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Waste and Resources: Rubbish or gold mines? Landfill mining ?!

Yves Tielemans



@tielemay

@GroupMachiels

Group Machiels, an overview



Operational since 1941, Group Machiels is known as a dynamic and well respected family owned Belgian company in full expansion, pioneering in the areas of sustainable materials, energy and infrastructure.

- Group Machiels is active in the following domains, as part of our continuous quest for CO₂ reducing measures and alternatives for mineral fuels:
 - Energy & Environment
(incl. Waste Management)
 - Machiels Building Solutions
(Timber frame construction)
 - Real Estate
(Residential and industrial)
- Company website :
<http://www.machiels.com/>



Group Machiels' Remo landfill

Location: Houthalen, east of Belgium

Activities of Remo as of today

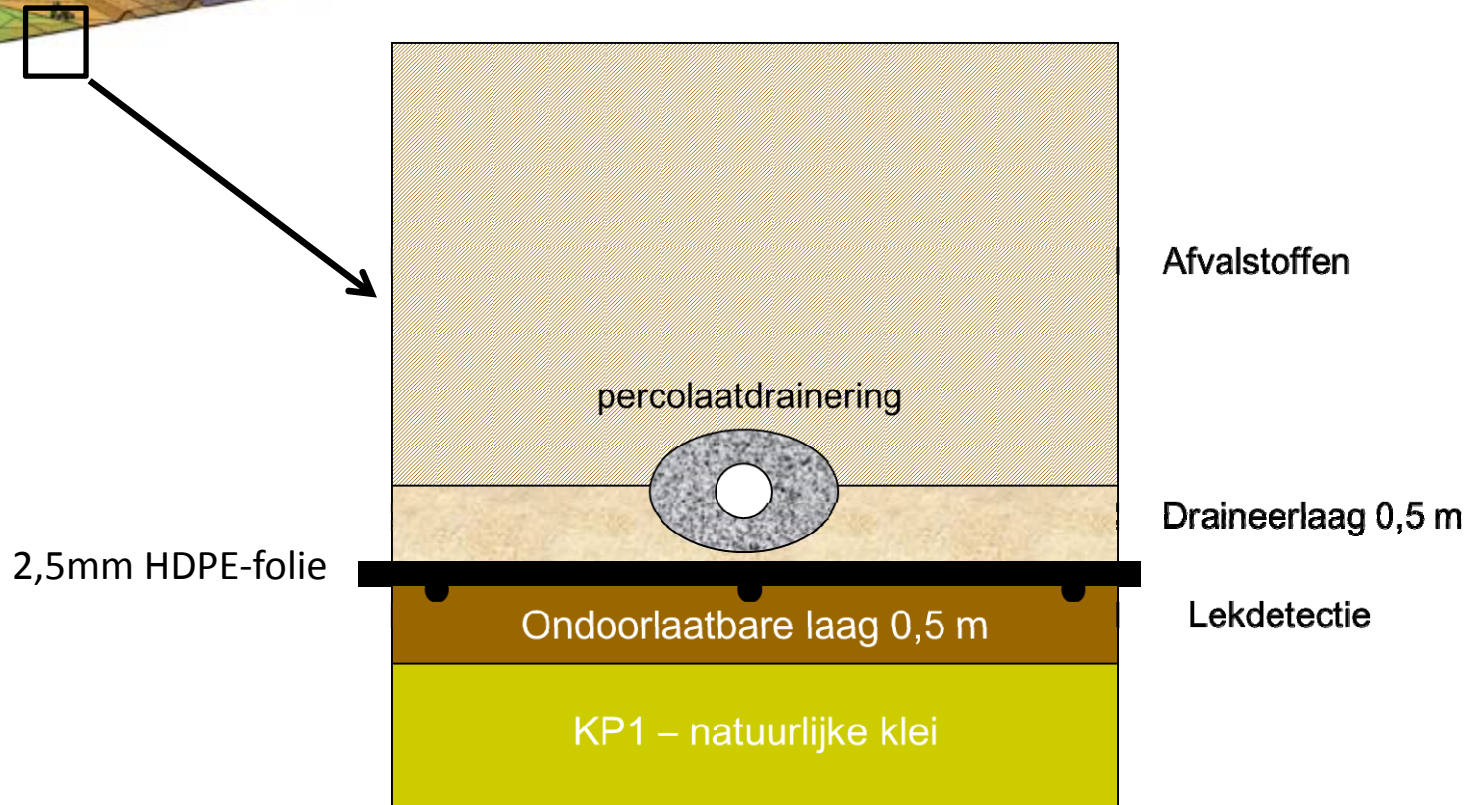
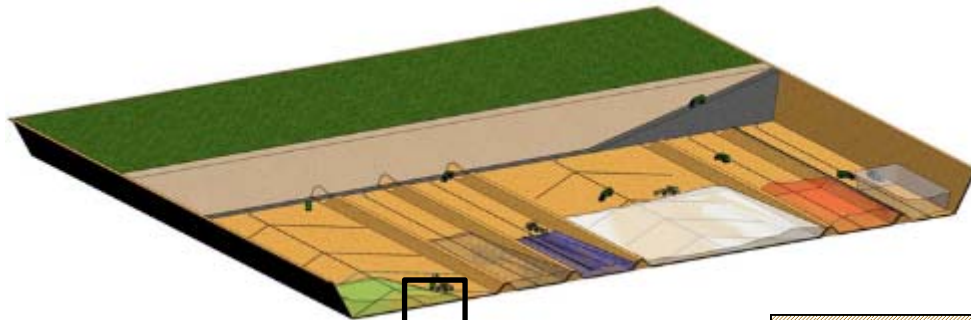
Landfill for industrial (± 300 kton/annum) incl leachate purification and landfill gas extraction and valorisation (CHP).

