directive of 1999. These older landfills tend to be filled with municipal solid waste and often lack any environmental protection technology. In order to avoid future environmental and health problems, many of these landfills will soon require expensive remediation measures. This situation might appear bleak, but it does present us with an exciting opportunity for a combined resource-recovery and remediation strategy, which will drastically reduce future remediation costs, reclaim valuable land, while at the same time unlocking valuable resources. However, the widespread adoption of Enhanced Landfill Mining (ELFM) in the EU, as envisaged by NEW-MINE, urgently requires skilled scientists, engineers, economists and policy makers who can develop cost-effective, environmentally friendly ELFM practices and regulatory frameworks. All this demands a European commitment to concerted, inter- and transdisciplinary research and innovation. NEW-MINE trains 15 early-stage researchers (ESRs) in all aspects of landfill mining, in terms of both technological innovation and multi-criteria assessments. The techno-

logical innovation follows a value-chain approach, from advanced landfill exploration, mechanical processing, plasma/solar/hybrid thermochemical conversion and upcycling, while the multi-criteria assessment methods allow to compare combined resource-recovery/remediation ELFM methods with the

“Do-Nothing”, “Classic remediation” and “Classic landfill mining with (co-)incineration” scenarios. By training the ESRs in scientific, technical and soft skills, they become highly sought-after scientists and engineers for the rapidly emerging landfill-mining and broader raw-materials industries of Europe.



EURELCO is an open, quadruple helix network that supports the required technological, legal, social, economic, environmental and organizational innovation with respect to Enhanced Landfill Mining within the context of a transition to a resource efficient, circular, low-carbon economy. Are you a relevant actor working on ELFM? More information on how to become a EURELCO Member can be found here: <https://eurelco.org/become-a-partner/>



December 2018

Peter Tom Jones
Eddy Wille
Joakim Krook



2nd ELFM Seminar in the European Parliament: 5 Lessons Learned

Why we need to develop a broad Dynamic Landfill Management strategy and vision for Europe's 500,000 landfills



Executive Summary:

- The Second ELFM Seminar in the European Parliament took place on November 20, 2018. More than 50 directly involved stakeholders from the European Parliament, the European Commission, regional Public Bodies, industry and academia interactively debated the need to develop a clear vision on the management and mining of Europe's 500,000+ landfills.
- **Lesson Learned #1:** The ELFM Amendment of the Landfill Directive was rejected by the European Council in May 2017 as ELFM is a red line for the Eastern European Member States that have other, more pressing priorities in waste management, such as the avoidance of landfilling and the setting up of basic recycling schemes.
- **Lesson learned #2:** The participants agreed that the (revised) EU Landfill Directive has a number of blind spots. It has no bearing on the majority of Europe's 500,000 landfills as they predate the Directive (1999). As regards the minority of sanitary landfills, for which it was created, it has no answer for the long-term liabilities, as aftercare funds are underfunded, making any kind of future remediation and/or mining activity less attractive.
- **Lesson learned #3:** There was a consensus that the way forward is to prioritise the incorporation of the more comprehensive, multi-phased concept of Dynamic Landfill Management into European legislation rather than focussing only on its most ambitious part, i.e. Enhanced Landfill Mining.
- **Lesson learned #4:** It was agreed there is an urgent need for a comprehensive definition of the concept Dynamic Landfill Management (DLM), which should capture various dimensions. First of all, DLM refers to the dynamic view on landfill management, i.e. the management of any given landfill needs to smartly change and adjust over time. Secondly, DLM needs to offer an integrated framework, satisfying multiple objectives, ranging from pollution prevention, land reclamation and restoration, creation of new landfill void space, interim use of the landfill surface, to the recovery of materials and energy resources. Thirdly, a DLM definition needs to highlight the need for a cross-cutting approach with respect to distinct European policies and legislations. The task to develop a broadly-supported definition for DLM is given to the Interreg Europe COCOON team.
- **Lesson learned #5:** It was agreed that Enhanced Landfill Mining (ELFM) remains a highly valuable concept, albeit as one specific, more advanced component within the broader DLM concept. The political acknowledgement of the resource recovery-driven ELFM concept remains relevant, in line with Europe's Circular Economy Action Plan.

