Current environmental sustainability challenges in waste management

EURO CASE "European Engineering Sustainability"
BUDAPEST - September 23rd, 2024

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WASTE TT

Christophe CORD'HOMME

+30 years of international industrial experience

Strategic advice & industrial expertise

in Environment & Energy:

- Renewable thermal energy
- Energy-from-Waste
- Air pollution control …

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Vice Chair WGER (Working Group Energy Recovery)

ISWA (www.iswa.org) (International Solid Waste Association)

ISWA International Solid Waste Association

What is the definition of WASTE?

- Noun:
  - Unwanted or unusable matter or material, especially what is left after useful substances or parts have been removed

- Adjective:
  - Eliminated or discarded as no longer useful or required after the completion of a process.
- --> it normally means:
  Of no use & no value, mixed up, degraded & polluted
- NB: also, bad use of something valuable that you have only a limited amount of. (money, substances, time, energy…)

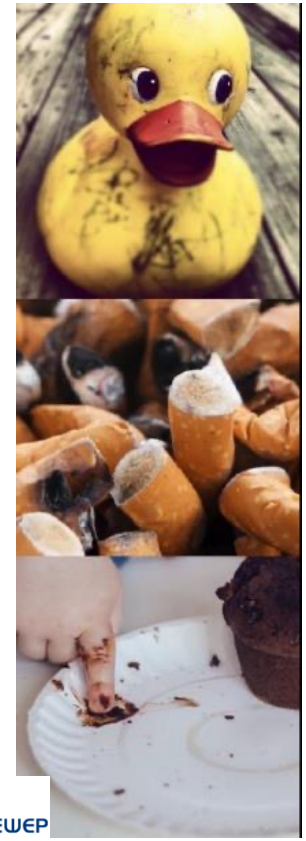
From concentration to dispersion/degradation

- SOURCE: Pr ALICIA VALERO (SP)

- THE DREADED 2nd LAW OF THERMODYNAMICS
  - All natural and man-made processes spontaneously tend towards degradation; the way back is very costly (especially in energy) or even impossible.
- COROLLARY:
  - MIXING is the most entropic process there is!
  - Maintain purity as much as possible (selective collection)
  - Transforming all waste into materials = alchemy of transmuting lead into gold

The pancake malediction!

Not everything can or should be recycled… but what do we do with residual waste?



While some artifacts without any further use can at least be recycled (after selective collection):

- What about:
  - Dirty, contaminated materials?
  - Mixed materials?
  - Degraded materials after being recycled several times?
  - Materials containing substances of high concern?

- To avoid circular pollution in the circular economy, the ONLY options as **FINAL SINKS** are…
  - **First, the hygienic Energy Recovery e.g. Energy-from-Waste EfW / Waste-to-Energy WtE**
  - Disposal e.g. ***Landfilling***, but to be avoided for climate change and pollution reasons
    Landfill “ban”: <10% in every EU country by 2035

Another easy option for residual/"recyclable" waste?

…Disperse by « asking » your « neighbours»!

lodz.wyborcza.pl/lodz/7,35136,23454268,wielki-pozar-w-zgierzu-plonie-skladowisko-odpadow.html

Source : EA/DEFRA

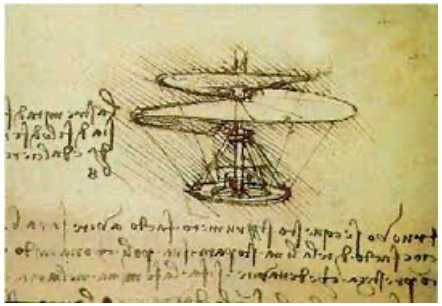
2 basic principles: PROXIMITY & «POLLUTER PAYS» as opposed to NIMBY (Not In My Back-Yard) risk

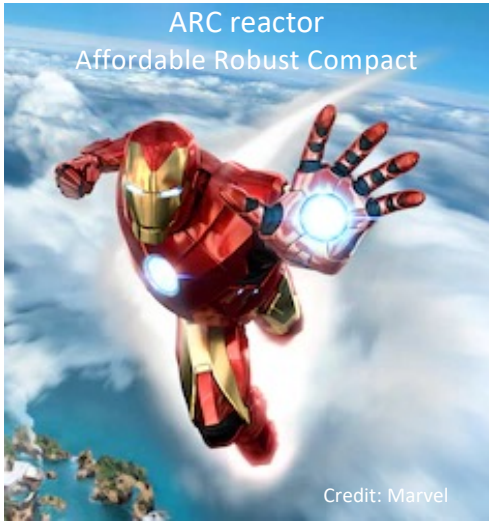
Energy, a major oversight in the circular economy and the resource management

