Waste Management and Upcycling Products for ZERO WASTE approach

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Climate Change

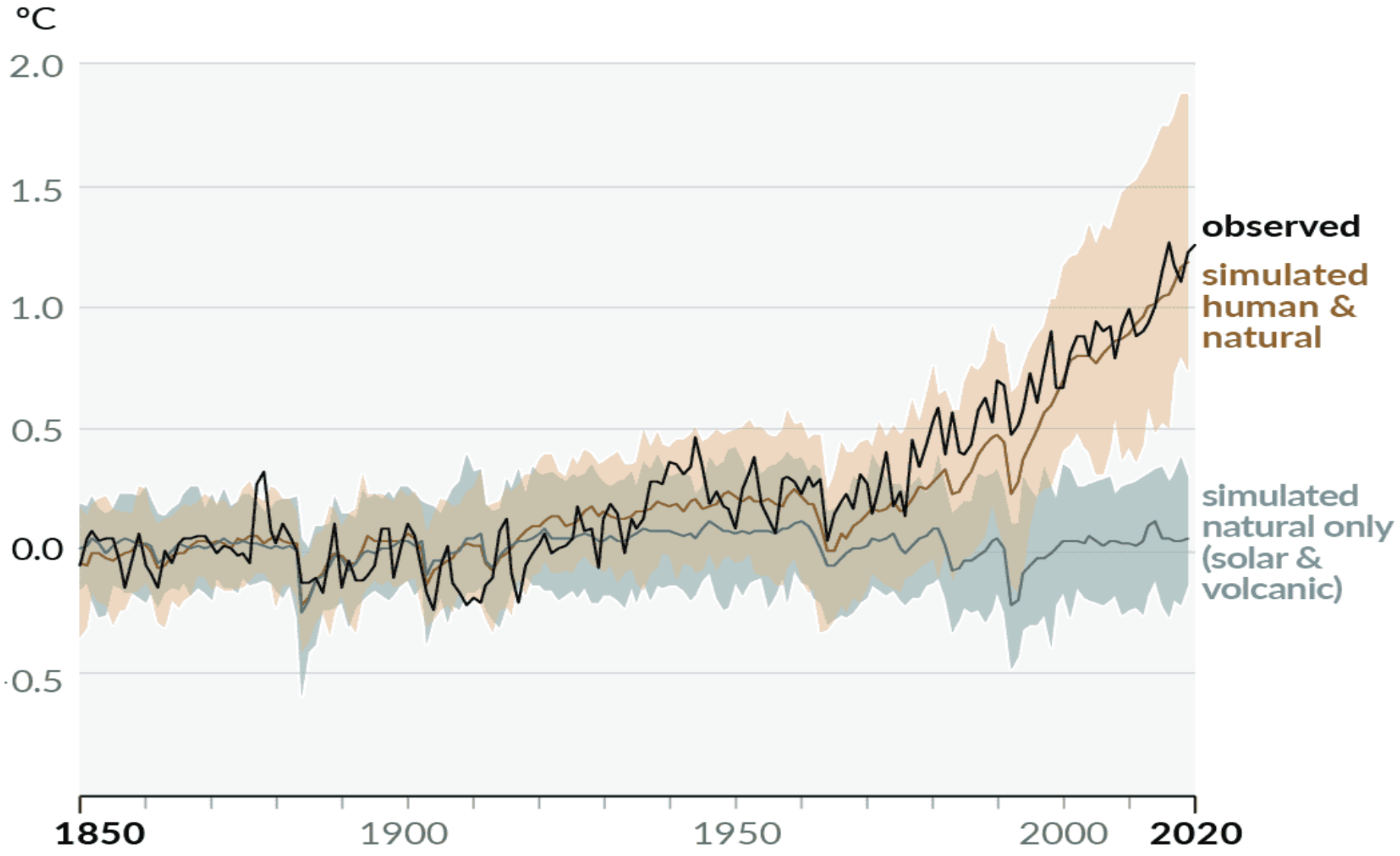
Climate variability causes impacts and disruptions to every aspect of life, including the economy, society, the environment, and all living organisms on Earth.”