First ELFM Seminar in the EP (20 October 2015)



From the First to the Second ELFM Seminar in the European Parliament

On October 20, 2015, two Flemish MEPs (Vautmans & Demesmaeker) organised the first ever Seminar on Enhanced Landfill Mining (ELFM) in the European Parliament, in collaboration with EURELCO, i.e. [the European Enhanced Landfill Mining Consortium](#). The Seminar featured speakers of the EC, the EP, along with leading actors representing industry, academia and public bodies. The seminar was attended by almost 100 people who debated the landfill (mining) situation in Europe. The meta-conclusion of the event was that the European Union urgently requires thorough inventories of its landfills and needs to develop a clear long-term vision on the management and mining of its landfills. One can download the event report here: [URL](#).

Three years after the First Seminar, the Second Seminar was organised in the European Parliament by MEP Hilde Vautmans (ALDE Group) in

collaboration with EURELCO, Cleantech Flanders, SIM² KU Leuven and 3 EU-funded landfill management/mining-related projects: EU MSCA-ETN NEW-MINE, Interreg Europe CO-COON and Interreg NWE RAWFILL. In this case, a more interactive debate formula was chosen and the scope was broadened from Enhanced Landfill Mining-only to a broader view on Dynamic Landfill Management (DLM).

In contrast to the First Seminar, which still had a very Flemish/Belgian orientation, the Second Seminar provided a truly European perspective. Lessons learned in distinct EU regions and Member States were shared and discussed in great depth (see Text Box Programme and Presentations). All stakeholders were also invited to send their testimonial of the event. A selection of these can be found throughout this Policy Brief, as they provide a clear view on the achieved consensus with respect to the Lessons Learned, summarised in the Executive Summary.

Second ELFM Seminar in the EP (20 November 2018) (Photo: Copyright 2018 EU/EP):



Programme and Presentations

- Keynote intro by **MEP H. Vautmans** (ALDE): download [speech here](#)
- Retrospective by **P.T. Jones** (EURELCO Coordinator & EU Horizon 2020 MSCA-ETN NEW-MINE) (download [presentation here](#))
- Intros by **U. Stock** (LfU Brandenburg, Germany), **E. Wille** (OVAM, Belgium) & **C. Neculau** (SpaQue, Belgium) on lessons learned on landfill management and mining policies/technologies in Europe (resp. COCOON & RAWFILL) (download [presentation on COCOON-RAWFILL here](#))
- Intro by **Y. Tielemans** (Group Machiels) on barriers & opportunities for private actors willing to undertake ELFM projects (cf. Closing the Circle case) (download [presentation here](#))
- **Debate I: Short-term opportunities for landfill management (e.g. interim use) and mining, featuring:** COCOON/RAWFILL partners & stakeholders: **G. Coca** (Junta de Andalucia, Spain), **Alexis De Mey** (Ministry of the Environment, Wallonia Region, Belgium), **C. Wolf** (TH Köln, Germany), **U. Stock** (Landesamt für Umwelt des Landes Brandenburg, Germany), **J.F. Mars & F. van de Sande** (Rijkswaterstaat, Netherlands), **H. Scharff** (Afvalzorg, Netherlands).
- Intro by **MEP M. Demesmaeker** (ECR, Shadow Rapporteur Landfill Directive – [URL](#)) on ELFM & Landfill Directive
- **Debate II: EU legislation/policies (LFD, Soil Directive, CE, climate targets) and landfill management and mining benefits, with interventions from:** EC: **M. Nyberg** (GROW), **S. Happaerts** (REGIO); EP: **M. Demesmaeker** (Belgium, ECR), **H. Vautmans** (Belgium, ALDE); Academics: **J. Krook** (EU NEW-MINE, Linköping Univ., Sweden), **S. Wagland** (EU SMARTGROUND, Cranfield Univ., UK).
- Closing statement by **MEP H. Vautmans** (ALDE)
- **Moderator: V. Dries** (Adviser Flemish Government, Cabinet Liesbeth Homans, Expert on ELFM)