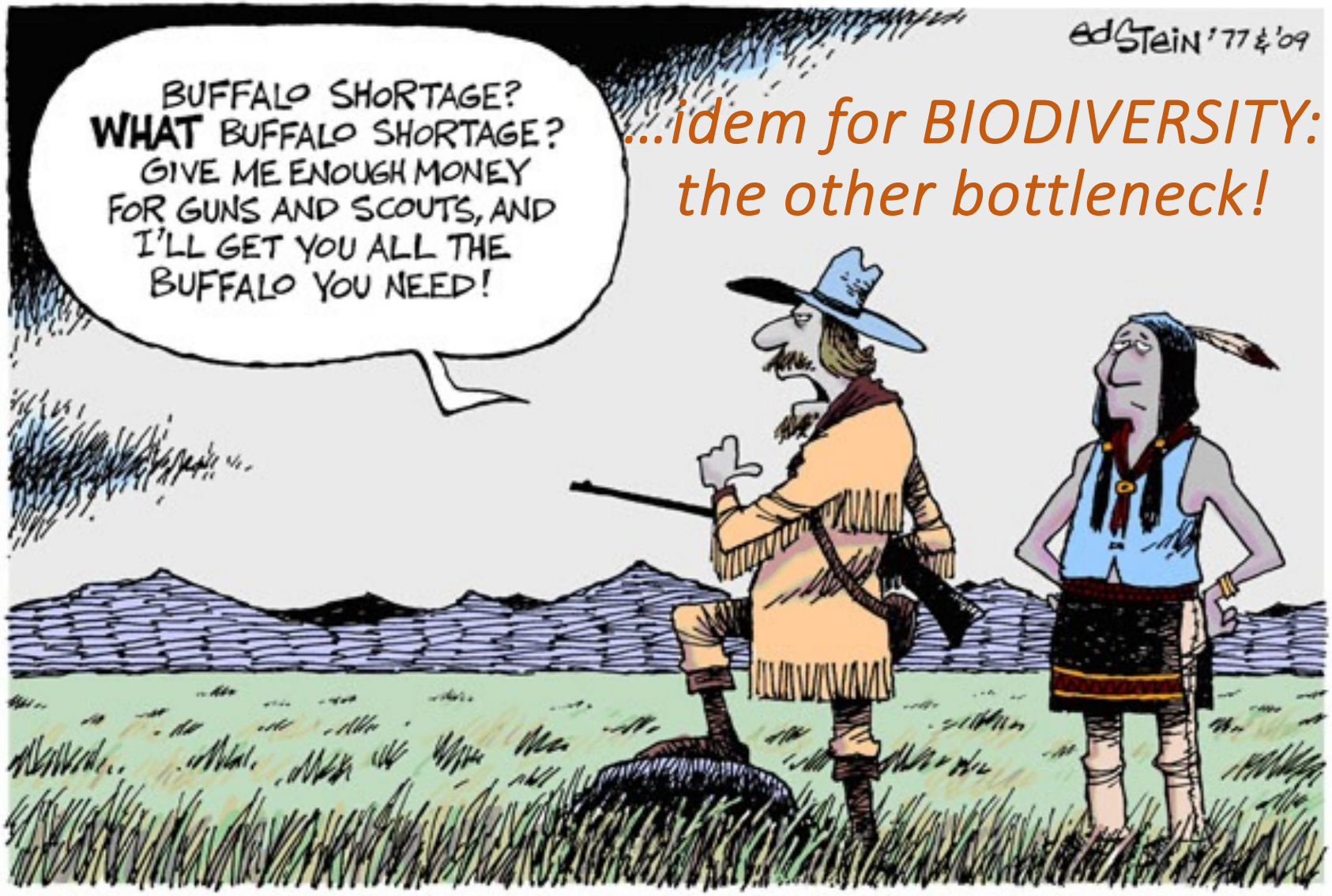
- How much energy does 100kWh represent ?
  - Electric: a mini-fridge plugged in **for 1 year,** costing ca.5€, (or the annual output of a ½ PV panel)
  - Thermal: energy content of a 10l jerry can of petrol, costing ca.**10€**
  - 10l of petrol = 100kWh is the av. European primary energy consumption **PER DAY** per cap. (Eurostat, 2020)
  - Mechanical: a man's muscular work capacity **for 1 year** (FAO, 2021), costing around **20 THOUSAND € in EU**

Without energy, no resources, no technologies and no economy!