Transition towards Closing the Circle

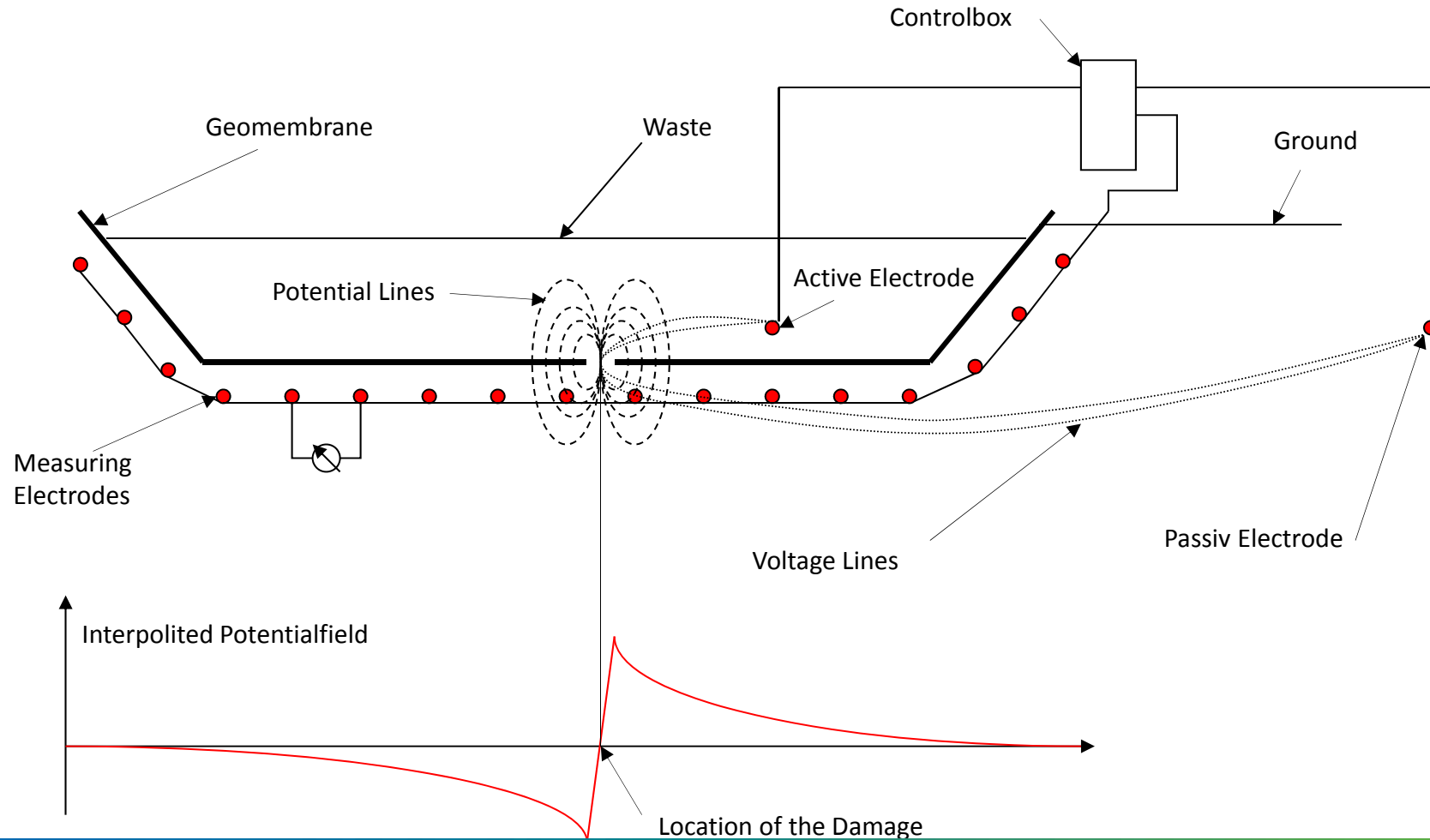
Landfill represents a reserve of materials and energy, reclaimed land can be redeveloped into an integrated nature park after mining of the landfill.