Photos (Copyright 2018 EU/EP)

Lesson Learned #1: The ELFM Amendment of the Landfill Directive was rejected by the European Council as ELFM is a red line for the Eastern European Member States that have other priorities in waste management

During the first panel debate considerable attention was devoted to finding explanations for the 2017 rejection of the so-called ELFM Amendment to the Landfill Directive in the trilogue negotiations in May 2017. Let us recap. This Amendment was previously introduced by MEP Mark Demesmaeker. It stated “*The Commission shall further examine the feasibility of proposing a regulatory framework for enhanced landfill mining so as to permit the retrieval of secondary raw materials that are present in existing landfills. By 31 December 2025 Member States shall map existing landfills and indicate their potential for*

enhanced landfill mining and share information.” The Amendment was adopted by the European Parliament on March 14, 2017, which at that time was considered as a major milestone for the proponents of the ELFM concept. Unfortunately, a couple of months later, this ELFM Amendment was blocked by the European Council during the trilateral meeting between the Parliament, the Council and the Commission.

The reasons for the reluctance by the Council to accept a formal reference to the ELFM framework were widely discussed by the participants of the 2nd ELFM Seminar. However, it was a pity that, despite numerous invitations by MEP Hilde Vautmans, to various persons of DG ENV, the Directorate that is the competent authority for the Landfill Directive, was not represented at the Seminar. The views of various MEPs and EC representatives (DG GROW,

“WTF Landfills. Indeed, what’s the future of landfills? Should we eternally invest in maintaining the status quo or develop a dynamic management, bringing landfills in harmony with their environment? All current schemes of Circular Economy expel (500,000+) landfills. That’s breaking your own rules. Each landfill should be at least assessed in view of a re-integration in the circular system of resources (materials, energy, land). The future implies dealing with the past, not walking away from it. This seminar was inspiring and a driver we needed.”

Eddy Wille (Flemish Public Waste Agency, Belgium)



MEP Hilde Vautmans (ALDE Group) @ Second ELFM Seminar in the EP (20 November 2018)
(Photo: Copyright 2018 EU/EP):

DG REGIO) were nevertheless heard, as well as those of multiple landfill experts from regional and national public bodies. MEP Hilde Vautmans summarised the discussion as follows: *“Talking about ELFM is a red line for the Eastern European Member States that have other priorities in that field, think of waste and landfill reduction. As other European Member States - more advanced when it comes to waste management - fear that a package will not pass if a concept like ELFM is included, we end up with a Landfill Directive that does not refer to ELFM.”*

Lesson Learned #2: The EU Landfill Directive suffers from multiple blind spots

Subsequently, a number of landfill experts discussed the merits and pitfalls of the (revised) Landfill Directive. The following conclusions were made. First of all, the Landfill Directive does not have anything to say on the fate of Europe’s historic landfills, which predate the Landfill Directive (1999) and which form the majority (i.e. > 90%) of Europe’s 500,000 landfills. The existence of such a vacuum is mind boggling.

Furthermore, even for those landfills for which the Landfill Directive is actually relevant, serious flaws were exposed during the Seminar. The (revised) Landfill Directive is still based on a static view on (sanitary) landfills. In this paradigm, landfills are considered as final repositories of waste. They need to be monitored; the waste needs to be contained with a multi-barrier system, all in view of a risk-based approach. The minimum period of 30 years of

monitoring, however, was called into question by a number of landfill management experts, who indicated that the monitoring period will need to be much longer than 30 years. This view was summarised by the renowned landfill expert Heijo Scharf (Afvalzorg, Netherlands): *“It is amazing how many people believe that monitoring and aftercare of EU landfills can stop. Funding needs to cover at least 30 years. But monitoring only stops when a landfill poses no hazard to the environment any more. An assessment method doesn’t exist. Therefore, landfills in the EU cannot be discharged from aftercare and monitoring.”*

It was agreed by the landfill experts that the Landfill Directive does not have an answer for the long-term liabilities, as aftercare funds are underfunded, making any kind of future remediation/mining activity less attractive. The long-term liability issue becomes increasingly important as new threats, such as climate change, will impact landfills in coastal and alluvial areas, requiring remediative action in the future.

