



Co-funded by the Walloon region

RAWFILL WP T1
Enhanced Inventory Framework
Deliverable 1.1
Current Inventories Structure Report

December 2017

WP leader: ATRASOL sprl

www.atrasol.eu



Interreg North – Ouest Europe (NWE) VB 2014 - 2020

Project: NWE377 RAWFILL

Title: Supporting a new circular economy for RAW materials recovered by landFILLs

Table

ACRONYMS AND DEFINITIONS	3
PRESENTATION OF RAWFILL	5
PRESENTATION OF WP T1 “ENHANCED INVENTORY FRAMEWORK”	6
Existing inventories, landfill mining experiences and accuracy of information.....	6
The ELIF challenge and how we will fix it.....	7
A T.1.1 current situation in NWE countries	7
Partners involved	7
Analysis of the current situation in NWE regions & countries	9
Synthesis of the analysis	10
Data accuracy	11
Landfill ID card	11
Landfill surroundings	12
Landfill geometry	13
Wastes description	13
Annex: Questionnaire related to s Inventories	16

ACRONYMS AND DEFINITIONS

COCOON: “Consortium for a Coherent European Landfill Management Strategy”, an INTERREG Europe-funded project, whose objective is to develop, integrate and improve relevant policy instruments, while increasing subsidies through operational programs for landfill mining projects,

<https://www.interregeurope.eu/cocoon/>

DST: “Decision Support Tool”, a tool that will rank landfills regarding landfill mining opportunities. The ranking is based on information following ELIF structure. It will operate at 2 levels: “Selection” (a first level of quick screening to identify landfills with a priori interesting potential but which need further historical investigations and geophysical survey) and “Ranking” (a prioritization tool to rank pre-selected and fully investigated landfills of economic interest for raw material recovery purposes).

ELFM: “Enhanced Landfill Mining”, the safe exploration, conditioning, excavation and integrated valorisation of (historic, present and/or future) landfilled waste streams as both materials (Waste-to-Material, WtM) and energy (Waste-to-Energy, WtE), using innovative transformation technologies and respecting the most stringent social and ecological criteria).

ELIF : “Enhanced Landfill Inventory Framework”, a landfill inventory structure that is focused on information regarding resources that can be extracted from a landfill (materials, energy carriers and land). The ELIF is used to describe landfills not only in terms of environmental and risk issues, but focuses on the quality and the quantity of dormant materials lying on them, in order to supply relevant data for stakeholders involved in ELFM projects.

LFM: “Landfill Mining”, the safe exploration, conditioning, excavation and integrated valorisation of (historic, present and/or future) landfilled waste streams as both materials (Waste-to-Material, W2M) and energy (Waste-to-Energy, W2E), without specification of technologies.

RAWFILL: “Supporting a new circular economy for RAW materials recovered from landFILLS”, an INTERREG North-West Europe-funded landfill mining project, launched in March 2017, www.nweurope.eu/rawfill

RECLAIM: “Landfill mining pilot application for recovery of invaluable metals, materials, land and energy”, project funded by the European Commission through Life+ 2012 vehicle, contract LIFE12 ENV/GR/000427

SMART GROUND: “SMART data collection and inteGration platform to enhance availability and accessibility of data and information in the eU territory on secondary raw materials”, an H2020-funded project aiming at improving the availability and accessibility of data and information on SRM (Secondary Raw Materials) in the EU territory, while

creating collaborations and synergies among the different stakeholders involved in the SRM value chain, www.smart-ground.eu

PRESENTATION OF RAWFILL

RAWFILL (“Supporting a new circular economy for RAW materials recovered from landfills”) is an INTERREG EU-funded landfill mining project, gathering partners and associated partners of North-West Europe regions and supported by EURELCO. RAWFILL was launched in March 2017 and will end in March 2020.

The ultimate goal of RAWFILL is to allow North West Europe public & private landfills owners & managers to implement profitable resource-recovery driven landfill mining and enhanced landfill mining projects, hereunder named LFM or ELFM according to the context.

RAWFILL develops a cost-effective standard framework for creating landfill inventories (ELIF) based on existing experiences, an innovative landfill characterization methodology by geophysical imaging and guided sampling and an associated Decision Support Tool (DST) to allow smart ELFM project prioritization. The whole concept will be demonstrated in 2 pilot sites in Flanders (Meerhout) and France (Les Champs Jouault). Additional geophysics calibration operations will take place on a few other landfills where specific information is available.

