UNECE Waste-to-Energy and People-first PPPs Survey

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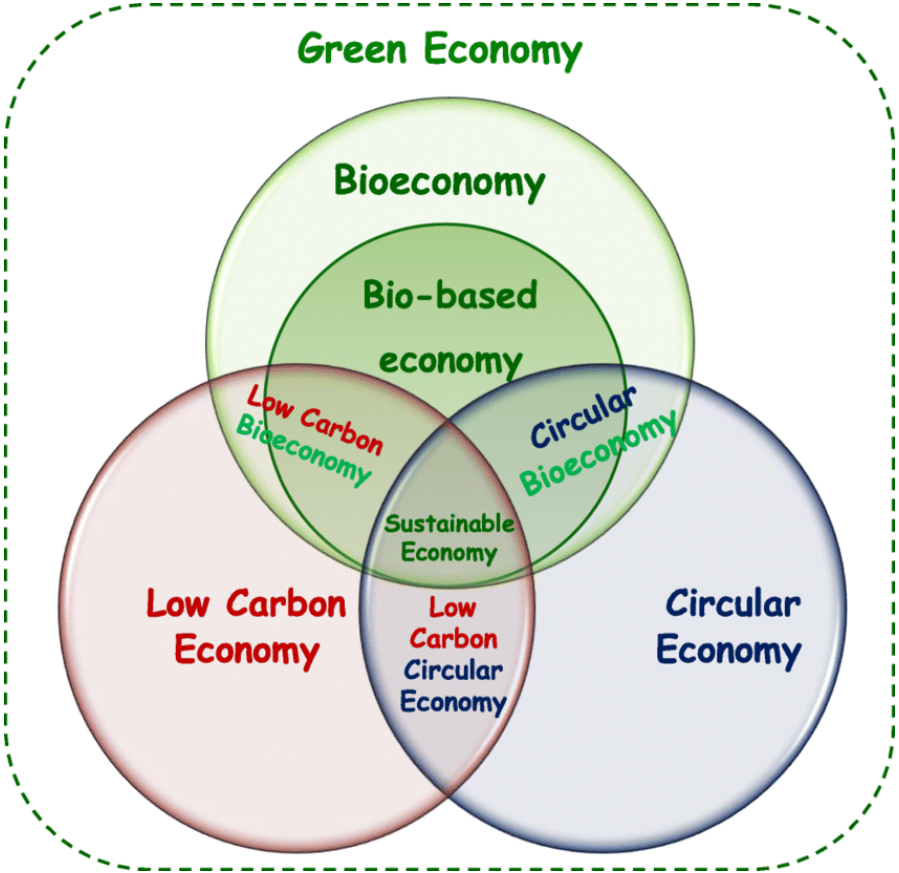
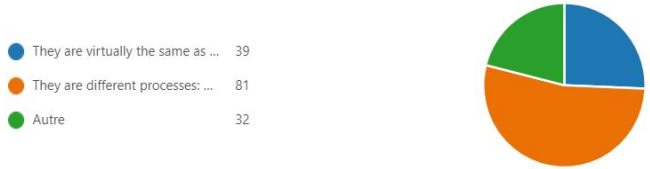
Venn diagram depicting various economies in green economy (adapted from Kardung and Wesseler 2019)



1) Methods of managing wastes and the role of WTE

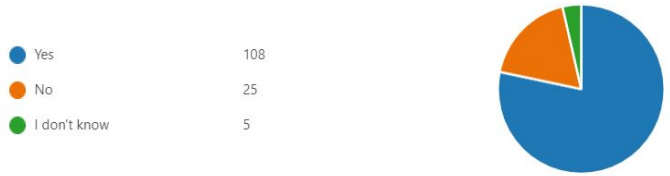
Focus 1. Waste-to-Energy vs. Incineration

4. How are, in your view, incineration of waste and Waste-to-Energy processes different?



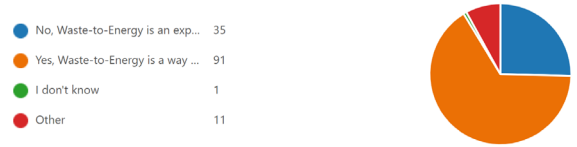
Focus 2. Waste-to-Energy for non-recyclable materials

5. Should Waste-to-Energy facilities only be used for processing non-recyclable materials (as per the UNECE Guidelines)?

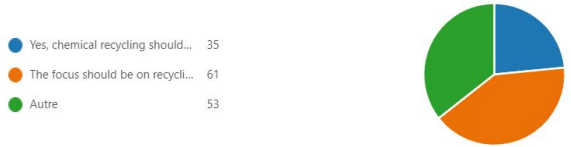


Focus 3 . Technologies and innovative processes

11. The United Nations Environment Programme (UNEP) identifies modern district energy as the most effective approach for many cities in transition to sustainable heating and cooling, by improving energy efficiency and enabling higher shares of renewables. Do you think Waste-to-energy should be used for district heating and cooling?