"Our planet is becoming more fragile and vulnerable every day. The main cause is human activities that generate large amounts of greenhouse gases, leading to global warming and causing continuous impacts that are interconnected with various aspects of life”

Global warming” is one example of “climate change”

https://www.ipcc.ch/sr15/graphics/

Change of global surface Temperature
"Nature" VS "Human + Nature"



Change of global surface Temperature
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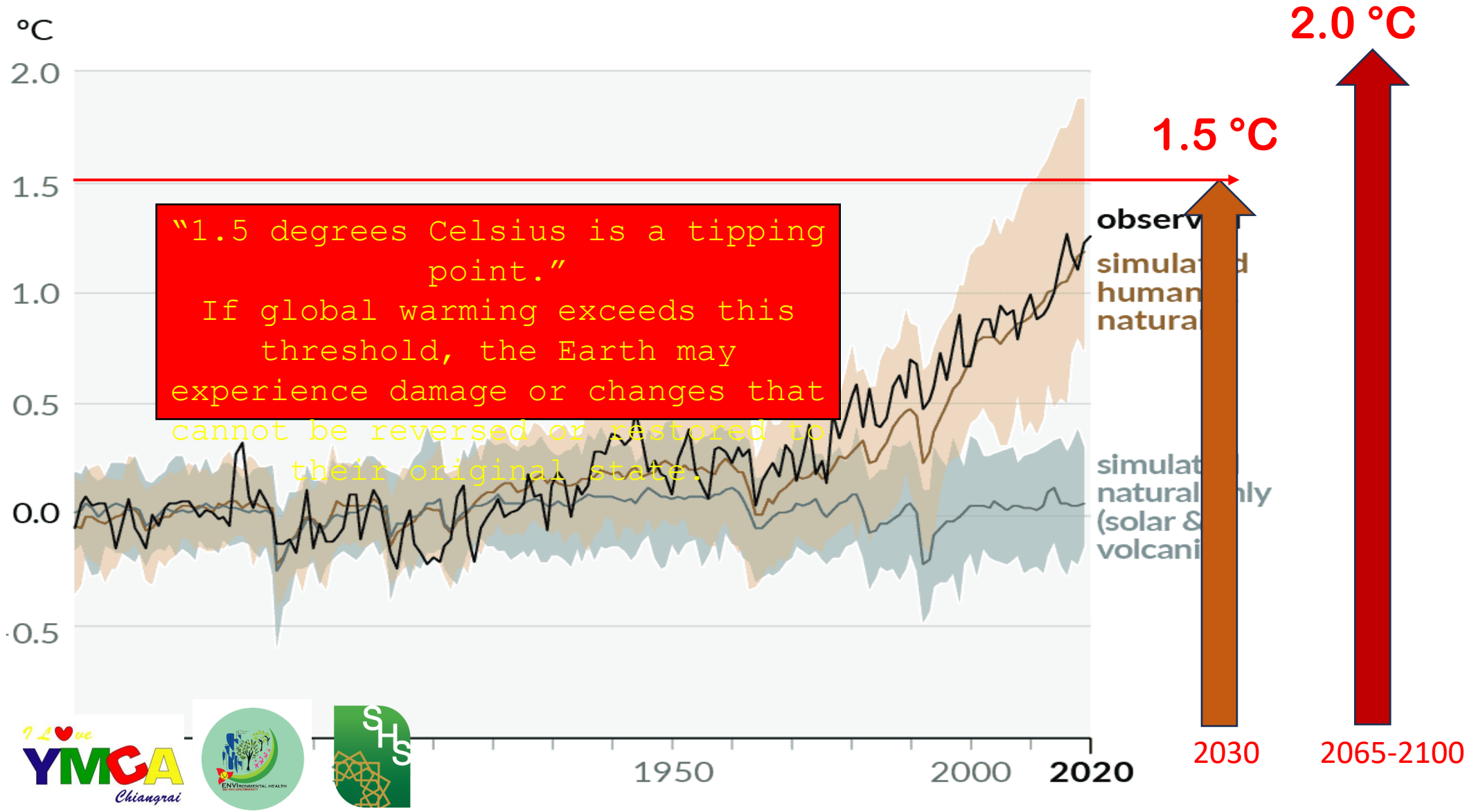


Is climate disruption closer to us than we think?



Flood



Drought



Cold Wave



Wind Storm

The wasteful loss of valuable resources





https://thematter.co/brief/188148/188148


What Happens When Polar Ice Melts?
It's not just a higher sea level — it's a global crisis.