More information about RAWFILL and its progress reports can be found at the project site: www.nweurope.eu/rawfill

The ELIF will be used to describe landfills not only in terms of environmental and risk issues, but will focus on the quality and the quantity of dormant materials lying on them, in order to supply relevant data for stakeholders involved in ELFM projects.

The ELIF is the basis for the DST ranking tool and so a prerequisite to assess feasibility, business plan & business cases for launching profitable projects.

The DST is a ranking tool that will allow ELFM projects prioritization based on a set of suitable physical, chemical, environmental, technical and social information. It will integrate the multiple aspects involved in ELFM projects, i.e. economic, technical, environmental & social factors in order to compare and classify landfills regarding their ELFM interest.

PRESENTATION OF WP T1 “ENHANCED INVENTORY FRAMEWORK”

One main challenge for stakeholders involved in ELFM operations is to evaluate the project profitability risk based on quantity and quality of dormant resources that can be excavated and recovered from a particular landfill site. Related reliable decision elements are missing in most of the landfill inventories we have reviewed, covering NWE region. The most advanced inventories describe landfills in terms of environmental and risk issues, but give no way to evaluate, even roughly, their dormant resources potential. In most cases, even the volume of waste remain unknown and only a very general information is given about waste type (which is very often a mixture of domestic, industrial and construction wastes).

Existing inventories, landfill mining experiences and accuracy of information

The first review of North-West Europe existing inventories presented hereunder (WP T1 – Activity A T.1.1) shows that most of these inventories describe their landfills in terms of generic information (name, location, ownership, sometimes periods of landfilling, sometimes waste volume estimation, etc.) and, for the most advanced of them, in terms of environmental and risk issues (type of wastes, physical state, presence of leachates and biogas, geology, hydrogeology and hydrology, environmental impacts surrounding population, etc.). Detailed information about the quantity, distribution inside the waste volume and composition of buried wastes is missing.

A T.1.1 analyses current situation in NWE countries by collecting structures of public & private available LFs databases/inventories. Supported by the WP Leader, each partner collects data from its region, while the WP leader uses the EURELCO network to gather additional information.

A short review of landfill mining experiences, presented hereunder too (WP T1 – Activity A T.1.2) and focused on the methodology applied to evaluate the landfill resources potential, shows that, in the studied cases, no specific particular attention was given to the precise evaluation of resources. Other important factors lead to the decision of mining the landfill, as solving an environmental issue, recovering valuable land or performing feasibility tests. This situation is expected to change as far as the ELFM market will grow and, within North-West Europe, because some mineral resources will request more attention. For sure, in a high density populated area, the economic value of the land that can be reclaimed through an ELFM project will remain a key decision factor.

A T.1.2 performs a benchmark analysis of the existing LFM initiatives (+/- 20 in Europe), including legal, technical & economic issues, focusing on how the raw material content of the LFs was estimated, the accuracy of the evaluation and its economic impact in the (positive or negative) results.

Regarding existing information, the level of accuracy of some data is sometimes difficult to estimate, for example the indicated surface of the landfill which is mixed with the total surface of the site, the volume of waste which can be just a draft estimation based on a mean height, the type of waste which remain generic in uncontrolled landfills, etc. . As this precision is very important for launching a LFM feasibility study, our ELIF should specify for each DST-relevant field an accuracy estimation that will be taken into account for the ranking. The simplest one will be a classification as “poor/average/good/unknown”.

Analysis of A T.1.1 and A T.1.2 will lead to establish a list of suitable fields for our ELIF, which is part of the 3rd activity of the Work Package:

A T.1.4 supplies the enhanced ELIF, i.e. a database structure taking into account LFs resources, under the form of 1) a list of fields (“indicators”) and 2) a spreadsheet (“tool”). Only the first deliverable “indicators” is presented here.

The ELIF challenge and how we will fix it

The ELIF ambition is to supply stakeholders with an inventory framework that can be filled with suitable data, in order to evaluate the ELFM potential of the site. We are aware that this information, based on some general documentary studies completed by on-site geophysics investigation, will demand lots of efforts to be found, validated and encoded. We also know that this information will remain on general level and, for a particular given project, will not be sufficient to design a detailed and precise business case model. But ELIF is expected to be useful to 1) demonstrate to stakeholders the interest of reliable, enhanced inventories seen from a perspective of material and energy recovery, which is a quite recent approach; 2) do not invest time and money on sites with obviously limited ELFM potential and 3) select the most promising sites where further investigations can be concentrated.

