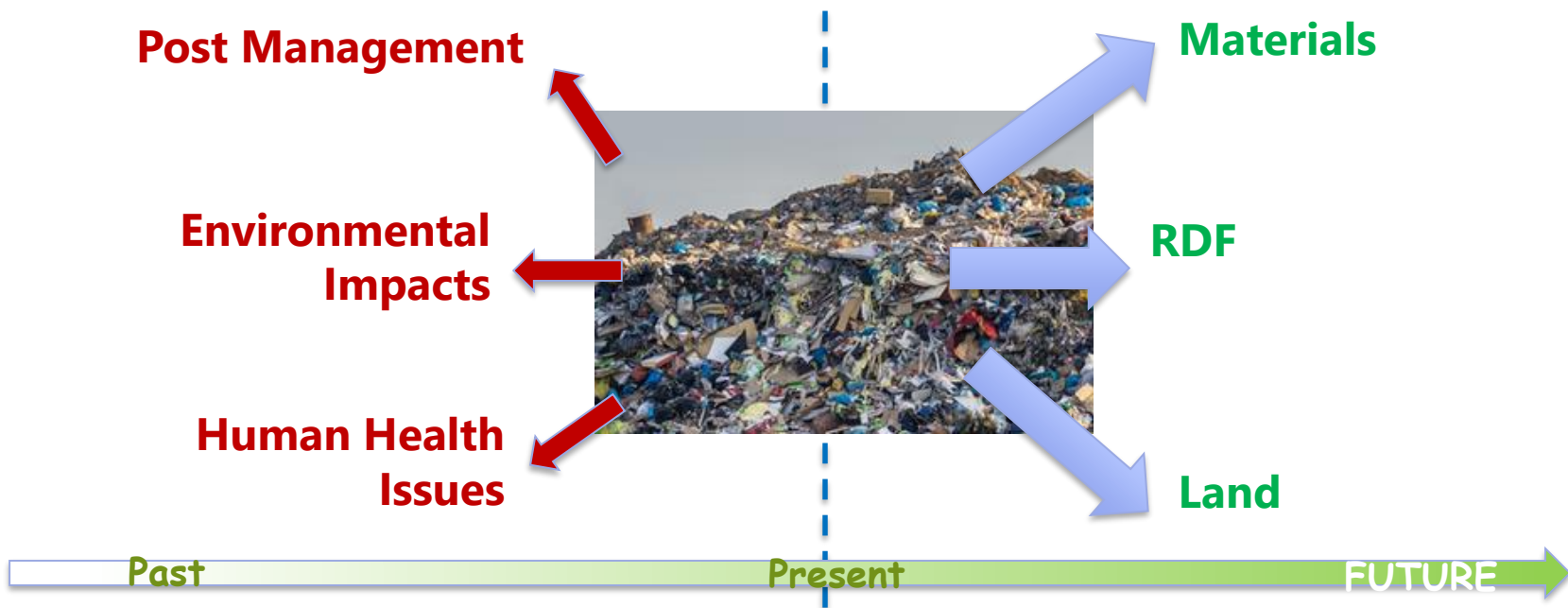


# ELIF: Enhanced Landfill Inventory Framework



Ir. Renaud DE RIJDT  
ATRASOL sprl

# CHANGE OF PARADIGM: LANDFILL = SOURCE OF RESOURCES

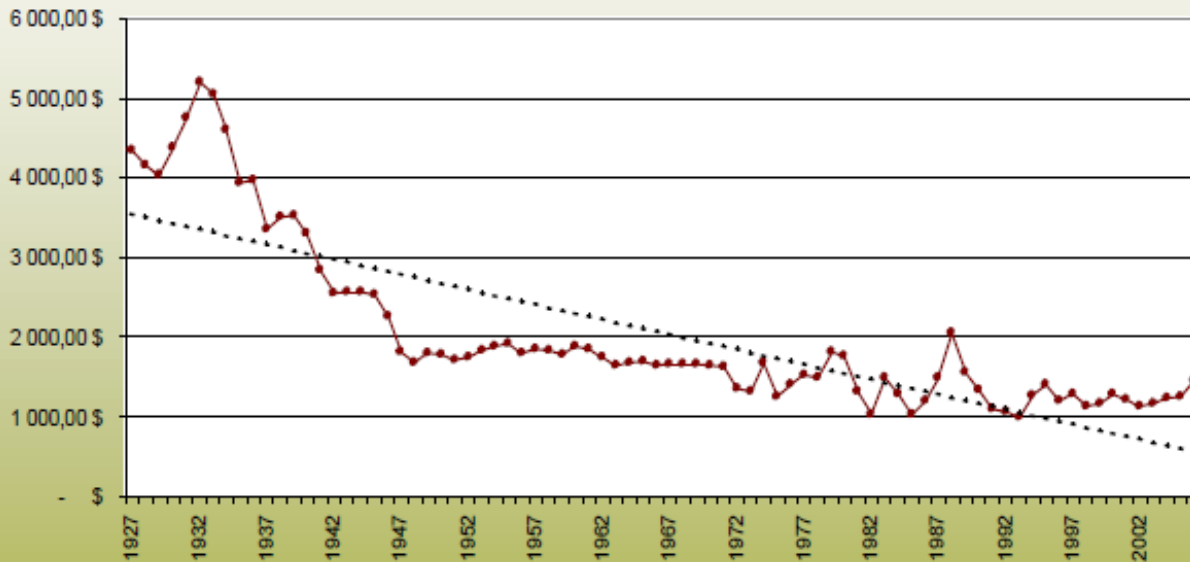


# OVERCOMING OBSTACLES

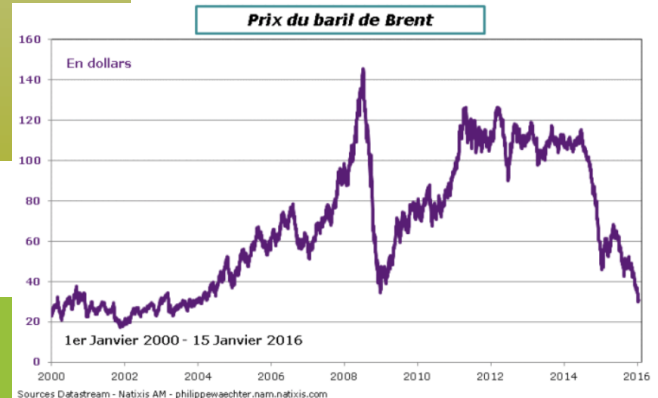
WHY LANDFILL MINING IS NOT YET ON THE MARKET	WHY IT WILL CHANGE
LOW PRICES OF MATERIALS & ENERGY CARRIERS	<b>HIGH PRICES FOR LAND</b> SCARCITY OF SOME METALS & MATERIALS/ENERGY
HIGH COST OF LANDFILL SURVEY IN ORDER TO EVALUATE THE LF RESOURCE POTENTIAL	<b>RAWFILL GEOPHYSICAL IMAGING</b> MULTIMETHODS + GUIDED SAMPLING
DIFFICULTY TO IDENTIFY PROFITABLE PROJECTS	USE OF <b>ELIF</b> USE OF <b>DST</b>
WRITE A COHERENT AND CONVINCING BUSINESS MODEL WHEN LACKING OF INFORMATION	BETTER LEVEL OF INFORMATION MORE RELEVANT INFORMATION ( <b>RDM</b> )
WASTE PROCESSING TREATMENT	NEW EQUIPMENTS WITH HIGHER EFFICIENCY WILL DEVELOP TO FOLLOW THE MARKET
LACK OF PUBLIC POLICIES REGARDING LFM	COCOON <b>RAWFILL LT WORKING GROUPS</b> <b>COMMUNICATION RAWFILL</b>
LACK OF INCENTIVES	DEVELOPMENT OF SPECIFIC LFM INCENTIVES LARGE SCALE DEMONSTRATION PROJECTS
LACK OF SUPPORT FOR CIVIL SOCIETY FOR SOME SITES	ADDED SOCIAL, ECONOMIC & ENVIRONMENTAL VALUE

# Resources

Prix réel de l'aluminium primaire, \$US constants de 1982 pour une tonne métrique, 1927 à 2006