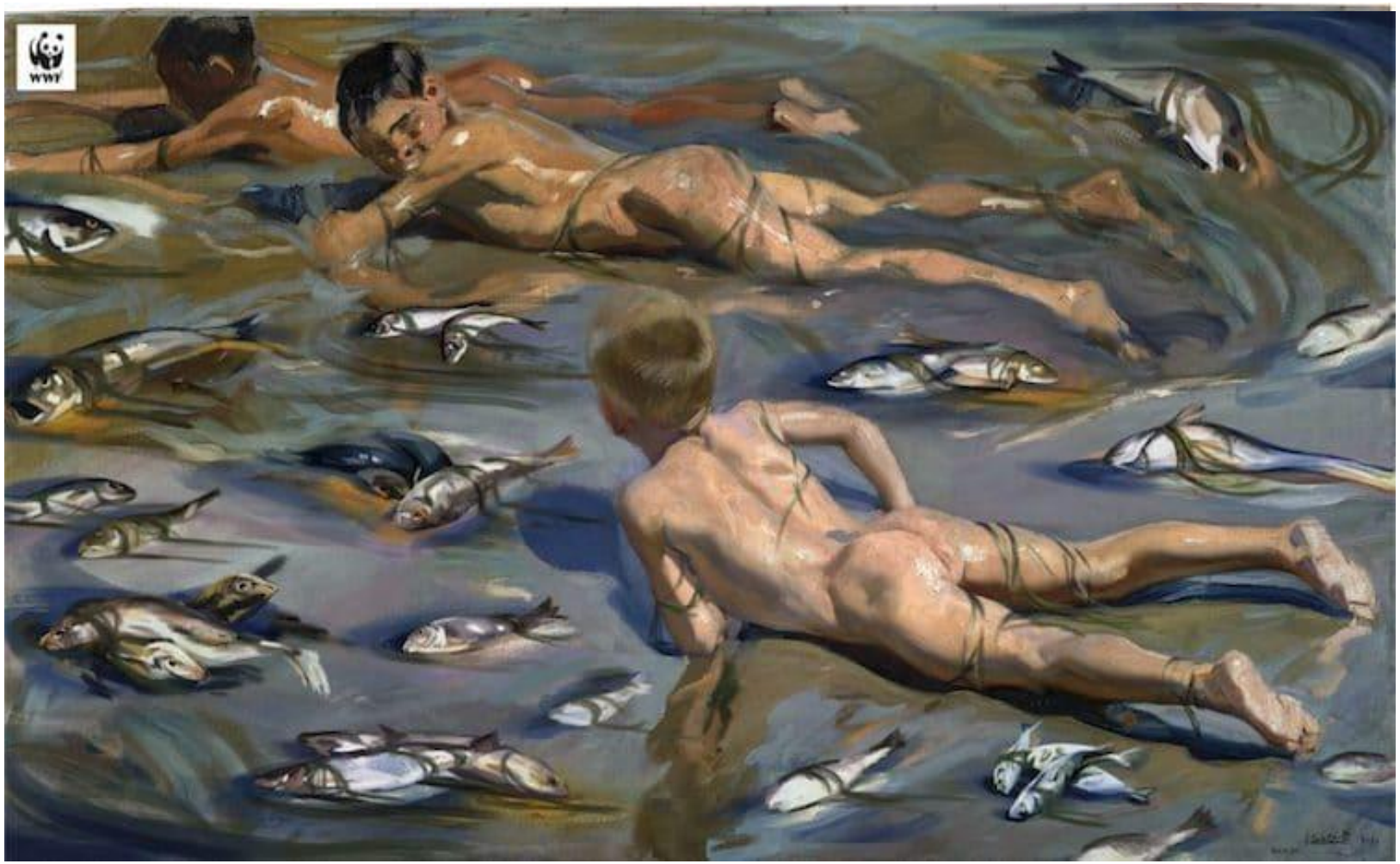
“Felipe IV a Caballo” (1635-36) by Diego Velázquez



“The Parasol” (1777) by Francisco de Goya



“Landscape with Charon Crossing the Styx” (c. 1515-1524) by Joachim Patinir



Boys on the Beach” (1909) by Joaquín Sorolla

https://mymodernmet.com/climate-change-paintings-museo-del-prado-wwf/

Sources &Types of solid waste

Solid waste can be classified into different types depending on their source:

Sources of solid waste

Households



Industries

Hospital

- **Household waste or municipal waste:** includes food, paper, cardboard, plastic, textiles, leather, glass, metal, ashes, electronics waste, etc.