Please note that RAWFILL ELIF is not a database in itself, but a database structure that will not contain information about any particular site. It will be presented as a spreadsheet and proposed to stakeholders in order to be integrated in their database structure and filled with information. Information will come first by exporting or transposing existing data and then by completing as much missing information as possible, using RAWFILL historical survey and geophysics imaging methodology. The challenge is to present a useful, easy-to-use, cost-effective and reliable structure that can be adopted in every NWE region or elsewhere to build a new generation of landfill inventories focused on the principles of circular economy, sustainable development ad ELFM perspectives.

A T.1.1 current situation in NWE countries

Partners involved

Lead Partner

- Atrasol sprl

Partners involved

- BAV
- NERC
- SAS Les Champs Jouault
- SPAQuE
- OVAM
- ULiège

Inventories of landfills and contaminated sites

- AuditSite © (SPAQuE)
- Walsols (SPAQuE)
- FLAMINCO (OVAM)
- Landfills in Environmental Monitoring Network (ISSEP - Wallonie)
- Système de gestion des sites contaminés (SPW - DGO3 – Wallonie)
- Denmark, Danish Waste Association Agency reply to questionnaire
- France, Les Champs Jouault, reply to questionnaire
- France, Conseil Départemental 64, structure de l'Inventaire des décharges
- France, Snefid, reply to questionnaire
- Permitted landfill sites in England at end of September 2017
- Scotland, Waste sites and capacity information, 2017
- Wales, Natural resources Wales, details on permitted waste sites, 2017
- England, Environment Agency, Authorised Landfill Sites, 2017
- LIFE12 ENV/GR/000427 LIFE Reclaim "Landfill mining pilot application for recovery of invaluable metals, materials, land and energy"; Technical Report on the inventory of landfills of interests to landfill mining in Greece and selected EU countries, Athens, March 2015
- LIFE12 ENV/GR/000427 LIFE Reclaim "questionnaire about active and closed landfill"
- Germany, reply to questionnaire: Interessengemeinschaft Deutsche Deponiebetreiber – InwesD: Deponiebuch - compiled characteristics of 99 landfills, biennial update according to landfill operators general information (spreadsheet), Nordrhein-Westfalen
- Germany, reply to questionnaire: Landesamt Für Umwelt (LfU) Brandenburg
- Greece, ENVECO reply to questionnaire
- Assessment of Member States' performance regarding the implementation of the Extractive Waste Directive; appraisal of implementation gaps and their root causes; identification of proposals to improve the implementation of the Directive, European Commission final report, July 2017
- Progress in the management of Contaminated Sites in Europe, Marc van Liedekerke, Gundula Prokop, Sabine Rabl-Berger, Mark Kibblewhite, Geertrui Louwagie, JRC Reference reports, 2014
- Sustainability of Brownfield Regeneration for Soft Reuse: A Case Study of Port Sunlight River Park (PSRP). Summary Report, University of Brighton, May 2017

Other documents of interest

- Country Report – Denmark Landfilling Practices and Regulation Situation in Denmark, René Møller Rosendal, Danish Waste Association, Eurelco Report, 2014

- Sweden, Swedish Environmental Protection Agency, Methods for inventories of contaminated sites: environmental quality criteria guidance for data collection, 2002
- Reclaim: GET SDI Portal v3.0 User Manual
- Sufalnet4eu European Network, Report to the Executive Director for Economy, Place and Skills, January 2011
- Haskoning, Sustainable materials and energy recovery from landfills in Europe
- Vademecum (ch. Geophysics)
- COCOON, questionnaire on landfills, landfills management and (enhanced) landfill mining in the EU, March 2017
- Optimization of LFM, R.J. Murphy, Florida center for solid and hazardous waste Management, 1993
- Characterization of fine fractions from LFM: a review of previous LFM investigations, Hernandez, Höllen & Pompberger, Proceedings Sardinia 2017 / Sixteenth International Waste Management and Landfill Symposium
- DST LFM 679, Cranfield, Smartground
- Etat de l'environnement wallon
- North Brabant landfill inventory, <http://www.brabant.nl/dossiers/dossiers-op-thema/milieu/bodem-en-stortplaatsen/stortplaatsen.aspx>

Analysis of the current situation in NWE regions & countries

We have collected, compared and compiled all fields retrieved from public or private inventories of landfills, contaminated sites and several indicators lists from guidelines, in order to define a final list of fields that will constitute the ELIF structure.