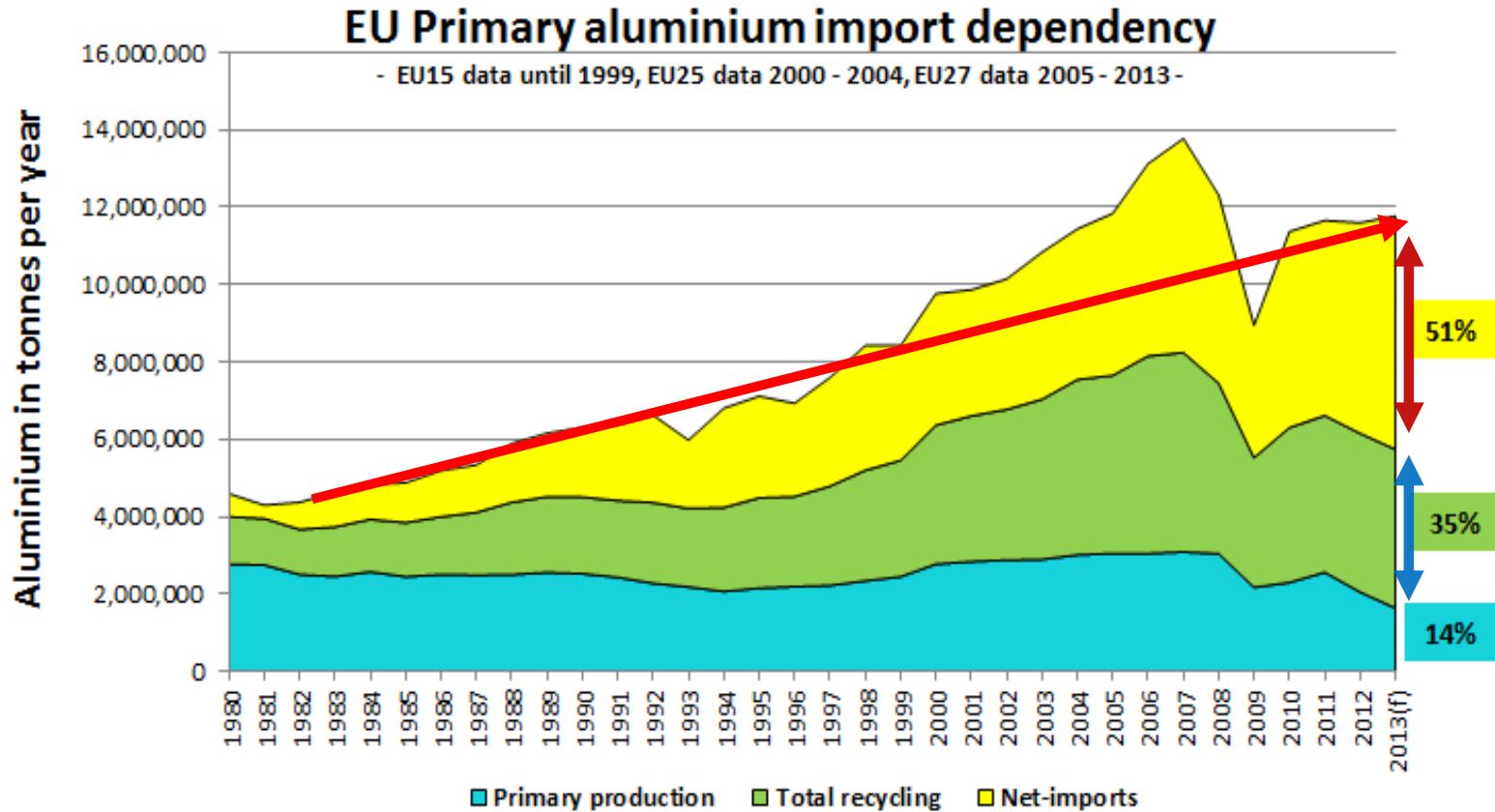


Sources : US Geological Survey (Prix nominal); US Bureau of Labor Statistics (Indice de prix à la production, Métaux et produits métalliques);  
 Traitement : CRDT-UQAC

