



reclaim
reclaim





The Project



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Project Title:

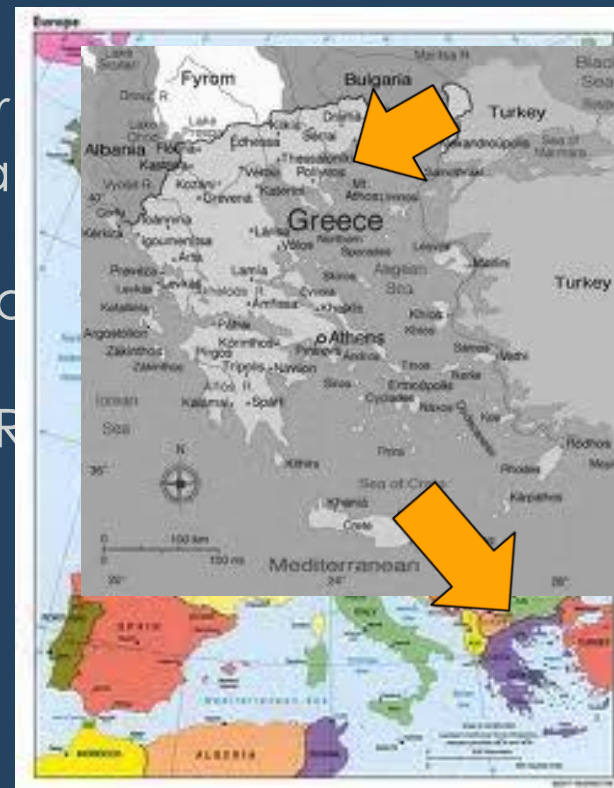
“Landfill mining pilot application for invaluable metals, materials, land a

Project Location: Polygyros (Chalkida)

Implementers: ENVECO , HELECTOR

Start – End: 01/07/2013 – 30/6/2016

Budget: 1,4 M € (50% co-fund)



Municipality of Polygyros



NTUA School of Mining & Metallurgical Engineering



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LandFill Mining definition (generic):

“the extraction of resources from landfills”

→ Definition varies according to:

Who (*issues of ownership & needs*)

(public vs private bodies)

What (*issues of technology & methods*)

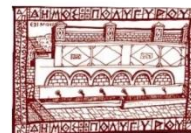
(in situ vs ex situ, direct vs indirect, materials vs other)

Where (*issues of legislation*)

(EU vs everywhere else)

Why (*issues of motivation & efficiency*)

(for profit or social benefit)



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>> increasing interest in municipal solid waste (MSW) **valorization**
(hierarchy of WFD 2008/98/EC)

>> growing inquisitiveness on the **fate of existing landfills**
(especially closed ones)

>> **abandoned landfills & dump sites**
(considered environmental and health threats
occupy valuable land close to settlements)

>> conceived as **unintentional storage** for raw and soil material

>> countries like Greece still continue to **bury more than 50%** of their MSW
(despite the EU trend of 35% reduction on landfilled waste)

Old landfills and dump-sites occupy:
space, land, soil, raw materials and metals, energy content
that can be reclaimed when technologies mature



Methodology



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Extensive research to understand:

- History of Landfill Mining
- Waste mining and treatment processes
- Legal background
- Environmental implications
- Financial and Socioeconomic aspects



Methodology



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Use of communicational and research tools to gain a deep understanding about the concept of landfill mining:

- **Literature review** : peer reviewed papers, proceedings from conferences, reports and studies (from academic and private sources)
- **Expert Interviews:** Belgium, Netherlands, UK, Cyprus, Greece



Results

Landfill Mining History



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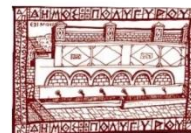
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- **First** Landfill Mining application: Israel, 1953
- **United States:** Many pilot studies and full-scale projects during 80's-90's
 - Introduced in the **EU later**, with fewer full scale applications in Germany, the Netherlands, Sweden, Finland.
 - Some attempts in the **UK** were abandoned.
- **Asia:** Several studies on Landfill Mining owing to population issues, mainly in India and China.
- Currently raised interest in **Belgium** (Flanders): research, publications and the EURELCO consortium