Not aware of all energy involved in product creation & distribution and in waste.
With all our machines fed by fossil fuels,
we are STRONG as 100 men.
It is 500 times CHEAPER per kWh mec.
Perpetual motion is impossible without energy, which is doomed to be linear.

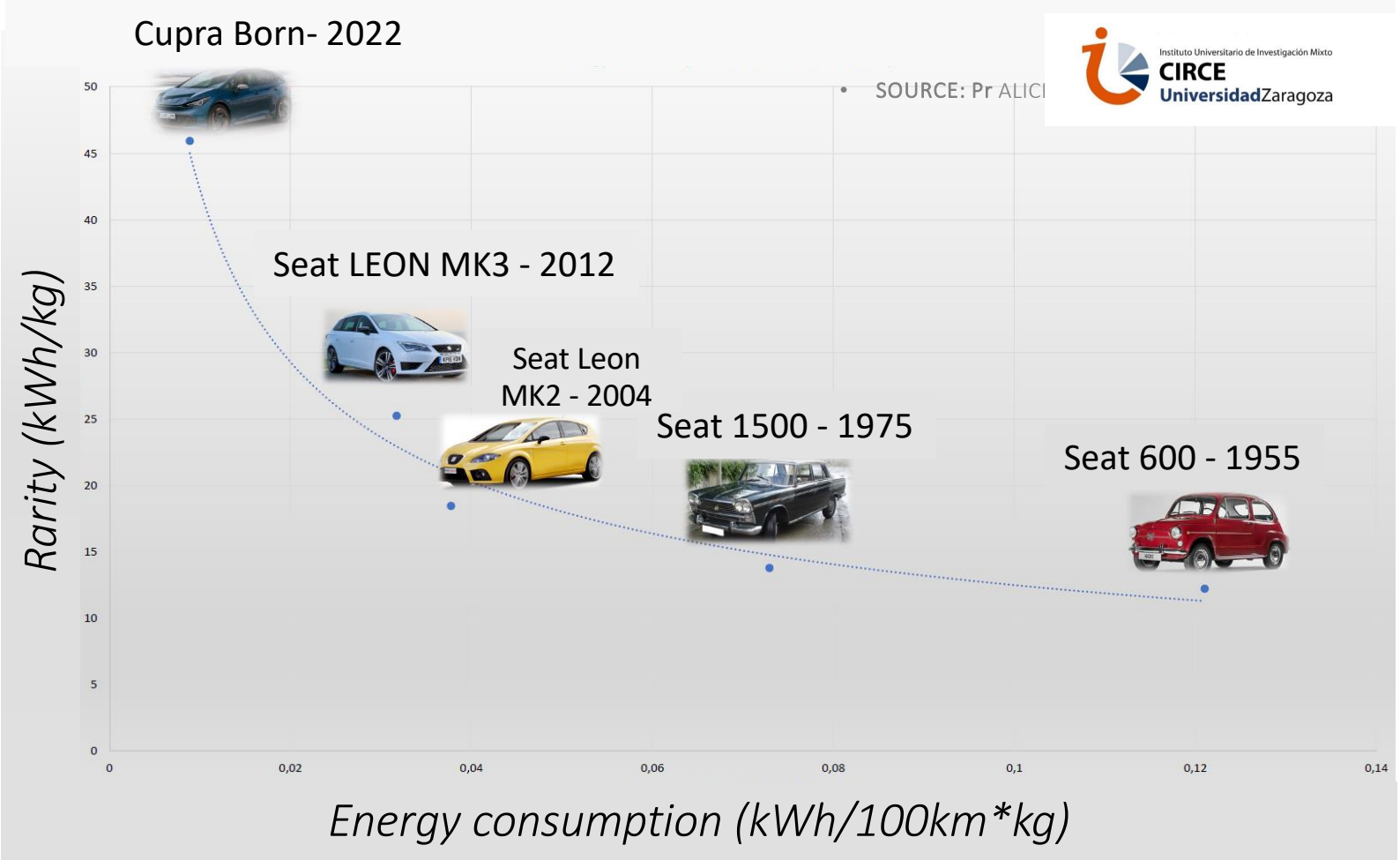





BUFFALO SHORTAGE?
WHAT BUFFALO SHORTAGE?