A questionnaire (see Annex) has been built and disseminated by RAWFILL partners in the project's regions, as well as through EURELCO network. Several answers are still missing, but we have received enough data from representative sources (questionnaires and also documentary work on several inventories, guidelines and relevant documents) to establish a common list of fields fitting our purpose.

As the ELIF will be reviewed at the end of RAWFILL, based on iterative work regarding DST elaboration, geophysics results and demonstration phase, we will continue to request additional data from the RAWFILL website and proactive actions during events, workshops and seminars. Discussion with Smartground consortium will also help us to be sure that information extracted from an ELIF –based inventory can fit Smartground's DST requirements (Smartground's DST analyses several scenarios for mining a landfill, based on an average composition of the waste and surrounding facilities. It operates downstream the RAWFILL approach which focuses on a description of resources that can be extracted).

All database fields have been listed, compared and eventually gathered to supply a common EIF content.

We will not describe and compare all received inventory structures, for confidentiality reasons and because these inventories fit very different purposes, from a single count to a complete environmental follow-up. Some of them describes only a short identity card

of the landfills, in order to count them. Others add more detailed information about the administrative situation. Some focuses of landfill volume and waste type, and sometimes environmental data and risk assessment data, for instance when a monitoring is performed. Almost none of them consider landfill in a possible ELFM point of view.

An important conclusion is that ELIF will contain lot of fields for which no data is either available, or is available somewhere but will have to be introduced in the data sheets in the suitable format.

An ELIF-based inventory will first contain a lot of empty fields that will request some documentary and encoding work to be operational.

Synthesis of the analysis

We will privilege fields given on a structured way, as Figures and Boolean in order to facilitate searches. Plain text fields will be limited as much as possible. This will not facilitate export operations from existing inventories, but this is necessary to harmonize information between all of them.

The ELIF structure will contain fields that will be used in the DST, and other fields that will not be taken into account for ranking, but are of great interest for an ELFM project developer. This way will allow ELIF to be used as the core of a self-supporting database, but of course users remain free to adapt their existing structure according to RAWFILL guidelines, and merge it with a SGI system (which should be particularly convenient for questions related to land planning).

RAWFILL DST is a ranking tool that will allow ELFM projects prioritization based on a set of suitable physical, chemical, environmental, technical and social information. It will integrate the multiple aspects involved in ELFM projects, i.e. economic, technical, environmental and social factors. The DST will help ELFM stakeholders to take suitable decisions.

RAWFILL's DST will operate at 2 levels:

- "Selection": a first level of quick screening to identify landfills with a priori interesting potential but which need further historical investigations and geophysical survey;
- "Ranking": a prioritisation tool to rank pre-selected and fully investigated landfills of economic interest for raw material recovery purposes. This 2nd level of the DST is a more dynamic model integrating the landfill in its physical, economic and social environment, including safety aspects of the operations.

ELIF will be divided into 4 large sections:

- Landfill ID card,
- landfill in its surroundings,
- landfill geometry,
- specific waste information, this last section mostly based on geophysics operations.

Section	Definition	Fields examples
1. Landfill ID Card	All administrative information about a given landfill	Name, location, owner, operator, monitoring, aftercare, legal status, permits
2. Surroundings	All relevant data about the landfill's surroundings	Land planning, territorial strategy, current use, specific risks, geology, groundwater, access
3. Geometry	Landfill geometry, regardless wastes information	Surface, volume, depths, stability, bottom, capping, biogas network
4. Wastes	Specific information about the landfill's waste streams	Types, density, water and gas content, temperature, estimated composition from RDM

Table 1: ELIF divisions and most representative fields

Data accuracy

Regarding existing information, the level of accuracy of some data is sometimes difficult to estimate, for example the indicated surface of the landfill which is mixed with the total surface of the site, the volume of waste which can be just a draft estimation based on a mean height, the type of waste which remain generic in uncontrolled landfills, etc. As this precision is very important for launching an ELFM feasibility study, our ELIF should specify for each DST-relevant field an accuracy estimation that will be taken into account for the ranking. The simplest one will be a classification as “poor/average/good/unknown”.