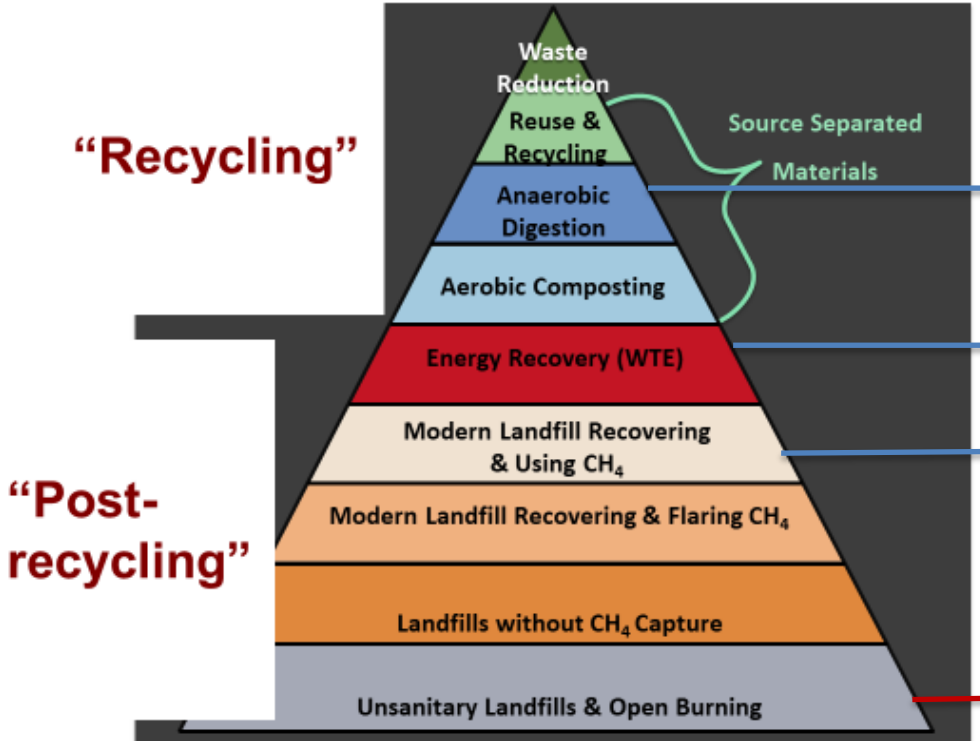
8. Chemical recycling is a promising technology for the utilisation of waste plastic materials. In your opinion, should chemical recycling be used for post-recycled materials?



Focus 4. Adequacy of existing standards and regulations

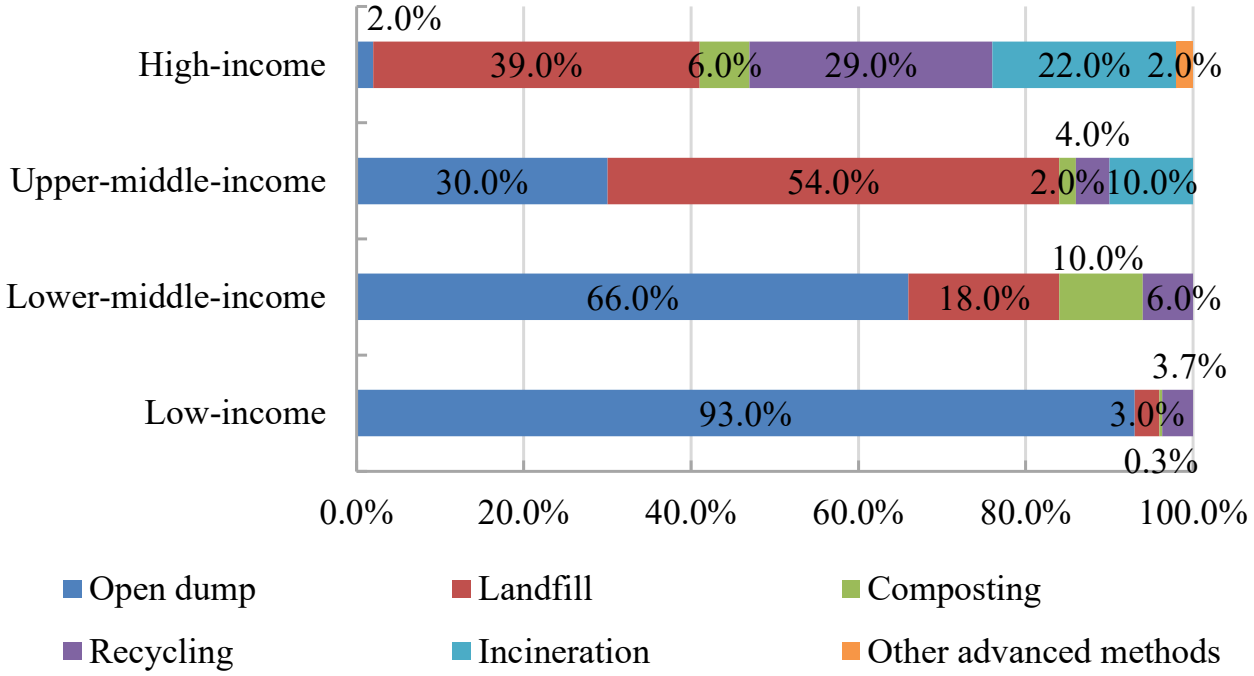
12. All incineration-based Waste-to-Energy must comply with stringent emissions standards (such as the EU Industrial Emission Directive and US MACT). But are, in your views, existing regulations concerning the emissions of Waste-to-Energy facilities adequate to prevent public health damage?