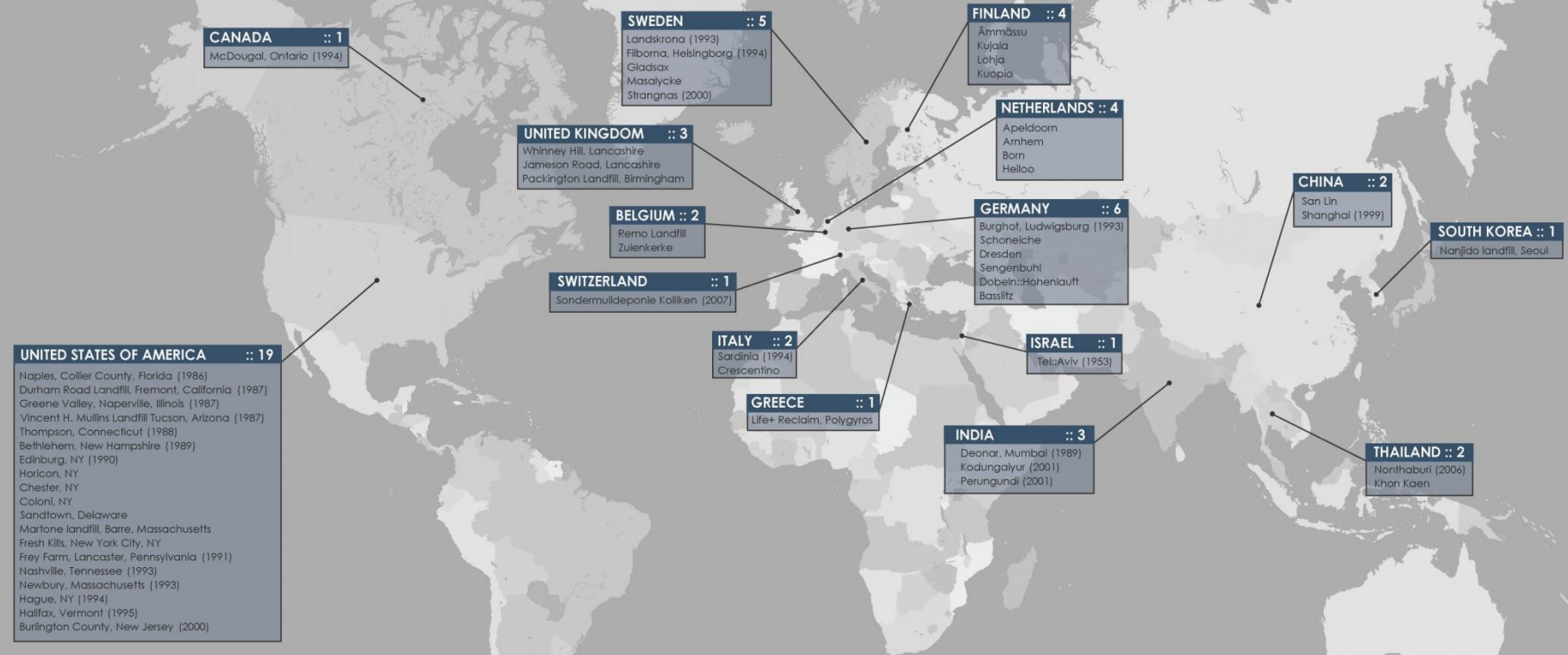


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LFM applications around the World



Landfill mining projects map: designed for Life reclaim LIFE12\ENV\GR\000427 (2013)





Results

Primary Typology of Landfill Mining



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1) Landfill Mining as a tool

→ Prerequisites:

- Brownfields or ULFs
- Material handling
- Social pressure
- No need for net profit

→ Advantages:

- Land reclamation
- Decontamination
- Materials/Energy
- Other benefits (e.g. no nuisance)

→ Current status:

- Experimental phase
- Sub-optimal applications
- Practiced by public authorities



Results

Primary Typology of Landfill Mining



2) Landfill Mining for waste valorisation

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→ Prerequisites:

- Old LFs (20 years or more)
- Operating LFs
- Suitable en-product markets
- Strict LF policy

→ Advantages:

- Land reclamation
- Cover material
- Biogas

→ Current status:

- Sub-optimal (business risk)
- Expensive set-up and operation
- Proximity to large cities
- Difficult for the public sector



Results

Primary Typology of Landfill Mining



3) Landfill Mining as a future possibility

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→ Prerequisites:

Let landfills be
More mature technology
No pressing need for raw materials

→ Advantages:

LFs as Carbon Sinks
(credit: Piet Wens - Pollux)
On-site removal of bio-waste as biogas

→ Current status:

Only research applications
Biogas extracted
(safety & volume reasons)



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Economics of Landfill Mining



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- **Vary significantly** depending on: LF size, composition, hazardous waste content, operational model, degree of waste treatment
- CAPEX: **8 - 25 €/t**, OPEX: **1 – 14 €/t**
- Total: no less than **35 €/t**
- Cost-effectiveness depends also on **indirect factors** (e.g. soil material quality and quality control requirements)
- **Demanding market** for high quality recycled waste: more expensive treatment is needed.



Conclusions



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1. Landfill mining is **still evolving** (technology and process advances)
2. Need for **standardisation**; not only individual case applications
3. Preparation of **Action Plans** to solidify the technical and legal framework
4. Involvement of the **public sector** could affect the Solid waste management at a National level



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- Insufficient **legislative** framework
- **Lack of initiatives** on behalf of waste managers and the public sector
- Experience on LFM is **mostly vague** (desk studies)
- Limited experience on LFM **social acceptance**
- **Unfamiliarity** with the method



Next Steps of the Project



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- **Finalisation** of waste mining and treatment process
- Landfill Mining **potential in EU countries** – inventory
- Pilot-scale **Demonstration Unit** installation
- **Financial and Socioeconomic** analysis of LFM
- National **Action Plan** elaboration + SEA study
- Information and **Dissemination** actions



Next Steps of the Project



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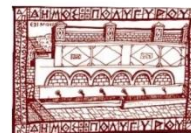
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1st National LFM Conference

(Polygyros, September 2014)

Papers accepted at life@reclaim.gr

Members of



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