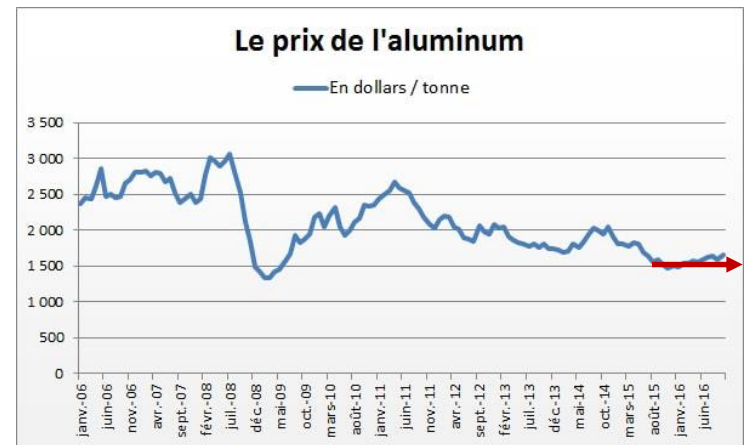
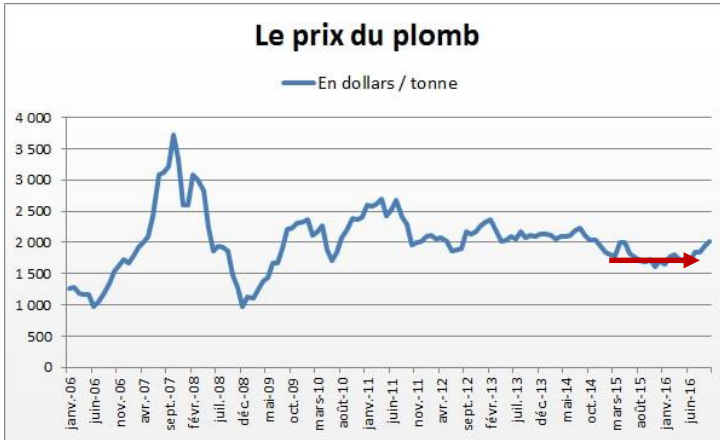