Methods of managing wastes



TRL: Technology Readiness Level

Disposal methods by income



Source: What a Waste 2.0, World Bank, September 2018.

2) Beneficial use and safe disposal of WTE residues (bottom and fly ash)

Focus 1. Bottom ash residues

14. After metal separation, the utilisation of Waste-to-Energy bottom ash in construction is subject to strict leaching standards, such as Leaching Environmental Assessment Framework, as is the case in several European countries such as Denmark, UK, France, Germany, Austria and Switzerland, and in Asian countries such as Singapore, China and Japan. But are, in your opinion, existing regulations concerning the utilisation of Waste-to-Energy bottom ash adequate to prevent public health damage?

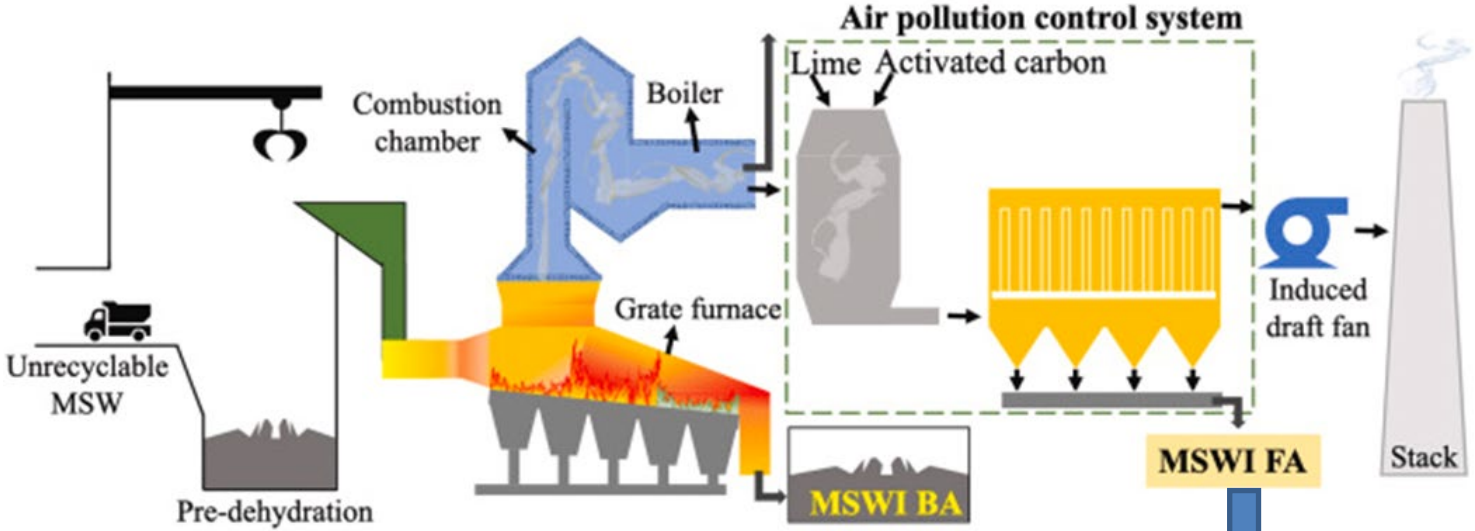
Yes. Existing regulations in pla...	58
No. While bottom ash may be...	41
I don't know	27
Autre	12

Focus 2 . Fly ash residues

16. Most Waste-to-Energy fly ashes are landfilled, often after washing and/or stabilisation or solidification in dedicated sites such as salt mines to prevent the leaching of hazardous substances in the environment. In your opinion, are existing technologies and regulations concerning the utilisation of Waste-to-Energy fly ash adequate to prevent public health damage?