GIVE ME ENOUGH MONEY FOR GUNS AND SCOUTS, AND I'LL GET YOU ALL THE BUFFALO YOU NEED!
EdStein '77 & '09
...idem for BIODIVERSITY:
the other bottleneck!

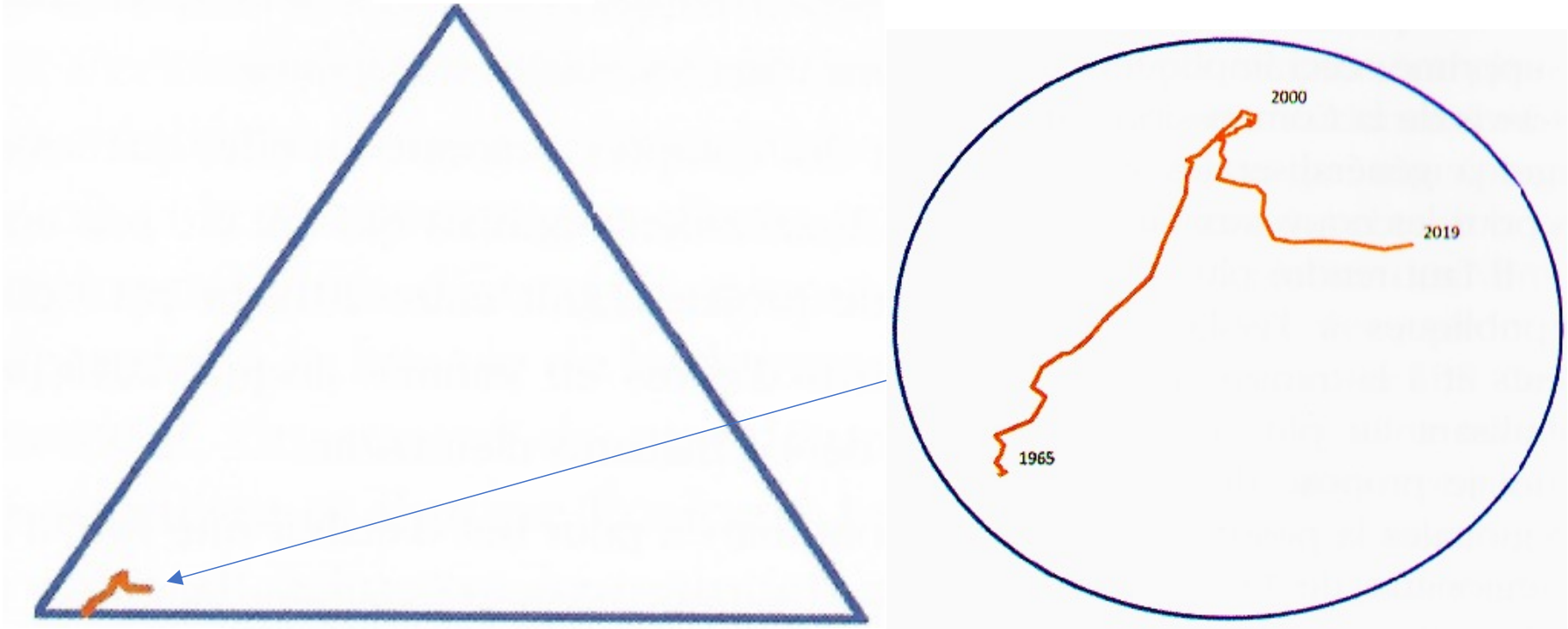
Paradox: Energy efficiency vs Resource inefficiency

More energy-efficient technologies are less sustainable from a material point of view!



How rapid is the energy transition?