Landfill ID card

Landfill ID card will be the easiest part to fill, even if some searches can be necessary to precise some fields which are not commonly used in existing inventories.

Proposed ELIF fields are the following ones:

- **Name(s)** : as a landfill can be identified by several names, synonyms must be allowed,
- **Reference in the database:** as a landfill may appear in several databases, some references must be allowed as well. Use of NUTS code (nomenclature of territorial units within 98 EU regions) can allow an integrated EU classification that can be used almost everywhere in the Union, facilitating cross-border ELFM investigations. It can be proposed as the main reference.
- **Coordinates of the landfill:** it should be convenient to use the most recent and most common system within EU. To facilitate implementation of ELIF, we suggest to let each user download data from its own system, with an indication of the reference system,
- **Ownership type:** public, private, both or unknown,
- **Ownership status:** coordinates of current landfill owner,
- **Landfill operator(s)** : coordinates of landfill operator(s),
- **Public administration** in charge of the landfill follow-up,

- **Landfill class** according EU Directive: hazardous, not hazardous, inert
- **Landfill main type of wastes:** main type of waste as known, as municipal waste or the main type of industrial wastes
- **Mono landfill** (with a list of common waste streams and free field) or not,
- **Landfill status:** abandoned, in operation, rehabilitated, not rehabilitated, aftercare
- **Monitoring:** existence of an environmental monitoring
- **Fence/isolation:** existence of a protection system for safety reasons
- **Buried volume:** global volume of waste in the landfill
- **Remaining volume:** global remaining volume of waste
- **Estimated remediation costs:** estimated future rehabilitation costs
- **Aftercare period:** date of beginning and date of ending
- **Aftercare cost per year,** in order to appreciate the financial interest for mining
- **Estimated total aftercare cost**
- **Warranties:** amount of money hold for remediation purpose
- **Legal status:** legal or illegal landfill
- **Complexity of legal situation:** unknown/not special/special issues
- **Taxes** perceived during exploitation
- **Existence of permits & authorisations**
- **References and validity of permits & authorisations**

Landfill surroundings

Landfill surroundings will request some completion in order to precise specific environmental and social site-related questions. As land reclamation is an important aspect of ELFM economic feasibility projects, specific attention will be given to the expected future of the area surrounding the landfill through several fields coming from national/regional/local policies, as strategic territorial intelligence, land planning and existence of territorial tools to modify land use and local land pressure.

Proposed ELIF fields:

- **Land planning (current affectation)** : affectation of the landfill site at present time
- **Land planning (future affectation):** possible different affectation in the future
- **Current use:** none/cultivation/natural reforestation/solar farm/use by local people
- **Territorial strategy aspects:** is the landfill placed on a “strategic” territory (zone to be developed following an EU or national/regional priority)
- **Territorial tools:** existence of territorial tools, i.e. a way to change land use?
- **Projects:** does a project exist already to define a new use of the surroundings?
- **General risk evaluation:** existence of a specific risk, as flooding, earthquake, karstic area, water protection zone, fires, etc.
- **Specific environmental situation:** only if a specific well-known aspect is foreseen
- **Surface water risk of contamination:** depending on distance of surface receptors to the landfill and water monitoring
- **Geology:** a very short description of soils and rocks where the landfill is located, regarding permeability
- **Groundwater vulnerability:** indication of the vulnerability of the aquifer
- **Exploited groundwater resources:** is groundwater exploited for human use?
- **Groundwater contamination:** existence of a current contamination of the aquifer
- **Distance to a Natura 2000 protected area**
- **Social support:** possible support by local people for which landfill suppression should be welcomed

- **Specific biodiversity aspect:** only if a specific well-known aspect is foreseen
- **Landscape negative impact:** weak/strong/no impact
- **Land pressure:** this indicator is still discussed ,as it should be defined taken into account several parameters as land price, evolution of population, etc.
- **Access:** easiness of access for trucks and heavy machines
- **Access facilities:** distance to a major road, waterway, harbour, railway station
- **Nearest open landfills** able to receiving ultimate wastes
- **Nearest incineration plant** able to receive combustible wastes

Landfill geometry

Geometry will obviously cover all information related to the physical shape of the waste mass, but also available information about bottom layer and capping and an appreciation of stability issues that can be encountered during a partial or total excavation phase. Landfill geometry is not related to any kind of landfilled wastes.