Lesson Learned #3: Prioritise the incorporation of the more comprehensive, multi-phased concept of Dynamic Landfill Management into European legislation rather than pushing an ELFM-only approach

From a legal point of view, the present landfill paradigm represents a static, environmental risk-based view on landfills. Unfortunately, a plethora of new opportunities, such as the interim use and integrated revitalisa-





Heijo Scharff @ Second ELFM Seminar in the EP (20 November 2018) (Photo: Georgian Dinu/KU Leuven)

tion of landfills and their surfaces, are basically ignored in this paradigm. Such interim uses (solar parks, golf courses, nature parks...) could, however, generate revenues for aftercare, remediation and/or mining activities in the longer term. Furthermore, they can offer public benefits such as social cohesion, public health and sheltered employment. This was nicely illustrated by Prof. Paul Bardos (University of Brighton, UK) who referred to the *Lady of the North* example in the UK. This is an old landfill site, which has been converted into a country park and landscape sculpture that is open for the public from dawn til dusk each day. This example testifies to the public benefits that can be generated.

Amongst the participants of the Second ELFM Seminar there was an overwhelming consensus that the landfill paradigm needs to change from

the (Landfill Directive-linked) static view to a comprehensive, long-term, multi-phased Dynamic Landfill Management (DLM) vision, in which Enhanced Landfill Mining (ELFM) is only the icing on the cake for some specific landfills in specific situations.

Such a new DLM paradigm should have strategies and solutions for all of Europe's landfills, not only for the (minority of) Landfill Directive-compliant operational and recently-closed sanitary landfills but also for the historic landfills and waste dumps pre-dating the Landfill Directive. This is key as the latter form the majority of Europe's 500,000+ landfills. This paradigm should be aligned with the Circular Economy paradigm, rather than opposing it. Eddy Wille (Flemish Public Waste Agency) summarised it as follows: *"What's the future of landfills? Should we eternally invest in maintaining the*

"It is amazing how many people believe that monitoring and aftercare of EU landfills can stop. Funding needs to cover at least 30 years. But monitoring only stops when a landfill poses no hazard to the environment any more. An assessment method doesn't exist. Therefore, landfills in the EU cannot be discharged from aftercare and monitoring."

Heijo Scharff (Senior Advisor, AFVALZORG, The Netherlands)



"I was very happy with the interactive debate and the participants acknowledging that the current Landfill Directive is actually not obligatory for more than 450,000 historic landfills in Europe. This makes our work on the COCOON project, where we aim to improve the regional policy on landfill management, even more relevant."

Annick Vastiau (Cleantech Flanders, Belgium)



Paul Bardos (University of Brighton, UK) @ Second ELFM Seminar in the EP (20 November 2018) (Photo: Georgian Dinu/KU Leuven):

Eddy Wille (Flemish Public Waste Agency, Belgium) @ Second ELFM Seminar in the EP (20 November 2018) (Photo: Copyright 2018 EU/EP):

"During the seminar everyone agreed that a new approach is required if we want to have ELFM on the European agenda. Making policy, certainly at European level, is a difficult balancing act. Talking about ELFM is a red line for the Eastern European Member States that have other priorities in that field, think of waste and landfill reduction. As other European Member States - more advanced when it comes to waste management - fear that a package will not pass if a concept like ELFM is included, we end up with a Landfill Directive that does not refer to ELFM. So first things first. And in the case of ELFM that means we should first aim to incorporate the concept of dynamic landfill management into European legislation. Given the current attention that goes to the circular economy, I am convinced that we will succeed in this."

Hilde Vautmans (MEP, ALDE Group)
– Host 2nd ELFM Seminar



"Several ongoing EU-funded projects show that there is still much to learn about how to manage the EU's many landfills in a sustainable and innovative way. These experiences are especially relevant as the European Commission is putting more emphasis on the transition to a circular economy, including in its proposals for the 2021-2027 cohesion policy. This will help Member States and regions to manage the transition and reap its benefits for regional development."