- WORLD PRIMARY ENERGY SOURCES EVOLUTION



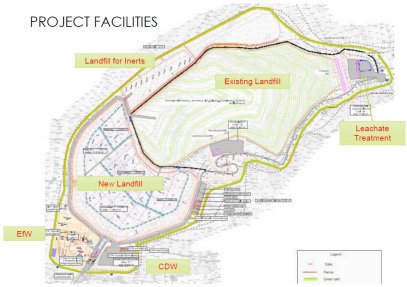
Energy in the circular economy?

- WASTE AND ENERGY DAILY BALANCE
  - 1kg of residual Municipal Solid Waste per capita per day
    = 2,5 kWh of thermal energy content
  - 2,5 % of European primary energy av. consumption per day
  - Waste-to-Energy process recovers this local, mostly renewable and non-intermittent energy and relieves this deficit

- DOESN'T MAKE SENSE TO THROW AWAY THIS "**CIRCULAR" ENERGY!**

  the equivalent of more than one magnum bottle of "green petrol" (1.5l) for every weekly garbage bag that each of us throws away

Importance of engineering for efficient solutions for waste treatment



Remediation of **THE** European site of ISWA « 50 World's most polluted places»
Vinca dumpsite - Belgrade (Serbia)

1st EfW in the Balkans (340kt/y) (Single line 103MW_{th})

https://www.youtube.com/watch?v=lNbrbyHoD2c

United Nations Economic Commission for Europe (UNECE)

Nations Unies

Conseil économique et social

Commission économique pour l'Europe

Comité de l'innovation, de la compétitivité et des

Groupe de travail des partenariats public-privé

Sixième session

Genève, 1er et 2 décembre 2022

Point 4 de l'ordre du jour provisoire

Examen des travaux menés depuis la cinquième session du des partenariats public-privé, tenue les 29 et 30 novembre

Lignes directrices sur les part des objectifs de développeme de valorisation énergétique de les voies de l'économie circ

Note du secrétariat

Contexte

United Nations

Economic and Social Council

ECE/CECI/WP/PPP/2022/3

Distr.: General
30 August 2022

Original: English

Economic Commission for Europe

Committee on Innovation, Competitiveness and Public-Private Partnerships

Working Party on Public-Private Partnerships

Sixth session

Geneva, 1-2 December 2022

Item 4 of the provisional agenda

Review of the work since the fifth session of the Working Party on Public-Private Partnerships on 29-30 November 2021

Guidelines on Public-Private Partnerships for the Sustainable Development Goals in Waste-to-Energy Projects for Non-Recyclable Waste: Pathways towards a Circular Economy

Note by the secretariat

Background

The following document contains a set of guidelines on how Waste-to-Energy (WTE) for non-recyclable waste can, through Public-Private Partnerships (PPPs) for the Sustainable Development Goals (SDGs), can contribute to a transition towards a circular economy (CE).

A first version of this document was submitted to the Working Party on PPPs at its fourth session in 2020 (ECE/CECI/WP/PPP/2020/5). The Working Party proposed its submission to the 69th Commission session in April 2021 and agreed on its further development by the secretariat based on comments from stakeholders.

In 2021, the secretariat conducted a stakeholder consultation through an online survey directed at governments and with the participation of industry and civil society. 138 respondents provided input which was used to prepare a revised version of the guidelines. A review of the revised document was initiated in early 2022 and a peer review process was established.[1] The revision process also benefited from experts' input from two panel discussions on the topic: one held at the fifth session of the Working Party in November 2021, and another at the sixth ECE International PPP Forum in May 2022.

The document was prepared by the secretariat with substantive inputs from A.C. (Thanos) Bourtsalas, and Jiangrong Yu. The secretariat is grateful to the European Commission for its input on the legislative and regulatory framework of WTE in the European Union.

The document was shared with the Bureau in July 2022 and is submitted to the Working Party for its consideration.

[1] A list of experts who contributed to review the document is provided in Annex I.

GE.22-13488(E)

GE.22-13488 (F) 051022

Please recycle

"Guidelines on Public-Private Partnerships (PPPs) for the Sustainable Development Goals (SDGs) in Waste-to-Energy (WtE) projects for non-recyclable waste: Pathways towards a Circular Economy"

https://unece.org/eci/documents/2023/05/working-documents/guidelines-public-private-partnerships-sustainable

United Nations positions on WtE for the Sustainable Development Goals and Circular Economy

- « Role of Waste-to-Energy in integrated waste management systems for the **transition step to a more circular / sustainable development path**…
- WtE is considered to **complement recycling**
- **It is the** only proven alternative to the landfilling of non-recyclable materials with the importance of greenhouse gases (GHG) savings of WtE over landfilling.
- Existing policies such as EU regulations implemented in WtE plants … **ensure that citizens and the environment are not harmed**, thanks to the latest generation of industrial technologies.
- Large quantities of metals can be recovered from WtE plants.