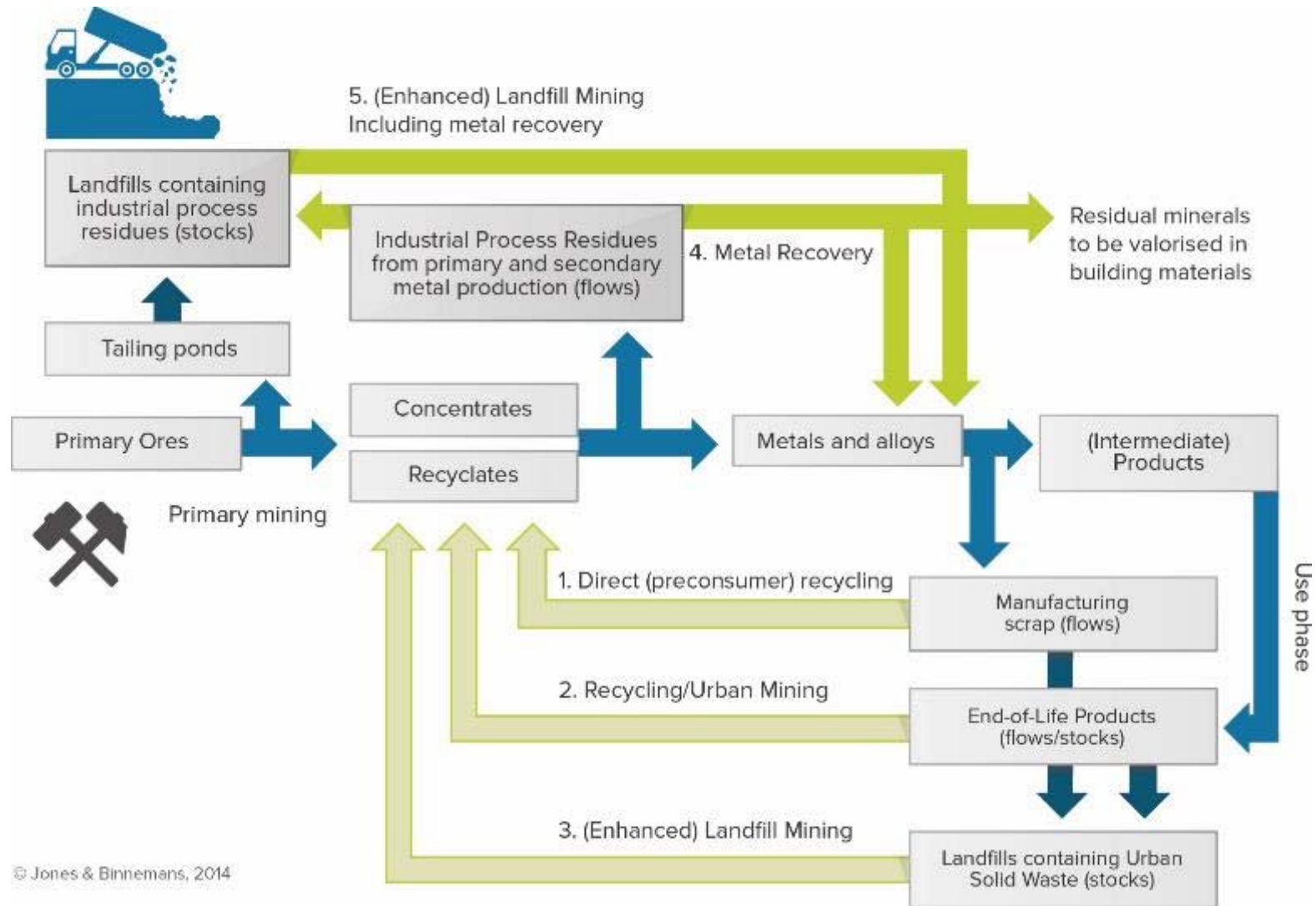
State-of-the-art Landfill design



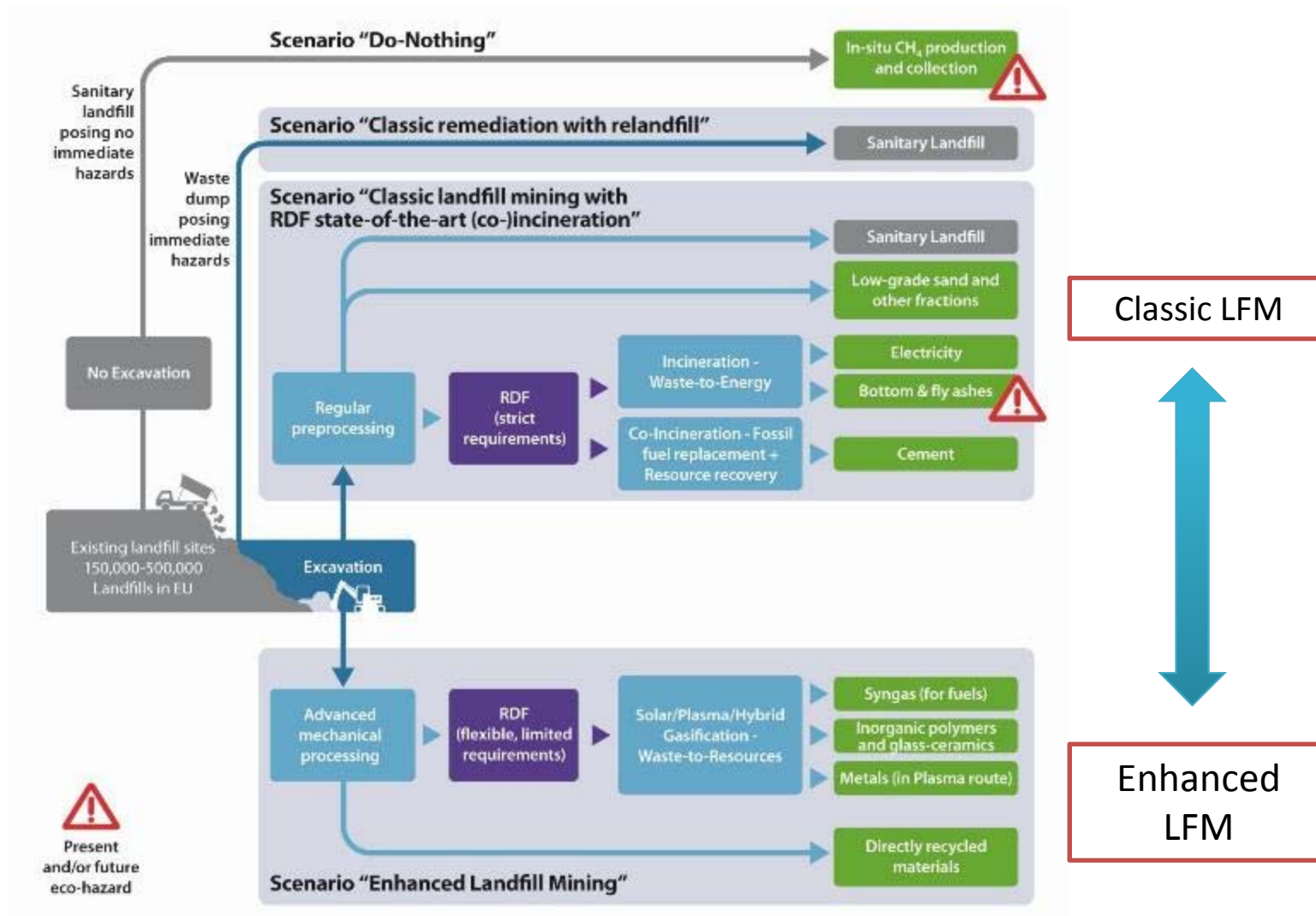
Landfill design – leak detection system



Enhanced Landfill Mining within a integrated recycling strategy



ELFM vs LFM



LFM vs ELFM

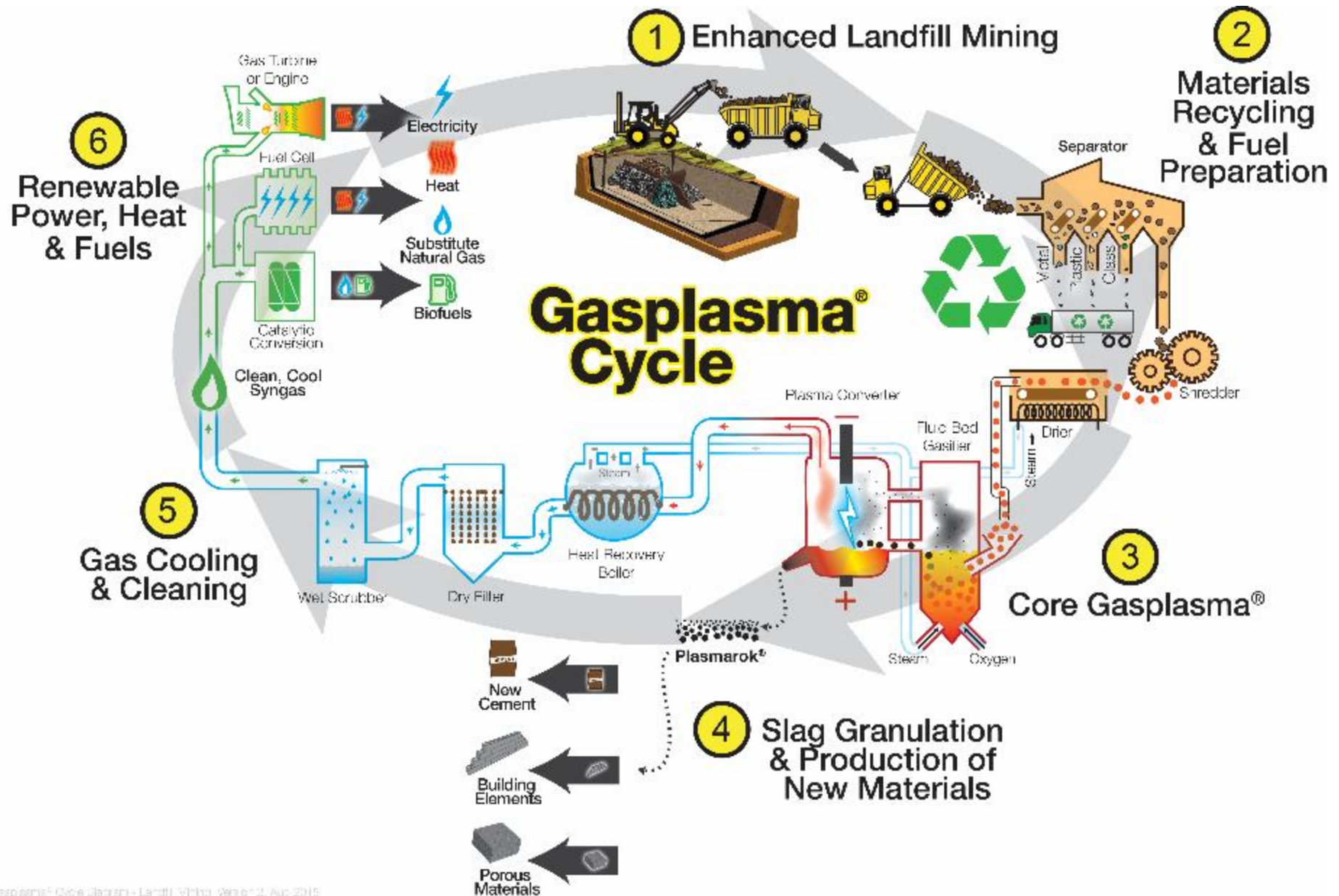


- Urban Solid Waste (USW) == Municipal Solid Waste (or equal) and/or Mixed Industrial Waste
- Most appropriate landfill mining solution for USW landfills to be tailored based on project driver(s) and objectives
- Option A: “Classic” Landfill Mining (LFM)
 - Drive: Resolve environmental problem and/or reclaim land for redevelopment
 - Duration: Few months to 2 years (**FAST** solution)
 - Equipment: Mainly mobile installations
 - Ambition level of resource recuperation: secondary focus
- Option B: “Enhanced” Landfill Mining (ELFM)
 - Drive: Maximize potential of materials, energy and land recuperation
 - Duration: 10 to 25 years (**TAILORED** solution)
 - Equipment: Mainly stationary installations
 - Ambition level of resource recuperation: primary focus