Sander Happaerts (EC DG REGIO, Belgium)



status quo or develop a dynamic management, bringing landfills in harmony with their environment? All current schemes of Circular Economy expel (500,000+) landfills. That's breaking your own rules. Each landfill should be at least assessed in view of a reintegration in the circular system of resources (materials, energy, land). The future implies dealing with the past, not walking away from it."

When the legal aspects of this DLM perspective were discussed, it became clear that the current EU legislation does not accommodate this shift in any way (yet). This led to the question on which strategy needs to be followed. Rather than focussing only on its most ambitious part, i.e. Enhanced Landfill Mining, which is difficult to grasp for many EU Member States who have other, even more pressing waste management problems to solve, it would be better to integrate the more encompassing DLM framework in EU legislation. The DLM approach can offer more straightforward solutions now, without major investments, while even creating some revenues from interim uses. MEP Hilde Vautmans summarised it as follows: "So first things first. And in the case of ELFM that means we should first aim to incorporate the concept of dynamic landfill management into European legislation. Given the current attention that goes to the circular economy, I am convinced that we will succeed in this."

Lesson Learned #4: Prioritise a sound definition for the Dynamic Landfill Management concept

One of the key conclusions from the first panel debate about competing landfill paradigms was that there is an urgent need to come up with a 21st century-oriented view on DLM, which is closely integrated with other EU Policy Goals. Apart from the Circular Economy targets, also climate change mitigation and adaptation, as well as regional development and smart specialisation strategies were mentioned by multiple participants, including Sander Happaerts (DG REGIO).

Several experts stressed the importance of the sustainability aspect of the DLM paradigm. John Laurence Esquerra, Linköping University (Sweden) and Early Stage Research in the NEW-MINE project, stated it as follows: *"The event highlights the need for a shared sustainability perspective regarding dynamic landfill management. Beyond resource recovery, a broader ecosystem services revitalisation including interim land use (...) has to be considered. This broad sustainability perspective with long temporal aspect could be a tricky concept to grasp, but it should also not limit the facilitation of this field through an explicit political legitimisation."*

Other experts referred to the transversal character of the DLM paradigm, which also creates legislative difficulties as legislation is often stuck in non-communicating silos. Yves Tieleman (Group Machiels): *"Being a very transdisciplinary topic, it is not a trivial question which EU Directive should stipulate the definition and framework for this topic, but I believe all the participants agreed that we need an unambiguous definition on an EU level."*



Sander Happaerts (DG REGIO, EC) @ Second ELFM Seminar in the EP (20 November 2018) (Photo: Georgian Dinu/KU Leuven):

“During the seminar, it became clear to me that ELFM forms part of a wider landfill management strategy where the interim use of landfills is able to generate both economical, ecological as well as societal benefits. Being a very transdisciplinary topic, it is not a trivial question which EU Directive should stipulate the definition and framework for this topic, but I believe all the participants agreed that we need an unambiguous definition on an EU level.”

Yves Tielemans (Project Manager Closing-the-Circle Project, Group Machiels, Belgium)



“The most important goal of dynamic landfill management is the creation of a safe landfill, even in the distant future. For me, dynamic landfill management means finding the most suitable route, taking into account the specific landfill and the environment. The proven technologies of risk-based approaches should have their place as well as innovative ideas. Landfill mining is an important component, although landfill mining has not been implemented in the European Landfill Directive.”

Ulrich Stock (LfU Brandenburg, Germany)



One of the key actions that was agreed at the Seminar, was the need to prepare, together with the stakeholders from the Interreg Europe COCOON project, an unambiguous, comprehensive definition of the term “Dynamic Landfill Management”, which can then be used by the European Institutions in future legislative work.