Sources of solid waste

Households

Industries



Hospital

- **Industrial waste:** includes toxic chemicals, oil, debris from construction site, packaging waste, ashes, etc.

Sources of solid waste

Households

Industries

Hospital



- **Biomedical waste or hospital waste:** medicine bottles, expired medicines, syringes, medical instruments such as scissors, blades, etc.

How about infectious waste? → COVID19 related

Sources of solid waste

Agricultures



Nuclear

Hazardous

- **Agriculture waste:** includes pesticides, crops, water coming from the fields also consists of small amount of toxic chemicals.

Sources of solid waste

Agricultures



Nuclear



Hazardous

- **Nuclear waste:** includes radioactive substances coming from reactors, fuel (uranium, thorium, plutonium, etc.). Its highly dangerous and requires proper disposal.

Sources of solid waste

Agricultures



Nuclear

Hazardous



- **Hazardous waste:** includes toxic chemical, acids, corrosive, ignitable and reactive materials. gases, etc.

Types of solid waste

Bio-degradable: can be biologically degraded e.g. paper, wood, fruits, etc.





Non-biodegradable: cannot be biologically degraded e.g. plastics, bottles, old machines, cans, containers, etc.







Waste is the cause of Global Warming



Reducing short-lived climate pollutant emissions from WASTE

Without action, global waste could grow by **70%** by 2050

ORGANIC WASTE

1/3 of all food produced goes to waste



CH4 METHANE
A powerful greenhouse gas that also leads to ground-level ozone pollution

OPEN BURNING

40% of all waste is openly burned



BC BLACK CARBON
A dangerous air pollutant that also contributes to global warming

LANDFILL GAS

3rd largest human-made source of methane



CLIMATE & CLEAN AIR COALITION to reduce short-lived climate pollutants
a UNEP convened initiative