Proposed ELIF fields:

- **Landfill typology :** open pit/quarry/(hip)hill/valley
- **Landfill site surface:** total area of the site
- **Landfill surface:** area occupied by wastes (in some inventories, there is no difference made between the site surface and the waste surface, which can generate overestimations of the waste quantities)
- **Depths:** minimal, average and maximal height of wastes
- **Fragmentation:** dispersion of the waste in several places or one single place
- **Slope stability issues**
- **Water table depth** within the landfill
- **IRA:** Indicative risk appreciation for excavation works based on type of landfill, average height, slopes and water table
- **Bottom layer:** presence of a bottom watertightness and drainage layer
- **Top layer:** presence of a top watertightness and drainage layer
- **Biogas emissions:** yes or no
- **Biogas collection aerial network** on the surface: this field will be interesting regarding feasibility of geophysics survey, and eventually future works
- **Leachate treatment plant:** No/Yes, abandoned/Yes until.../nearest plant that can be used if leachates will have to be treated
- **Daily cover:** was a daily coverage used during operations?
- **Type of daily cover:** earth/other/synthetic
- **% of daily cover** (in volume)

Wastes description

Wastes is the most complex and most important section regarding ELFM opportunities. The landfill is for the moment intended to be divided into 4 or 5 homogenous and contrasted parts that will be deducted from the geophysical imaging (RDM), in most cases it should be bottom layer (the oldest part of the landfill), top layer (most recent – and probably most documented – part) and 2 or 3 other volumes in between. Ideally, we should measure and calculate for each part precise data about surface, volume, in-situ density, tons buried, water content, temperature as well as some indication about the

waste composition, including the % of fine materials that are useless in many separation and valorisation processes.

RAWFILL geophysical imaging

Within RAWFILL, information extracted from the landfill geophysics methodology will be described as a 3D RDM “Resources Distribution Model”, mainly based on historical documentary works and geophysics investigations on site. This historical study and geophysical imaging is set up to precise the distribution of homogenous zones inside the landfill, and link the identified zones with information about the average waste composition and physical conditions (metal, organic materials, water content, etc.). The RDM of a landfill, when established, will feed the ELIF fields related to “geometry” and “waste composition” sections described hereunder.

Geophysical imaging will result of a flexible combination of most modern geophysics methods, designed to precise a lot of parameters related to the geometry of the landfill (surface, waste volume, depths), waste conditions (groundwater, biological activity, etc.) and waste composition (density, metal content, organic content, etc.). Imaging will be used to identify some homogenous zones within the landfill with some relevant contrasts and will be validated by guided sampling and analysis.

Prior to geophysics operations on site, documentary works will be performed. These works can be based on a specific historical investigation methodology such as the one developed and applied by SPAQuE for Walloon landfills and industrial sites⁶. The purpose is to obtain as much information as reasonably possible from various sources as written documents (permits and authorizations, reports, contracts, site pictures, etc.), testimonies of workers and neighbours, maps and aerial pictures. Historical results are related to wastes volume, wastes types, age and origins and when possible their distribution inside the landfill. Historical investigations will allow to precise some fields of the ELIF structure, and supply a guideline for more effective site investigations. However, geophysicists have to take into account that, in many cases, no historical information will be obtained at all, or some specific hazardous wastes may have been landfilled on a totally illegal way and will unfortunately not appear in any document.

Here is the ELIF list of waste fields for each division of a landfill:

- **Operation dates:** date of begin/end of LF operations/rehabilitation. Obviously, the bottom part should be older than the top layer.
- **Generic main waste type:** Municipal/Industrial/Inert (construction waste)/Military/mixed
- **Specific wastes to be found:** Dredging sludge / Water purification sludge/ Gypsum/ Fly ashes/Asbestos/Slags/Mining waste/Lime/Contaminated soils/Others (free field)
- **Hazardous waste:** assessed/probable/possible/No
- **Physical state:** mainly solid/liquid/sludge
- **Radioactive wastes:** assessed/probable/possible/No
- **Medical hazardous waste:** assessed/probable/possible/No
- **Leachates:** assessed/probable/possible/No
- **Samples taken:** from borehole, trench, pit..., under which form and performed analysis. Sample can come either from existing inventories or from RAWFILL geophysical imaging. Most of the time, they will concern the top waste layer

Annex: Questionnaire related to s Inventories

WORKPACKAGE WP T1 ENHANCED INVENTORY FRAMEWORK (EIF) REQUEST FOR INFORMATION – LANDFILL COMMON INVENTORY

1. Introduction

RAWFILL (“Supporting a new circular economy for RAW materials recovered from landFILLS”) is a new EU-funded landfill mining project gathering partners and associated partners of EU NWE regions and supported by EURELCO.