Such a comprehensive definition for DLM should capture the different aspects that were highlighted by the Seminar participants. First of all, DLM needs to refer to the dynamic view on landfill management, i.e. the management of any given landfill needs to smartly change and adjust over time. Secondly, DLM needs to offer an integrated framework for the management of landfills, satisfying multiple objectives, ranging from pollution prevention, land reclamation and restoration, creation of new landfill void space thereby avoiding the development of new landfills, interim use of the landfill surface for more productive purposes, to the recovery of materials and energy resources, while respecting the most stringent social, ecological and health criteria (i.e. ELFM). Thirdly, a DLM definition needs to highlight the need for a cross-cutting approach with respect to distinct European policies and legislations in the broadest sense (Waste and Resource Management, Climate change, Flooding, Soil sealing, No net land take, Biodiversity).

To conclude, such a comprehensive, dynamic, integrated and cross-cutting DLM concept provides a potential solution for tackling the long-term liability issue for landfills, for which there

is currently no real solution (see **Lesson Learned #2**). Furthermore, the DLM concept – which considers “land(fills) as a resource” – is fully in line with EU-needs to restore degraded land and encourage land recycling, in particular by supporting the regeneration of brown-fields such as landfill sites.

Lesson Learned #5: The resource-recovery driven ELFM concept should be seen as one specific, more advanced component in the broader “Dynamic Landfill Management” approach

The second panel debate covered the question about the relation between Enhanced Landfill Mining (ELFM) and the current landfill paradigm and the associated Landfill Directive. The working definition of ELFM remains the one published in 2013 in the Journal of Cleaner Production (Jones et al.): *“the safe exploration, conditioning, excavation and integrated valorisation of (historic, present and/or future) landfilled waste streams as both materials (Waste-to-Material) and energy (Waste-to-Energy), using innovative transformation technologies and respecting the most stringent social and ecological criteria.”*

As discussed in a previous **NEW-MINE Policy Brief** by Joakim Krook et al. (November 2018), in the current, risk-based landfill paradigm the possibility of recovering materials and energy from present and historic landfills is obstructed, as the landfilled waste is deposited and shielded ad infinitum. Landfilling implies that the landfill

"My interest is in the wider sustainability performance and value of different approaches to brownfields management, especially for "soft" (i.e. not built) re-use. I learnt how landfill mining can be used as part of brownfield rehabilitation, and the importance of its "interim" management."

Paul Bardos (R3 environmental technology ltd & University of Brighton, UK)



"The event highlights the need for a shared sustainability perspective regarding dynamic landfill management. Beyond resource recovery, a broader ecosystem services revitalisation including interim land use (e.g. extension of active landfills' lifespan as a short term value and eventual reuse of land especially for old landfills as a long term value, both for supporting human and biodiversity proliferation) has to be considered. This broad sustainability perspective with long temporal aspect could be a tricky concept to grasp, but it should also not limit the facilitation of this field through an explicit political legitimisation."

John Laurence Esguerra, Linköping University (Sweden) (ESR in EU MSCA-ETN NEW-MINE)



**Maria Nyberg (DG GROW, EC)
@ Second ELFM Seminar in the
EP (20 November 2018) (Photo:
Georgian Dinu/KU Leuven):**

represents a final destination for the discarded materials. This is a waste as Europe's 500,000+ landfills contain huge amounts of base metals, waste fuel, construction materials etc. and in the light of our most ambitious visions and goals of a circular economy, just neglecting these dormant resources does not seem as a very sound and sustainable option. On the contrary, in a dynamic view on landfills, a new vision appears, where landfilled materials can be reintegrated into the (circular) economy, if and when the time is right. This was the background for the EP-approved ELFM Amendment by MEP Mark Demesmaeker (see [Lesson Learned #1](#)).

In her speech MEP Hilde Vautmans reminded the Seminar participants that in June 2018 she asked a new Parliamentary Question to the Commission (E-003580/2018) to clarify its position with respect to ELFM after the rejection of the ELFM Amendment. The question was asked in the knowledge that in recent years the EC – DG GROW in particular – has been quite supportive to the ELFM concept. Apart from funding several ELFM-related EU projects, in 2018, the EC also organised a high-profile EIP Raw Materials workshop "Enhanced Landfill mining for critical raw materials", which was stressed in the contribution by Maria Nyberg (EC, DG GROW).