# Price and Availability

## Import Dependency

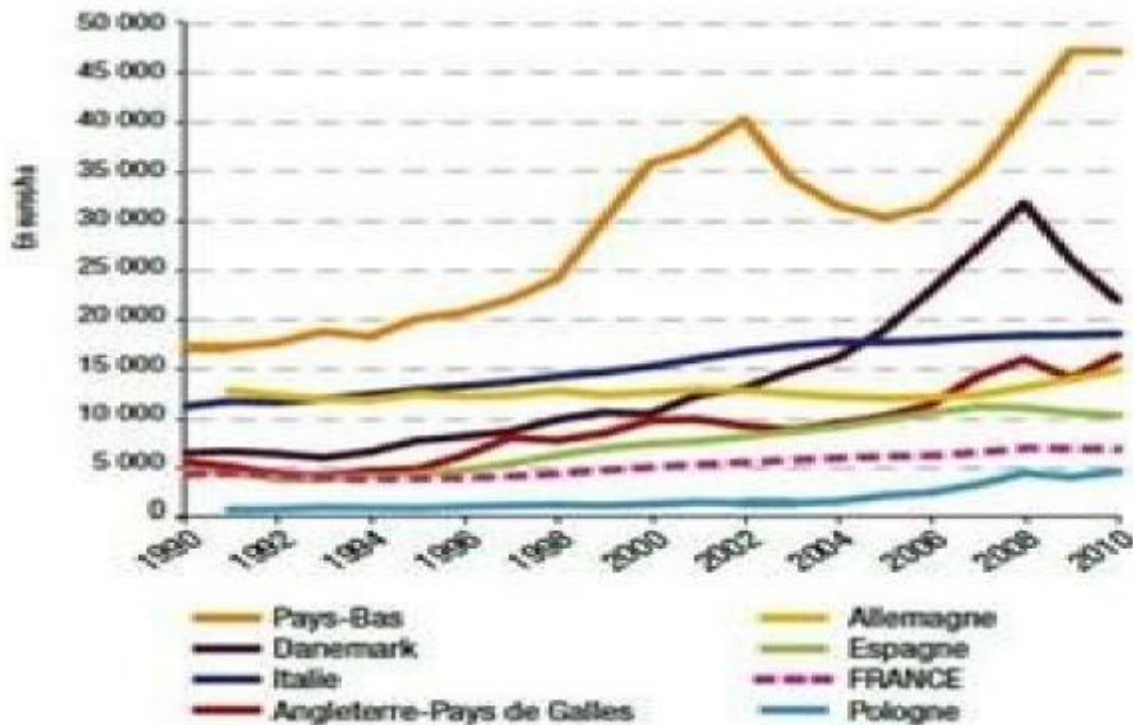


# Metals

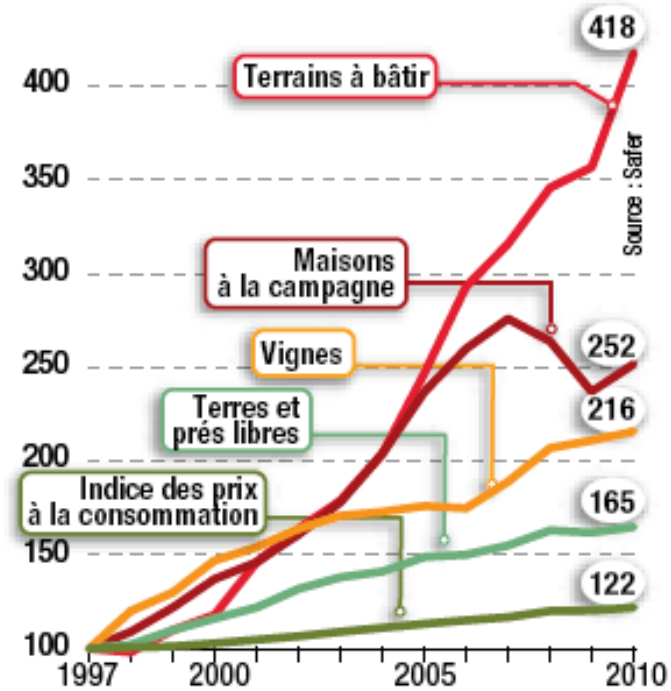


# Land

**EVOLUTION DU PRIX DES TERRES AGRICOLES ENTRE 1990 ET 2010**



Source : Terres d'Europe-Safer d'après Safer, Eurostat et données nationales.



Source : Safer

# RAWFILL DEMONSTRATES AT LARGE SCALE:



## 1) HOW TO QUANTIFY RESOURCES POTENTIAL

→ RAWFILL methodology for historical study & geophysical imaging

## 2) HOW TO DEVELOP ELIF AT EU LEVEL

→ ELIF Structure with test/demonstration database

## 3) HOW TO CLASSIFY LANDFILLS TO SELECT BEST LFM PROJECTS

(on a sustainable perspective) + to give other suitable information for DLM

→ RAWFILL DST 1 “CEDALION” & DST 2 “ORION”

## 4) INTEREST TO DEVELOP LARGE SCALE PROJECTS

→ LFM Guide, LT Effects Working Group



# ELIF: Enhanced landfills inventory framework

A landfill inventory is a list of landfills covering a given geographical zone, with information about each site (mostly environmental)

An **Enhanced Inventory** is a list of landfills covering a given geographical zone, with information about each site:

- **Data allowing to evaluate resources potential**
- **Data allowing to define a sustainable management method**



# IMPORTANCE OF ELIF CONCEPT



- ✓ ELIF is used for describing landfills not only on environmental point of view but with emphasis on **available resources, in order to quantify their mining potential**
- ✓ ELIF is a prerequisite for DST classification tool and so for
  - **allowing feasibility evaluation and setting up business plan/business model for LFM project**
  - **Guide stakeholders for DLM**

# ELIF STRUCTURE: 5 SECTIONS

Section	Definition	Fields examples
<b>0. Generic information</b>	Information about datasheet creation and maintenance	Date of creation, updating and who is responsible
<b>1. Landfill ID Card</b>	All administrative information about a given landfill	Name, location, owner, operator, monitoring, aftercare, legal status, permits
<b>2. Surroundings</b>	All relevant data about the landfill's surroundings	Land planning, territorial strategy, current use, specific risks, geology, groundwater, access
<b>3. Geometry</b>	Landfill geometry, regardless wastes information	Surface, volume, depths, stability, bottom, capping, biogas network
<b>4. Wastes</b>	Specific information about the landfill's waste streams	Types, density, water and gas content, temperature, estimated composition <b>from RDM</b>

# HOW ELIF WAS MADE (1)?



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

**December 2017**

**Prepared by ATRASOL sprl**  
[www.atrasol.eu](http://www.atrasol.eu)

- ✓ Sending questionnaires to stakeholders
- ✓ Compilation & deep analysis (field per field) of more than 33 inventories and methodological documents
- ✓ First list of fields that can be used for ELIF (69 fields) and can be part of DST

# HOW ELIF WAS MADE (2)?



RAWFILL WP T1  
Enhanced Landfill Inventory Framework  
Deliverable 1.2  
Existing LFM initiatives -draft version

December 2017

Prepared by **ATRASOL sprl**  
[www.atrasol.eu](http://www.atrasol.eu)

Remark: final version of this document will be published at the end of the RAWFILL project when additional information regarding landfill mining experiences will be available