The ultimate goal of RAWFILL is to allow NWE public & private landfills owners & managers to implement profitable resource-recovery driven landfill mining projects.

RAWFILL develops a cost-effective standard landfill inventory framework (EIF) based on existing inventories and experiences, an innovative landfill characterization methodology by geophysical imaging and guided sampling and an associated Decision Support Tool (DST) to allow smart LFM project prioritization. The whole concept will be demonstrated in 2 pilot sites in Flanders and France.

EIF will be used to describe landfills not only in terms of environmental & risk issues, but will focus on available dormant materials, so that it will be possible to economically evaluate later the resource-recovery potential of each landfill. EIF is the basis for our DST ranking tool and so a prerequisite to assess feasibility, business plan & business case for launching profitable landfill mining projects.

More information:

<https://www.eurelco.org/single-post/2017/04/10/EURELCO-partners-win-Interreg-North-West-Europe-project-RAWFILL-1>
<http://www.spaque.be/0114/fr/1309/SPAQuE-leader-du-projet-europeen-RAWFILL?from=139&artid=596>

Any general question?

Please contact SPAQuE – Marta Popova, m.popova@spaque.be

2. Request to landfill inventories owners - Structure of landfill inventories

2.1 Why do we ask you some information?

In order to define our EIF (common landfill inventory structure, that will integrate data related to the economic landfill resources), we need to gather and summarize the structures of existing landfill inventories that you would agree to send us.

So, we would like to receive some information related to landfill inventories from your organization.

Shouldn't you in charge of supplying this information, please let us know who else we can contact!

We will of course invite you to share the results of RAWFILL through several events that we will organize in the next 3 years, and will send you a detailed summarized report of our works to thank you for your cooperation.

Should you be interested to become part of our Associated Partners team, do not hesitate to come back to us.

The attached questionnaire is given hereunder.

Once again, we would like to thank you for supporting the emergence of a suitable landfill mining industrial sector!

2.2 The Request

Please note that we do not need to receive the data themselves, but only the data structure, i.e. all the fields that are used to characterize a landfill in a database as its type, location, depth, volume, geological context, nature of buried wastes, etc.

An example of landfill from your inventory would also be appreciated.

Here is the questionnaire we would be pleased to receive from your organization:

2.3 Questionnaire

Your organization:

Your name:

Position:

Mail:

Tel:

Name of your landfill inventory (if there is a specific one):

Type (select one):

- database specify used software:
- spreadsheet specify used software:
- other specify used software:

Date of creation:

Covering area (select one)

- country
- region

Use Statut (select one):

- private (for internal use only)
- public
- both

Update frequency (select one):

- completed
- less than once a year
- once a year
- more than once a year
- permanent updating

Number of landfills at present day:

List of fields used in your inventory (please fill the table, adding other necessary rows):

Field	Unit	Type	Length	Origin of data	Precision	Ease of obtain it

By	We mean
Field	name of the field in your inventory
Type	text field/number/Boolean/other
Length	length of text fields

Origin of data	the most common way you use to get the data (i.e. measured/estimated/come from historical source)
Precision	the most common precision associated to the data (i.e. good/medium/poor)
Ease of obtaining	Easy/not easy to obtain that information

Here is an example:

Field	Unit	Type	Length	Origin of data	Precision	Ease of obtaining
Landfill name	-	Text field	255 characters		n.a.	Easy
Other name	-	Text field	255 characters		n.a.	Easy
Date start	-	Number		Historic	poor	Not easy
Date end	-	Number		Historic	good	Easy
Location	coordinates	Numbers			n.a.	Easy
Volume	m ³	Number		Estimated	medium	Not easy
Waste type	-	Text field	1000 characters	Historic	medium	Not easy
Aquifer impacted		Boolean	Yes/No	Measured	good	Not easy
And so on...						

Thank you once again for your cooperation!

Any technical question? Please contact Atrasol - Ir. Renaud De Rijdt, renaud.derijdt@gmail.com
--