The EC's answer to the Parliamentary Question stated "... the [Landfill] directive does not specifically regulate landfill mining and the Commission does not currently

envisage proposing to amend the directive in this regard. Landfill mining is, however, not prohibited, if carried out in line with EU legislation on waste (...)" Although this is the first time the Commission somehow endorses the use of ELFM as a concept – which should be considered as a key milestone for the proponents of ELFM – the words "not prohibited" are not saying the same as "facilitates", dixit MEP Hilde Vautmans.

The problematic character of the fact that, despite 10 years of ELFM activities, there is still no formal, legislative definition nor any formal reference to the resource-recovery-driven ELFM approach in EU Policy documents, was reiterated by a number of speakers during the Seminar. It was agreed that such a political acknowledgement of ELFM, as one possible approach, for some landfills, is key to progress in this area, as was also pointed out in the 2018 [NEW-MINE Policy Brief](#).

However, what became evident from the discussions is that such an ELFM definition and endorsement should be integrated as one specific, more advanced component in the broader "Dynamic Landfill Management" approach, in line with Europe's Circular Economy Action Plan. This will be taken up as a key action for the COCOON network, which needs to come up with a broadly supported, comprehensive definition of Dynamic Landfill Management, which is to include an unambiguous, eco-friendly, socially-aware description of a resource recovery-driven ELFM element.



The European Commission acknowledges in the Circular Economy Action Plan that there is a potential for recovery of Critical Raw Materials from landfills and/or mining waste provided that it is carried out in line with EU legislation on waste. We will present a more detailed analysis of this topic in the first quarter of next year. More precise commitments and objectives of the continued work on Circular Economy will be outlined by the next College of Commissioners”.

Maria Nyberg (EC DG GROW, Belgium)



“Is Landfill mining a good idea? The answer is obviously affirmative. The ELFM Seminar at the European Parliament gave us an overview with the current on-going projects and two panel debates with high-quality experts. Landfill mining is an opportunity to redevelop and convert landfill for useful land-use purpose and, in the meantime, to recover secondary raw materials. This is a perfect illustration for curving the line of our conventional economy in order to reach the circular one. There are of course many steps to achieve on technical, social, political and regulatory framework aspects but I am confident that efforts will pay. Thanks again to ELFM seminar organisers and participants for making that nearly-new concept come true.”

Alexis De Mey (Ministry of the Environment, Wallonia Region, Belgium)



“ELFM has progressed significantly since the last seminar in the European Parliament. It is imperative that ELFM maintains pace as we work towards commercial operations where ELFM will make an undoubted and substantial contribution to the security of critical raw materials. Legal and political support is paramount to achieving this goal”

Stuart Wagland (Cranfield University, UK)



“I found the seminar most interesting and am very impressed with the dedication of European Enhanced Landfill Mining Consortium to push the agenda forward and ensure that ELFM is recognised in policy. Although the UK is set to leave the EU, we will continue to look to our European partners for the inspiration, dialogue and guidance on what we see as an integral part of the overall sustainable world and resources challenge.”

Richard Thompson (Recircled Resources Ltd, UK)



“Having the opportunity to participate in the 2nd Seminar on Enhanced Landfill Mining at the European Parliament gave me a very good insight into how a very close interaction between society, authorities, industry and research is crucial for the implementation of innovative technologies in a successful manner.”

Juan Carlos Hernández Parrodi (Renewi, Belgium) - ESR in EU MSCA-ETN NEW-MINE)



“The interactive discussion among experts of the field, motivated me even more to maintain my research and contribute as much as I can to the development of a dynamic landfill management strategy for Europe’s landfills. Connecting interdisciplinary bridges and bringing all the knowledge together, this seminar showed that Enhanced Landfill Mining has a great potential to achieve sustainable development in the framework of a circular economy, where the depletion of the resources is the driving force for a better future.”