WASTE TT

ISWA
International Solid Waste Association

IRRC Vienna - 5th of September 2022

Christophe CORD'HOMME
Presenter: Vice-chair WG Energy Recovery
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White Book Energy-from-Waste Technologies

www.iswa.org @iswa.org @iswa_org

1 Preface

Johnny Stuen
Working Group Chair

Christophe Cord'Homme
Working Group Chair

As Chair and Vice Chair of **ISWA's** Working Group on Energy Recovery, we are proud to present, after nearly two years of dedicated efforts from the whole Working Group, this new report, "**ISWA** White Book on Energy-from-Waste (EfW) Technologies"

This White Book is a comprehensive overview, looking at technical, economic, legislative, institutional, social and most importantly, environmental aspects of the available thermal technologies which produce energy from waste (EfW).

The idea behind this document is to assist those involved in the development of waste management, especially decision makers in countries where EfW is not yet familiar or implemented, particularly for the increasing number of large cities. Therefore, the intended users of the guidelines are primarily decision makers, waste management authorities and institutions involved in the financing of public infrastructure required by urbanization. The overall objective is to give an overview of the key pre-conditions which must be fulfilled in order to ensure short and long-term feasibility of Municipal Solid Waste (MSW) energy recovery facilities building and operation. The guidelines also include an overview of waste combustion and thermal treatment technologies as well as the necessary infrastructure and financing.

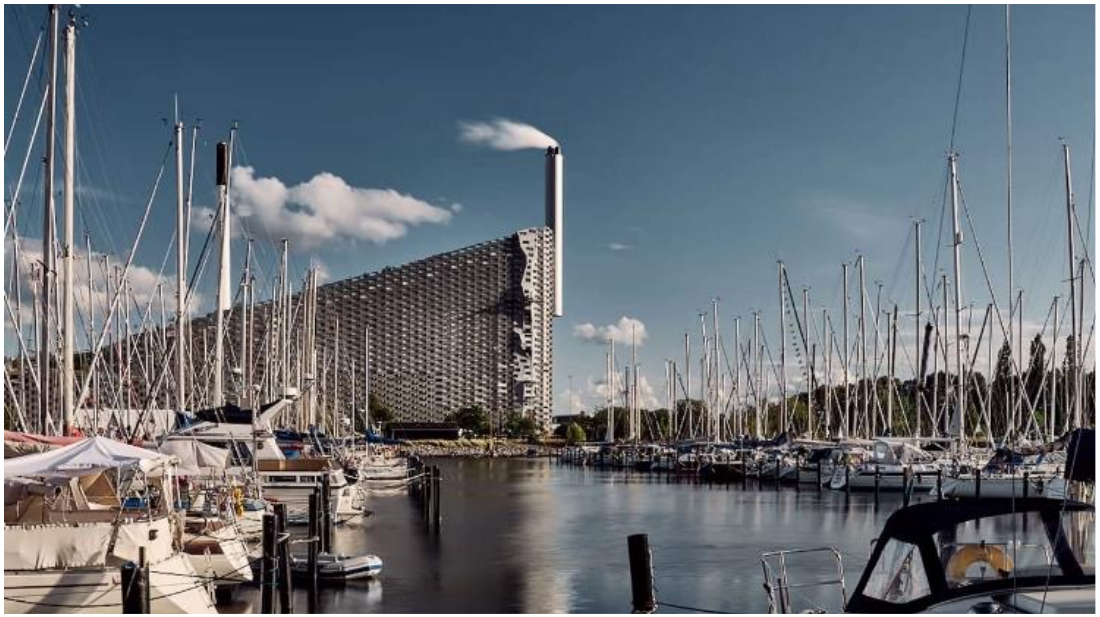
Waste-to-Energy (WtE) (or Energy-from-Waste (EfW)) is the thermal treatment of residual waste. The ideal role for the technology is to recover the energy and materials that cannot be recycled, and reduce the need for landfill, in some countries almost to zero.