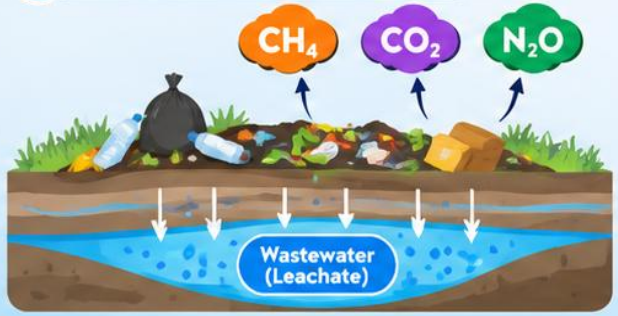
1 Organic Waste Decomposition



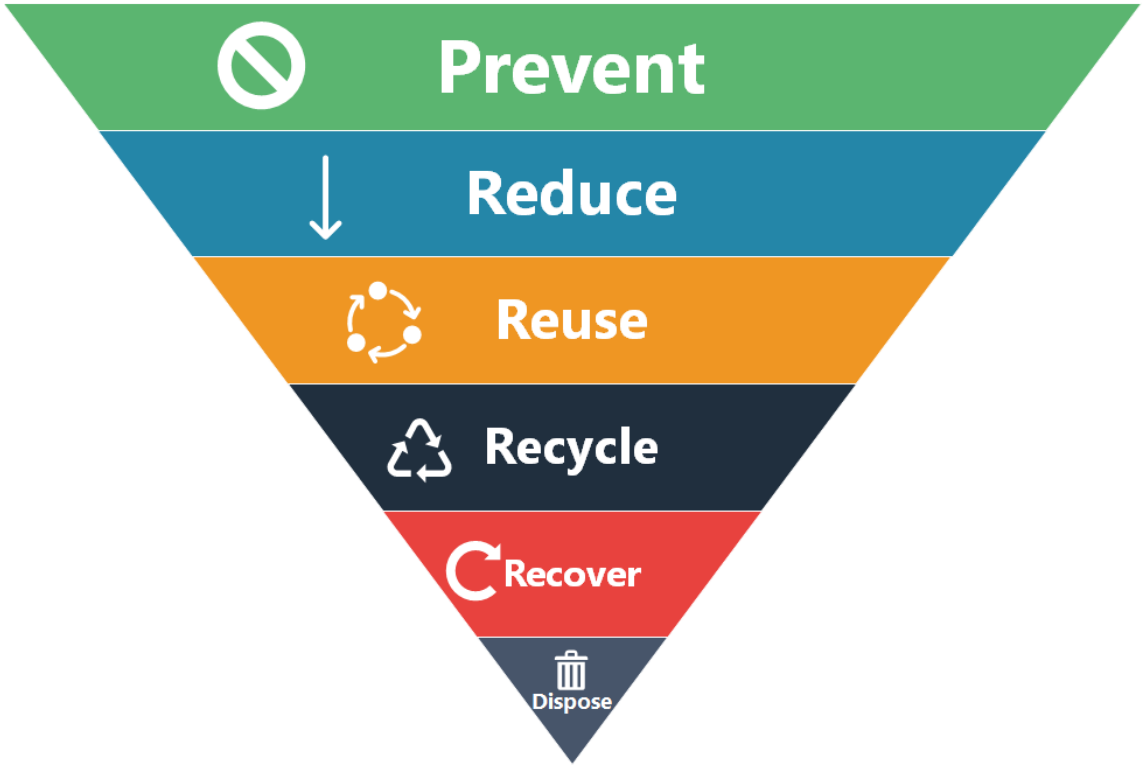
2 Open Burning of Waste



3 Landfill and Wastewater



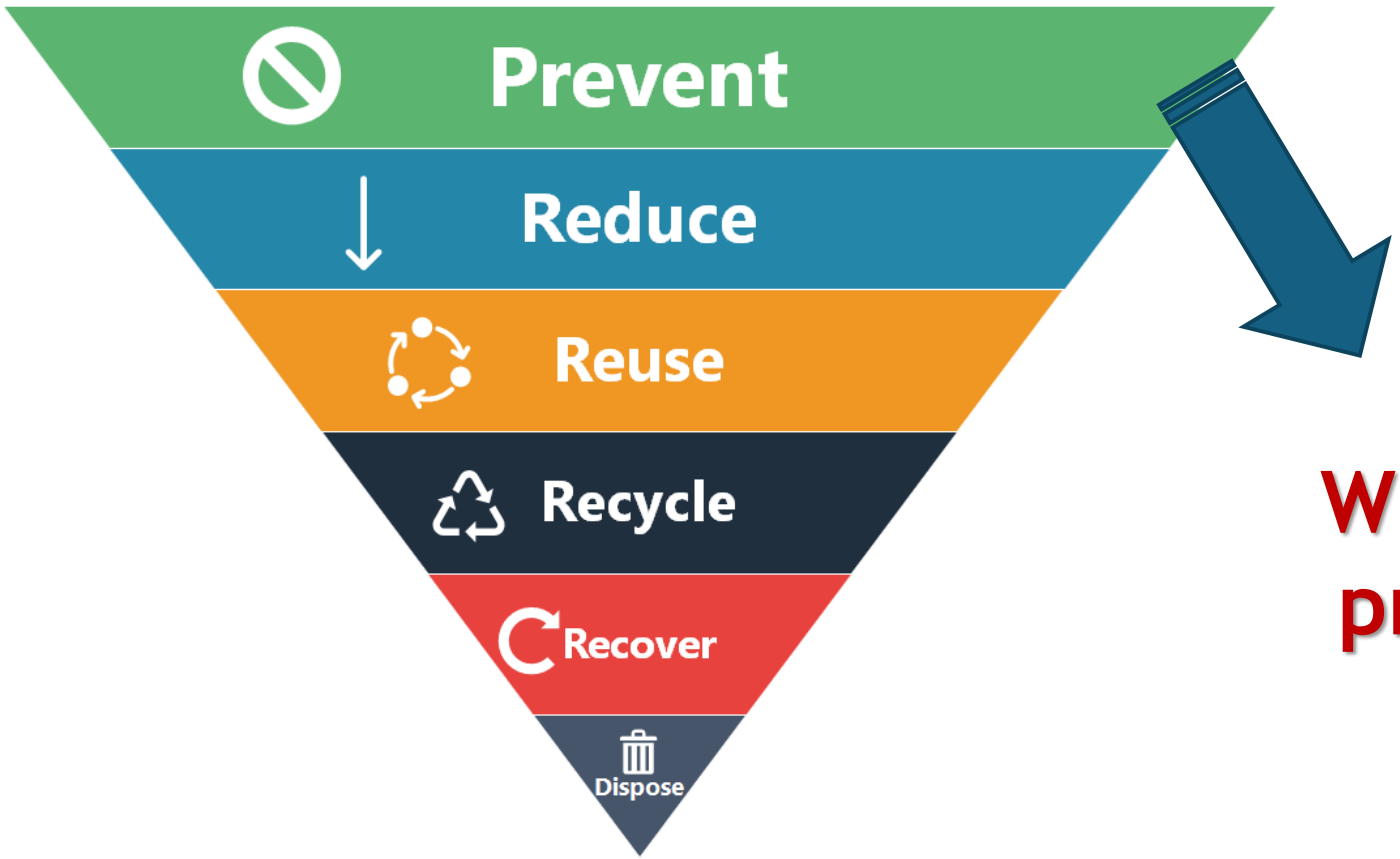