Classic Landfill Mining (LFM)



ELFM – Innovative upcycling technologies and products

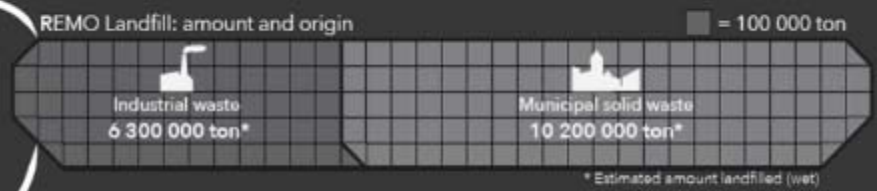


Existing hydrogen applications

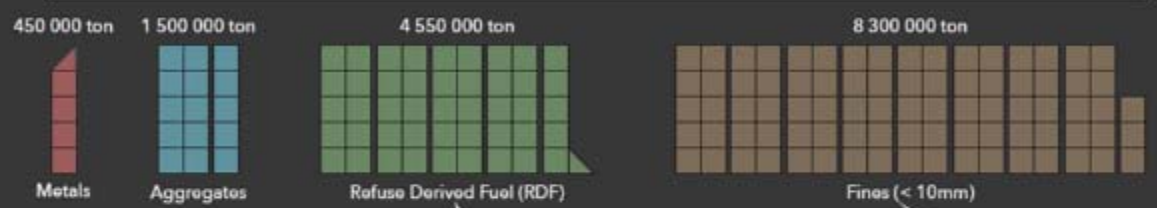


REMO Landfill: Material recovery and upcycling within the REMO case

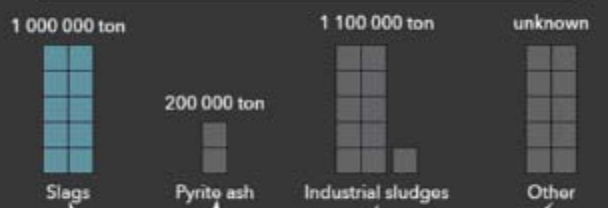
STEP 1
STEP 2
STEP 3



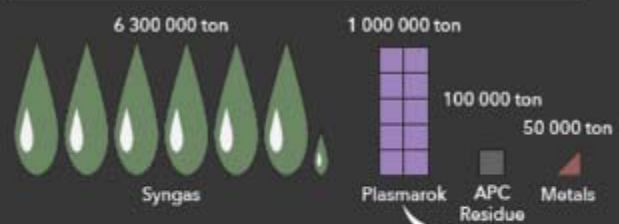
Excavation + Separation



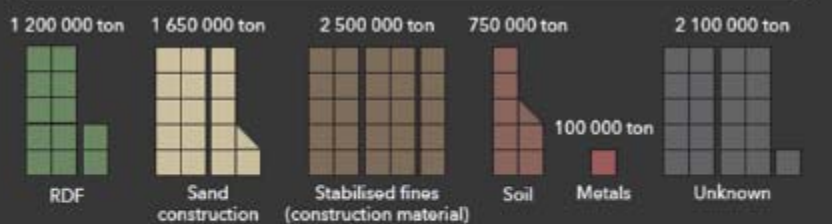
Selective excavation



Gasplasma® treatment



Physico-chemical treatment & upcycling



Upcycling Plasmarok®



<http://www.elfm.eu>

Andere partners:
KULeuven, UHasselt, OVAM,
HUBrussel, Cleantechpunt,
LRM BBL



sources: Spooren et al. (2018), Material recovery and upcycling within the ELPm concept of the REMO case