Waste thermal treatment is a clean and compact technology that can be adopted in central areas of cities. It diverts residual municipal waste from landfills or worse options, provides locally available and sustainable energy, reduces dependence on fossil fuels and contributes to climate protection by avoiding methane emissions from landfill. It contributes also to environmental protection by avoiding huge pollution from worse options such as open dumps or open burning. Installed as close as possible to urban centers, EfW facilities respect the proximity principle for our cities "metabolism". They offer a hygienic, safe, and reliable solution for residual municipal waste treatment, combined with non-intermittent renewable energy production and mineral & metals recovery.

As a final sink, Energy-from Waste is an integral part of an efficient and sustainable waste and resource system, going hand in hand with recycling and biological treatment of waste when it comes to reducing the amount of waste landfilled and to eliminating open dumping and open burning and thereby protecting the environment and human health as well as mitigating climate change.

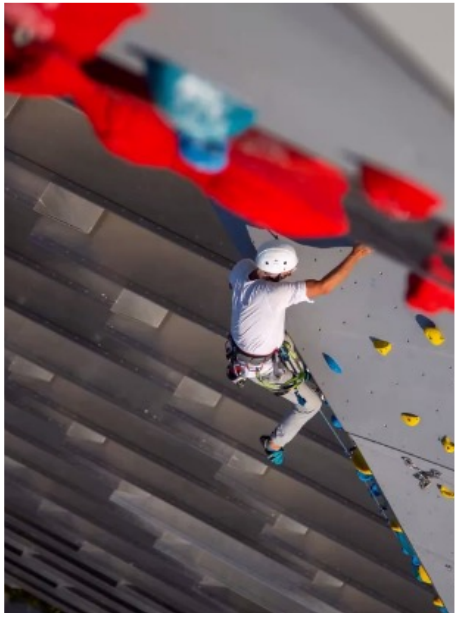
With this in mind, the Working Group has prepared this White Paper, which will serve as a roadmap for the industry from operators to owners and consultants in the field of EfW/WtE who seek to implement the technology as part of a balanced, integrated waste management system.