- ✓ Sending questionnaires to stakeholders
- ✓ Projects & methods analysis for investigating volume & waste composition (16 projects)
- ✓ **Interesting conclusion:** resource potential is not yet considered as a significant incentive compared to environmental & health issues or land price
- ✓ **Other conclusion:** evaluation of waste quantities (even by geophysical – monomethod – imaging are not precise

# HOW ELIF WAS MADE (3)?



**RAWFILL WP T1**  
**Enhanced Landfill Inventory Framework**  
**Deliverable 3.1**  
**SWOT Analysis of landfills investigation methods**

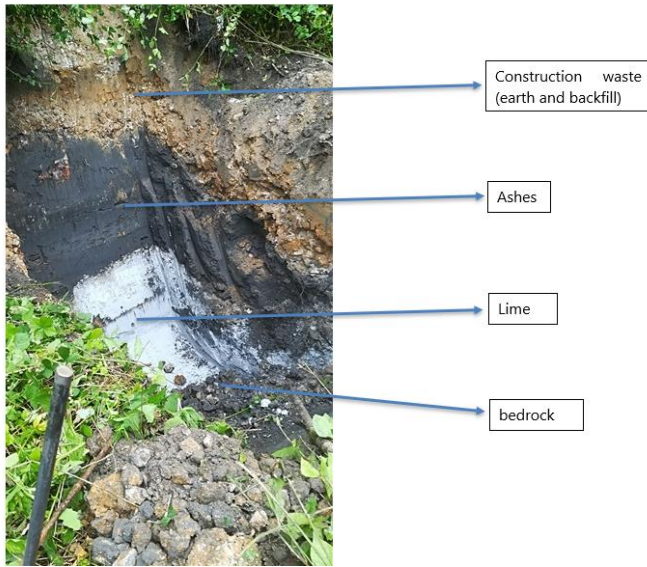
June 2018

Prepared by **ATRASOL sprl**  
[www.atrasol.eu](http://www.atrasol.eu)

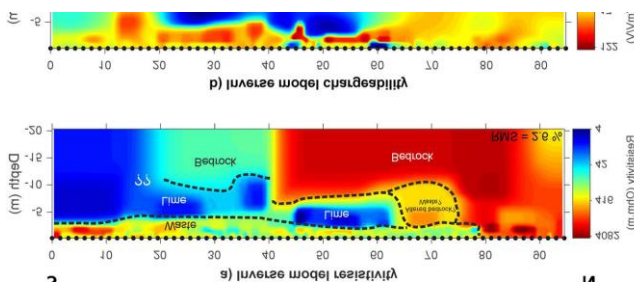


- ✓ Review of all characterization methods: boreholes, trenches, geophysical imaging, sampling & analysis
- ✓ SWOT analysis of these methods on the RAWFILL scope
- ✓ **Proposal of an harmonized method for surveying and sampling**
- ✓ **Proposal of a easy-to-use waste characterization method**
- ✓ Value for money of RAWFILL geophysical imaging + guided sampling (Onoz site)

# VALUE FOR MONEY OF GEOPHYSICS: ONOZ



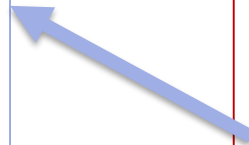
- ✓ Specific case of Onoz
- ✓ (not to be applied in all cases)
- ✓ **Specific Invasive boreholes & trenches: 40 000 €**
- ✓ **RAWFILL geophysics + guided sampling: 23 000 €**
- ✓ **Same quality of information, cheaper, faster, more secure...**



# STANDARD WASTE DESCRIPTION

- Ferrous metals
- Non-ferrous
- Paper & Carboard
- Plastics
- Glass & ceramics
- Inert mineral waste (stone, concrete...)
- Rubber
- Textiles
- Wood
- Organic materials
- Hazardous (ex: batteries)
- Fine matrix

- ✓ Water content
- ✓ Consistence
- ✓ Degradation index
- ✓ Temperature
- ✓ Specific odours
- ✓ Colors
- ✓ Homogeneity
- ✓ Composition (per mesh size)
- ✓ Other (ex: caloric potential)





# HOW ELIF WAS MADE (4)?



June 2018

Prepared by **ATRASOL sprl**  
[www.atrasol.eu](http://www.atrasol.eu)