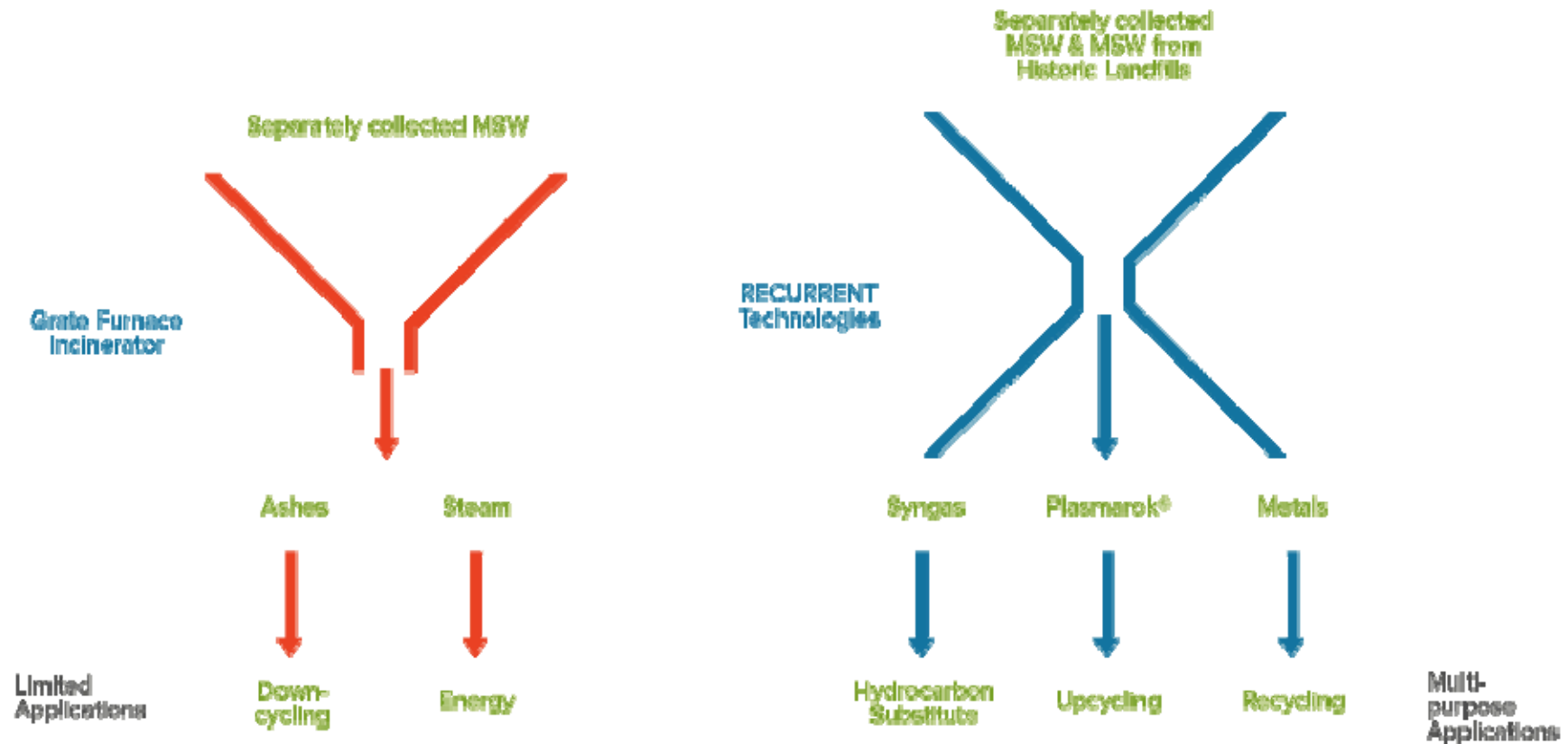
ELFM Seminar @ European Parliament (20 october 2015)



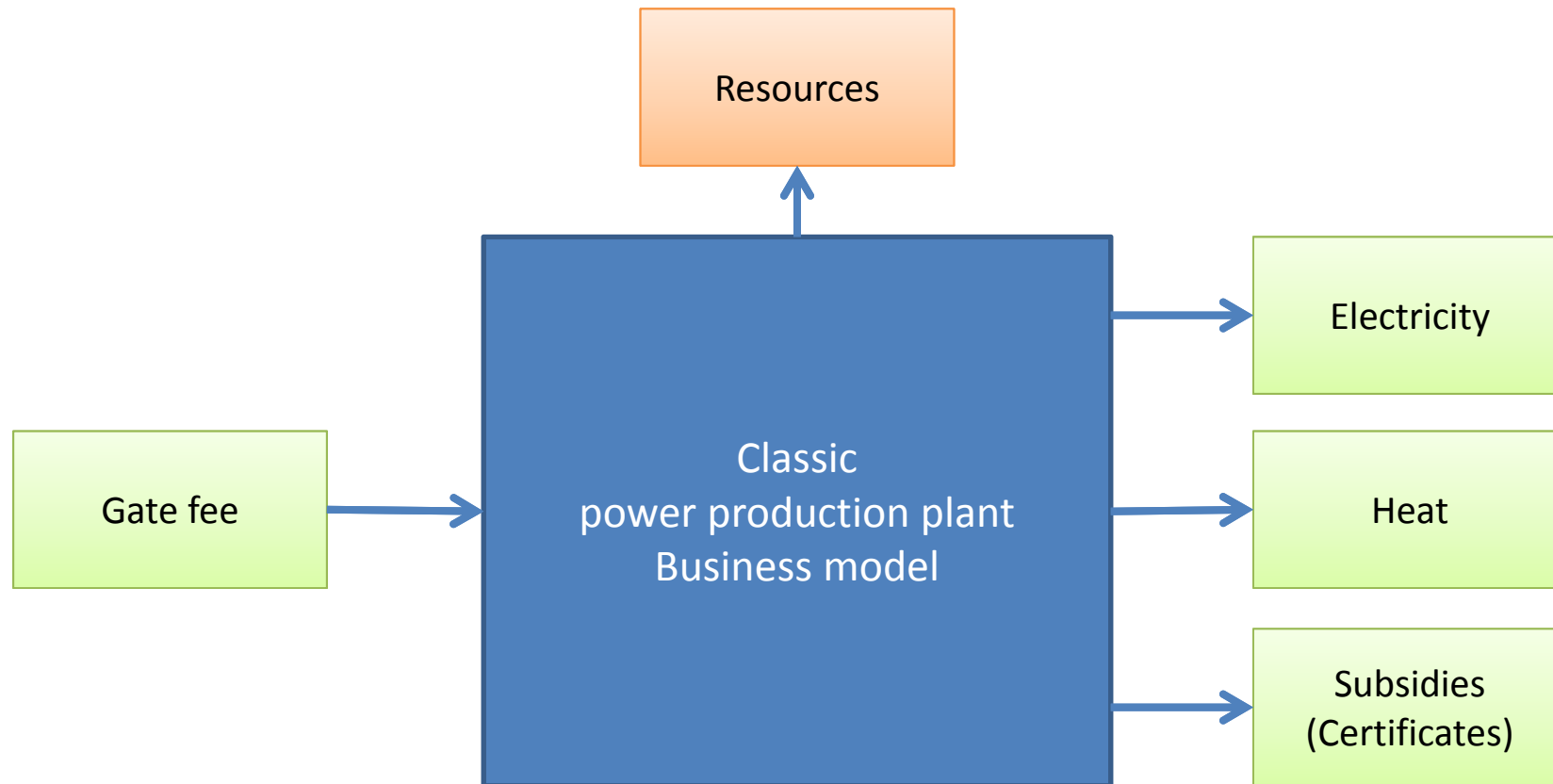
Towards a sustainable economical model for ELFM projects