Published
in July 2023
Available on
www.iswa.org

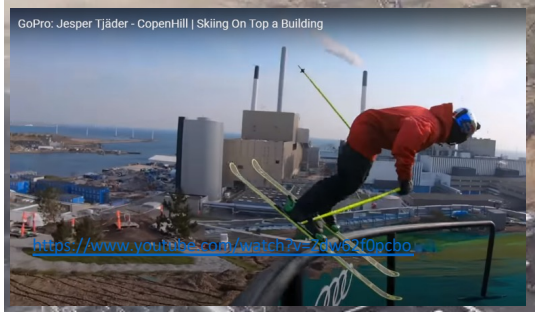



Neveplast


Amélie Louys



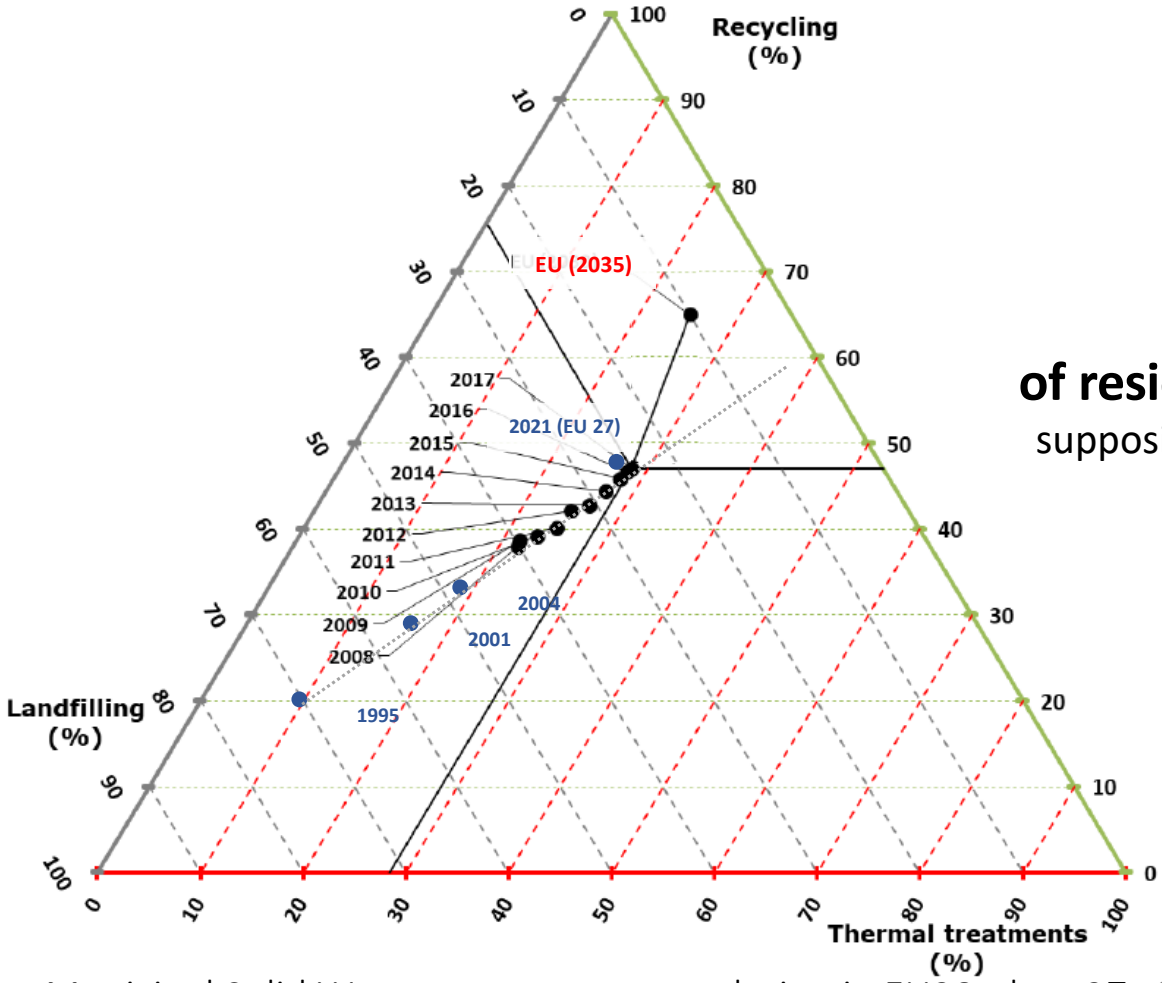
COPENHAGEN (DK): 1st CO_2-neutral capital with 100% renewable and recovery heat in district heating (98% demand)



EfW AMAGERFORBRAENDING, COPENHAGEN, DENMARK

Credit : BIG

Material- & Energy-from-Waste are essential and complementary pillars to divert Municipal Solid Waste from landfills



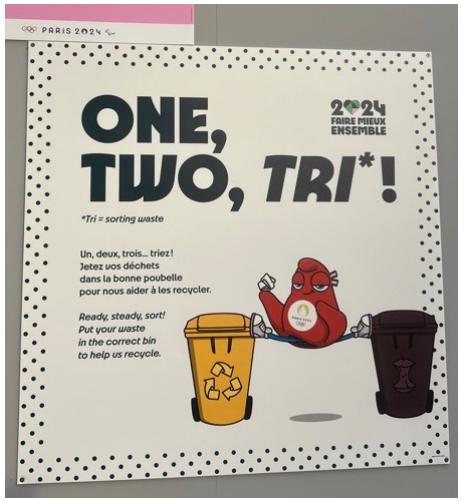
Still **132 M tonnes of residual waste /year in 2035 in EU**

supposing ambitious targets of the EU circular economy package reached

Municipal Solid Waste management evolution in EU28, then 27

Source : Abis –Sardinia 2019 completed by WasteTT - ChC

Waste management within the Circular Economy: now Resource-from-Waste!



– **Prevention**: effective, efficient, and safe use of raw materials and resources

– **Material-from-Waste**: high-quality recycling closing loops without loss of quality and thread of contaminating food and product cycles

– **Energy-from-Waste (EfW):** high-quality recovery of residual waste with the highest energy and material recovery rate, acting as a safe sink for pollutants, unwanted organic components
…. and methane (GHG)

Editorial in DETRITUS 2021
"Energy, a Major Oversight in the Circular Economy and Resource Management?" digital.detritusjournal.com

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