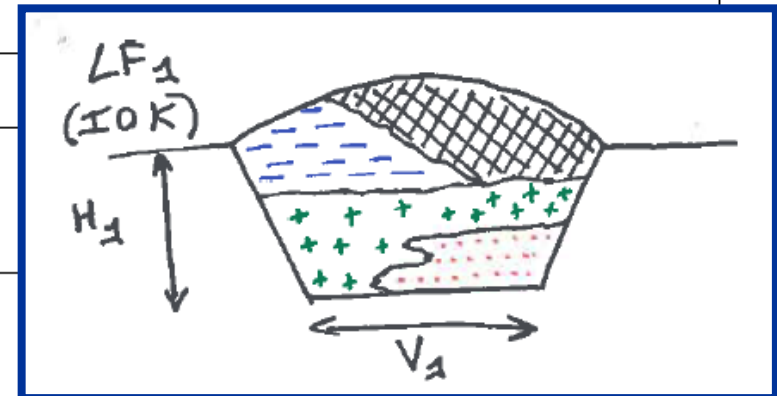
- ✓ From 3 previous deliverables, proposal of ELIF fields:
  - ✓ 9 generic fields
  - ✓ 20 ID fields (from 25 at the beginning)
  - ✓ 13 « surroundings » fields (22 at the beginning)
  - ✓ 9 geometry fields (from 13)
  - ✓ 12 waste fields(from 9) + 3D 5-layers RDM with 16 parameters

# WASTE DESCRIPTION PER LAYERS

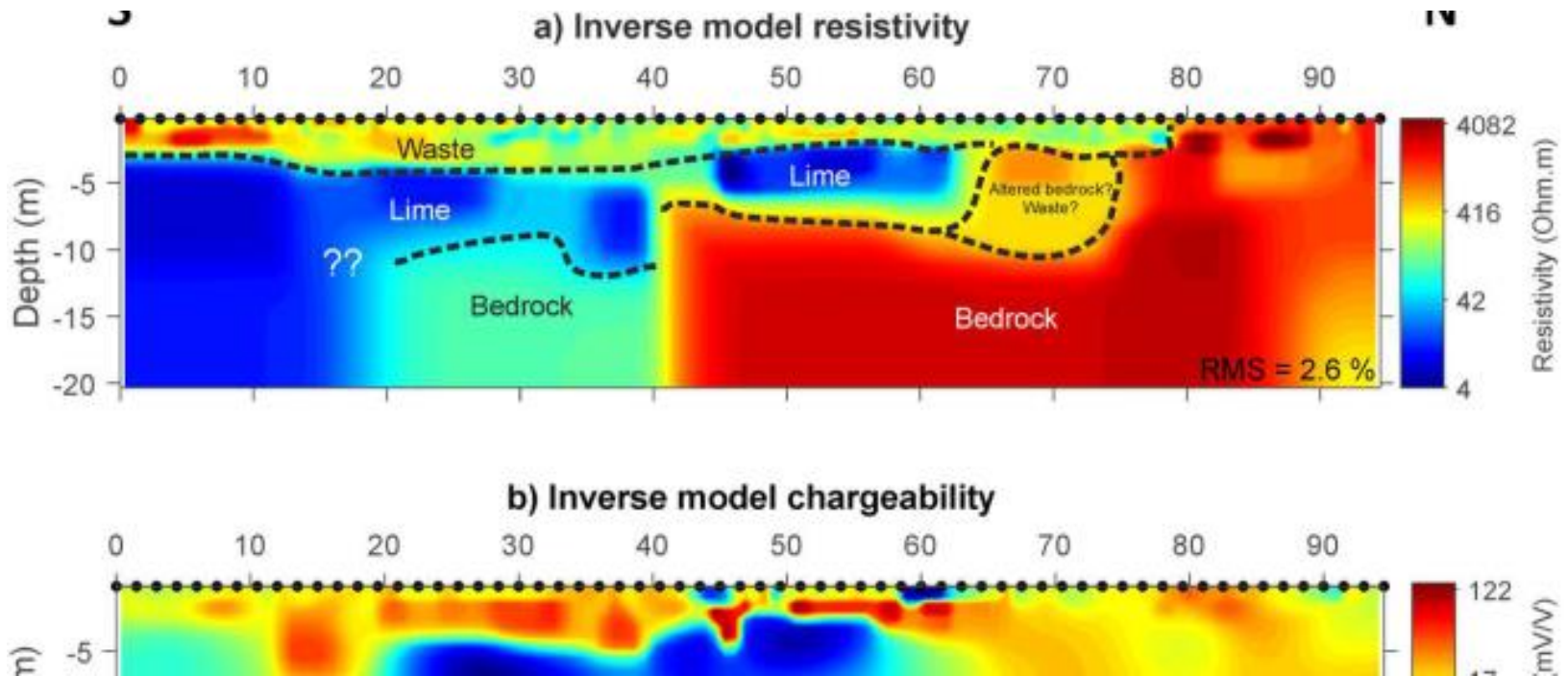
Déchets	Hauteur (m)	Volume (m <sup>3</sup> )	Densité (T/m <sup>3</sup> )	Poids (T)	Etat physique	% de fines	Type principal	Présence de Gaz	Présence d'eau	T° (°C)	Nappe d'eau souterraine	Début d'exploitation	Fin d'exploitation	Composition	Potentiel de Recyclabilité
Zone 1															
Zone 2															
Zone 3															
Zone 4															
Zone 5															
Total															