Funnel and Hourglass model

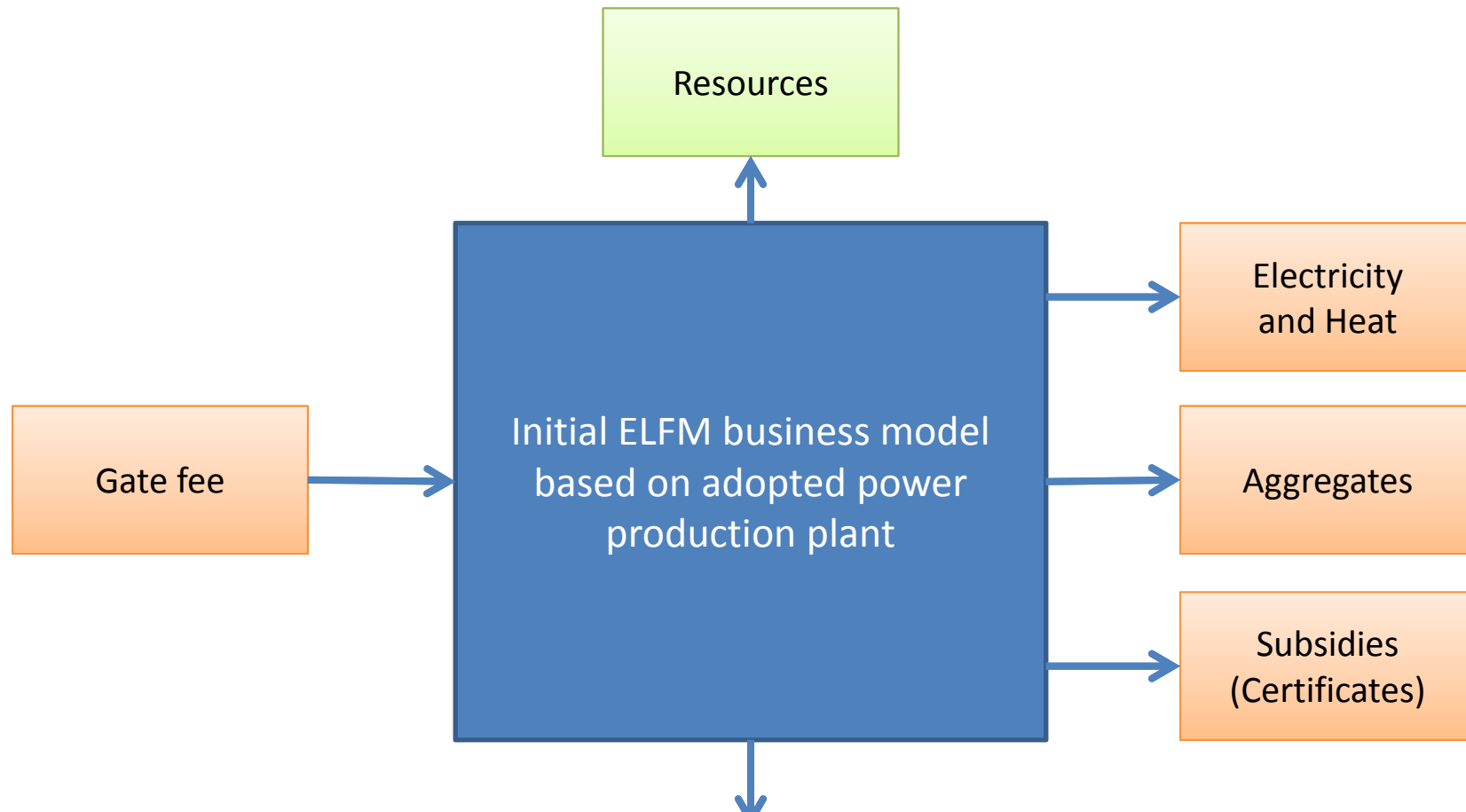


Towards a sustainable economical model for ELFM projects



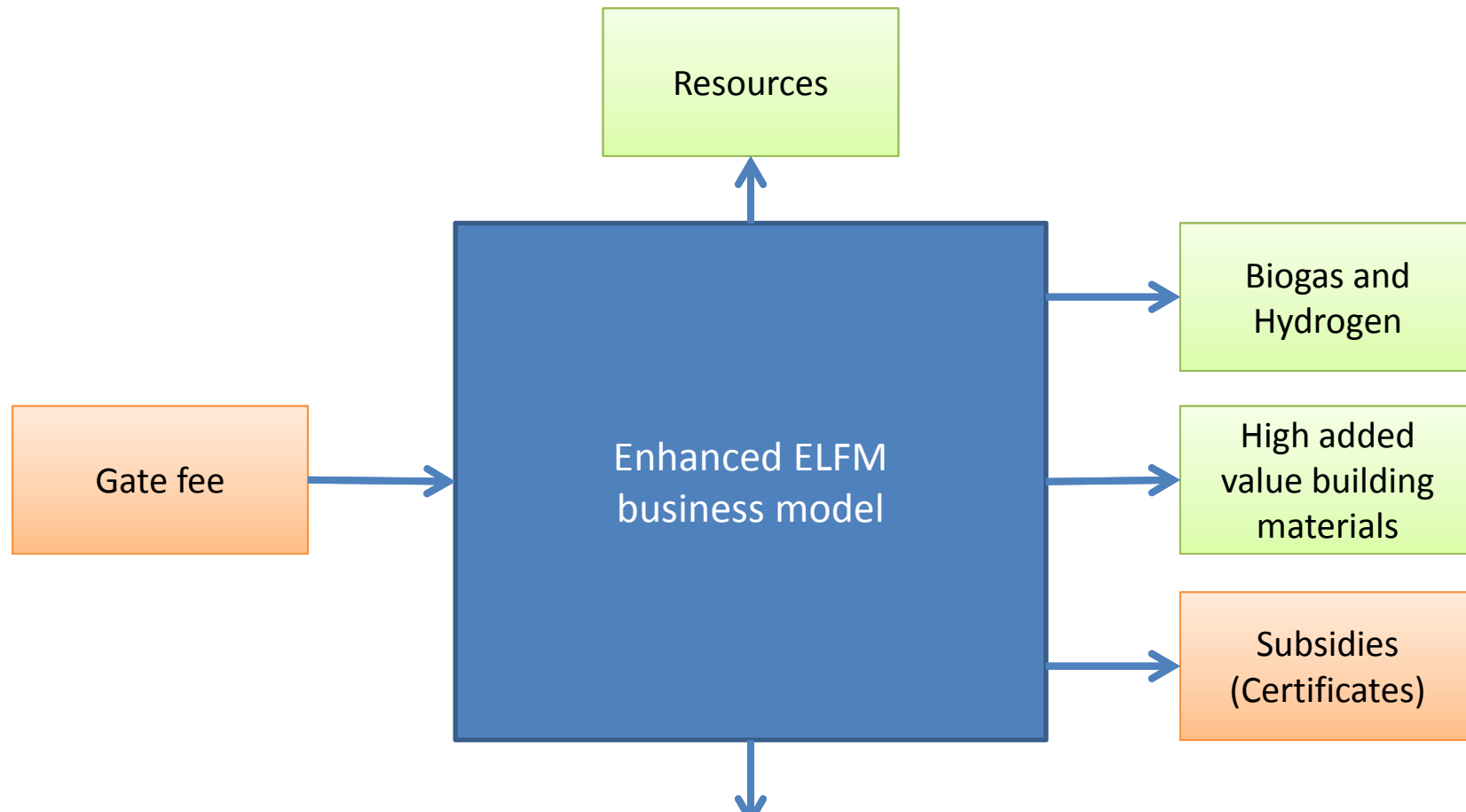
Classic configuration heavily depends on revenues from gate fee, grey and green electricity

Towards a sustainable economical model for ELFM projects



ELFM can't rely on same level of revenues from gate fee, grey and green electricity

A sustainable economical model for ELFM projects



Optimized ELFM model uses upcycling technologies in order to create value based on high added value sustainable products

Status realization CtC project

■ Science & Technology (R&D):

- R&D subsidy programmes are readily available: EFRO, VLAIO R&D and MIP ICON projects have generated required technical solutions, as a results first installations are permitted and ready-to-be-built

■ Awareness & buy-in:

- Quadruple helix model deployed since 2009: growing awareness and buy-in on all levels (local <-> super local, Belgium <-> Europe), but unfortunately appeals from isolated individuals pose a real threat

■ Planning & permitting:

- Long, complex and expensive set of procedures have led to all required permits, which will most likely be destroyed by higher court due to appeals from these isolated individuals

■ Legal appeals:

- Higher court assesses permits and all included decisions from a content point of view, going much further than securing that no procedural errors are made
- Hard protection of nature is at this moment only parameter being considered in this assessment
- Temporary local removal of nature in order to create a higher total nature value is not allowed
- Upsides like creation of nature park, recovery of resources & energy and employment are not being considered

■ Financing:

- Lack of ELFM legislation jeopardizes financial close of project as framework for ELFM is not available

■ Legislation:

- EC poses that ELFM can be performed as long as relevant EU (landfill) directives articles are being adhered to
- Much better would be to have an unambiguous definition and framework included in EU directives

Opportunities towards a sustainable implementation

- Best possible short term interim use will be explored as soon as final judgments are known
- Continuity of Remo landfill operation is imperative to be able to continue the development of CtC



Wright brothers, 1903