Georgia Flesoura (KU Leuven, Belgium) - ESR in EU MSCA-ETN NEW-MINE)



About the authors



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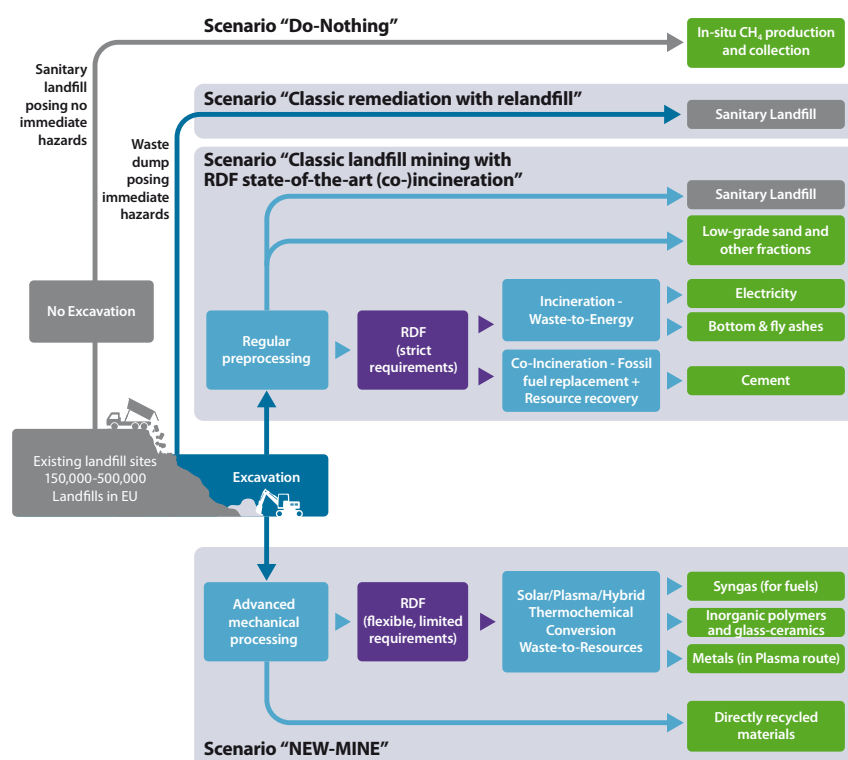


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Europe has somewhere between 150,000 and 500,000 landfill sites, with an estimated 90% of them being “non-sanitary” landfills, predating the EU Landfill Directive of 1999. These older landfills tend to be filled with municipal solid waste and often lack any environmental protection technology. In order to avoid future environmental and health problems, many of these landfills will soon require expensive remediation measures. This situation might appear bleak, but it does present us with an exciting opportunity for a combined resource-recovery and remediation strategy, which will drastically reduce future remediation costs, reclaim valuable land, while at the same time unlocking valuable resources. However, the widespread adoption of Enhanced Landfill Mining (ELFM) in the EU, as envisaged by NEW-MINE, urgently requires skilled scientists, engineers, economists and policy makers who can develop cost-effective, environmentally friendly ELFM practices and regulatory frameworks. All this demands a European commitment to concerted, inter- and transdisciplinary research and innovation. NEW-MINE trains 15 early-stage researchers (ESRs) in all aspects of landfill mining, in terms of both technological innovation and multi-criteria assessments. The techno-

logical innovation follows a value-chain approach, from advanced landfill exploration, mechanical processing, plasma/solar/hybrid thermochemical conversion and upcycling, while the multi-criteria assessment methods allow to compare combined resource-recovery/remediation ELFM methods with the

“Do-Nothing”, “Classic remediation” and “Classic landfill mining with (co-) incineration” scenarios. By training the ESRs in scientific, technical and soft skills, they become highly sought-after scientists and engineers for the rapidly emerging landfill-mining and broader raw-materials industries of Europe.



EURELCO is an open, quadruple helix network that supports the required technological, legal, social, economic, environmental and organizational innovation with respect to Enhanced Landfill Mining within the context of a transition to a resource efficient, circular, low-carbon economy. Are you a relevant actor working on ELFM? More information on how to become a EURELCO Member can be found here: <https://eurelco.org/become-a-partner/>