Description des 5 couches (image 2D ou 3D)

Source d'information et degré de précision



# LINK with ELIF & GEOPHYSICAL IMAGING



# WP T1 to WP T2

- ✓ Suggestions of Indicators for DST-1 « Cedalion »
- ✓ Suggestions of Indicators for DST-2 « Orion »
- ✓ Test database to review pertinence of indicators & weights/classification
- ✓ Sensitivity analysis of indicators
- ✓ Deadline: June 2019

# Q & A



# Raw materials recovered from landfills



The Interreg North-West Europe Project is coordinated by SPAQuE and unites 8 partners from 4 EU regions.



# 100.000 landfills in North-West Europe

According to EU Landfill Mining Consortium EURELCO the North-West Europe region has ~ 100,000 landfill sites.



# 100.000 landfills in North-West Europe



Most of these sites lack state-of-the-art **environmental protection systems**, leading to local pollution, land-use restrictions and global impacts. Fortunately, the large volumes of resources can be recovered through **Landfill Mining**.



# Outcomes of RAWFILL



- an enhanced framework for private/regional/national/ transregional landfill inventories
- landfill geophysics
- a decision support tool

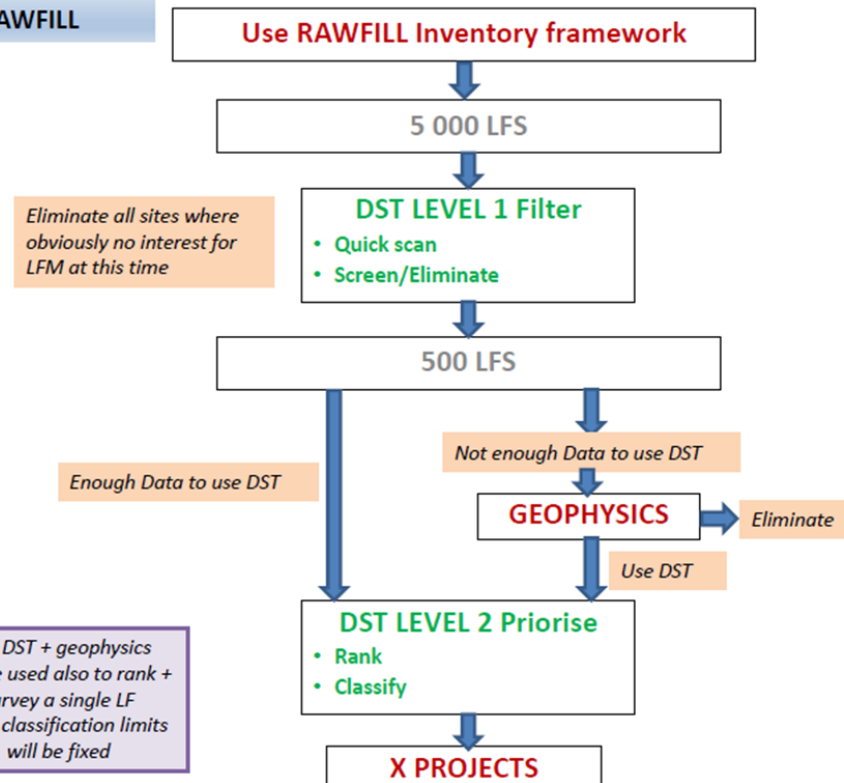
# 100.000 landfills in North-West Europe



The main **challenge** for stakeholders is the profitability risk due to the lack of reliable data on the recovery potential of landfills.

# Final results of RAWFILL

## HOW IT WILL WORK AFTER RAWFILL



# Interreg



EUROPEAN UNION

# North-West Europe

# RAWFILL

European Regional Development Fund

# Thank you!