The treatment and disposal of...	37
Waste-to-Energy fly ash conta...	50
Waste-to-Energy fly ash is hig...	35
I don't know	20
Autre	17

WTE bottom and fly ash (Municipal Solid Waste Incinerator Bottom Ash: MSWI BA)



20-25wt.%: Metals and construction materials

1-3wt.%: Contains precious metals, but also hazardous components, thus it needs special treatment.

Link here

Examples of utilization: Concrete tiles produced from WTE bottom ash

Link here

Examples of utilization: Construction of noise barrier along the A12 highway in The Netherlands using WTE bottom ash

Link here

Concrete blocks made from WTE bottom and fly ash used for shore protection and land reclamation in Bermuda.

Stabilized fly ash in Switzerland

3) Effective governance

Key elements of effective governance to advocate sustainable infrastructure, transparency of processes and stakeholder engagement:

- Strong regulations, incl. fiscal incentives, regular inspections, zero tolerance on corruption
- Education, and public outreach programs
- No discrimination, women empowerment
- Fiscal sustainability of projects
- Replicability and scalability of projects in other regions and countries
- Capacity-building and knowledge transfer from the private sector to the public sector (so that governments will build their capacity to develop better projects)

Effective governance: People-first outcomes and benchmarks

Outcomes	*Benchmarks*
Access and equity	Provide essential services
	Advance affordability and universal access
	Improve equity and social justice
	Plan for long-term access and equity
Economic effectiveness and fiscal sustainability	Avoid corruption and encourage transparent procurement
	Maximise economic viability and fiscal sustainability
	Maximise long-term financial viability
	Enhance employment and economic opportunities
Environmental sustainability and resilience	Reduce GHG emissions and improve energy efficiency
	Reduce waste and restore degraded land
	Reduce water consumption and wastewater discharge
	Protect biodiversity
	Assess risk and resilience for disaster management
	Allocate funds for resilience and disaster management
	Advance community-driven development
Replicability	Encourage replicability and scalability
	Enhance government, industry and community capacity
	Support innovation and technology transfer
Stakeholder engagement	Plan for stakeholder engagement and public participation
	Maximise stakeholder engagement and public participation
	Provide transparent and quality project information
	Manage public grievances and end user feedback

https://unece.org/sites/default/files/2021-11/ECE_CECI_WP_PPP_2021_03_0.pdf

Emphasis on emissions: EU IED and US MACT limits

Pollutant	E.U. IED limits (mg/Nm^3)	BAT-AEL (Best Available Technology- Associated Emission Levels) (mg/Nm^3)	U.S.A. MACT limits *
Total Suspended Particulates	10 (24-hr average)	2-5 (daily average)	20 mg/dscm
Sulfur Dioxide (SO_2)	50 (24-hr average)	5-30 (new plant) 5-40 (existing plant) (daily average)	30 ppmv (or 80% reduction)
Oxides of Nitrogen (NO_x)	200 (24-hr average)	50-120 (new plant) [a] 50-150 (existing plant) [a, b] (daily average)	150 ppmv (24-hr. average)
Hydrochloric Acid (HCl)	10	<2-6 (new plant) < 2-8 (existing plant) [c] (daily average)	25 ppmv (or 95% reduction) [f]
Dioxins and Furans	0.1 ng TEQ/Nm^3 (6-8 hr. average)	<0.01-0.06 (new plant) <0.01-0.08 (existing plant) (average over sampling period) [d]	13 ng/dscm (total mass)
Cadmium (Cd)	0.05-0.1 (0.5-8 hr. average) (Cd and Ti)	0.005-0.02 (average over sampling period) (Cd and Ti)	0.01 mg/dscm
Carbon Monoxide (CO)	50-150	10-50 (daily average)	50-150 ppmv [g]
Lead (Pb)	Included in total metals below	Included in total metals below	0.140 mg/dscm
Mercury (Hg)	0.05-0.1 (0.5-8 hr. average)	< 5- 20 µg/Nm^3(daily average) [e]	0.05 mg/dscm (or 85% reduction) [f]
Total metals	<0.5 (0.5-8 hr. average)	0.01-0.3 (average over the sampling period)	N/A
Hydrogen Fluoride (HF)	1	<1 (daily average or average over sampling period)	N/A

Thank you very much for your attention!
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