Waste Management Hierarchy



Most Preference

Less Preference

Solid Waste Management Hierarchy

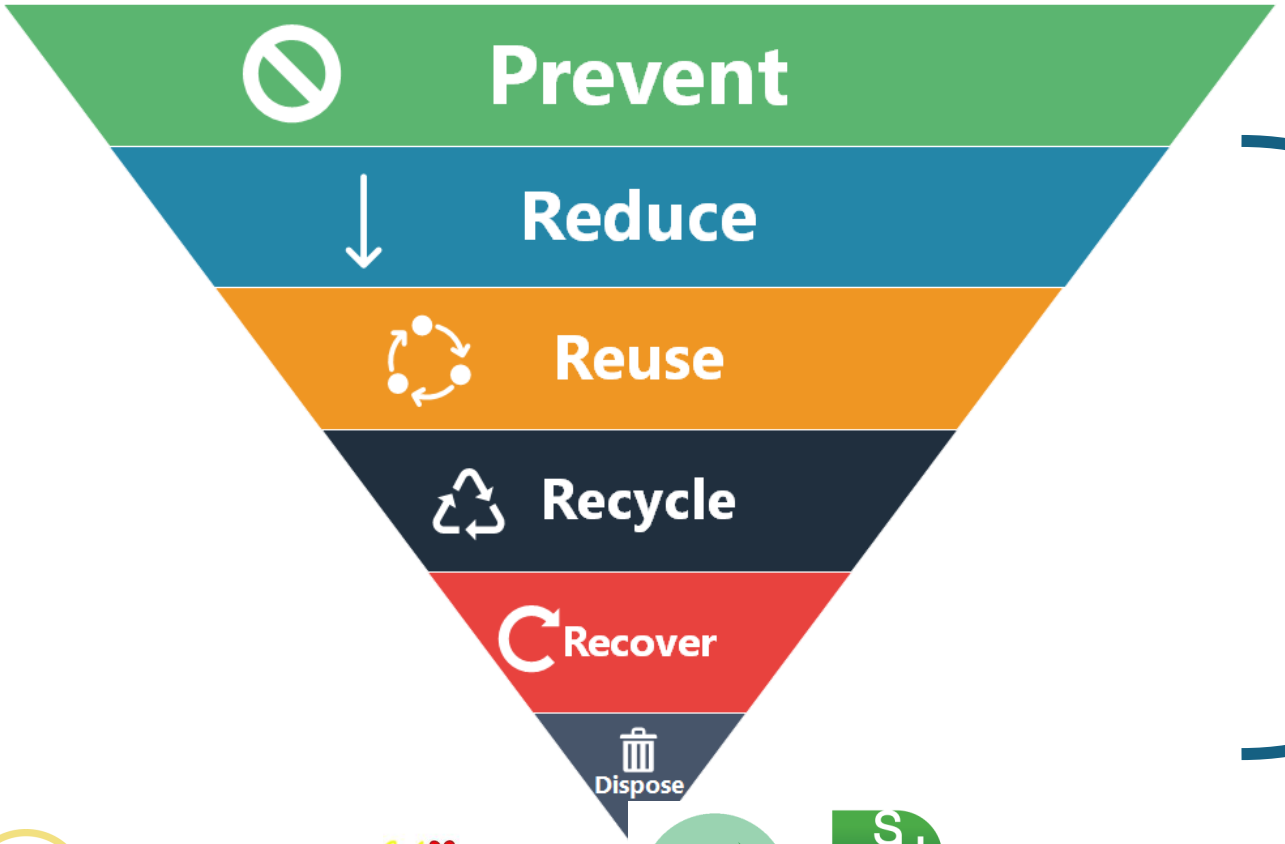


What could you do for preventing the waste generation?

Solid Waste Management Hierarchy

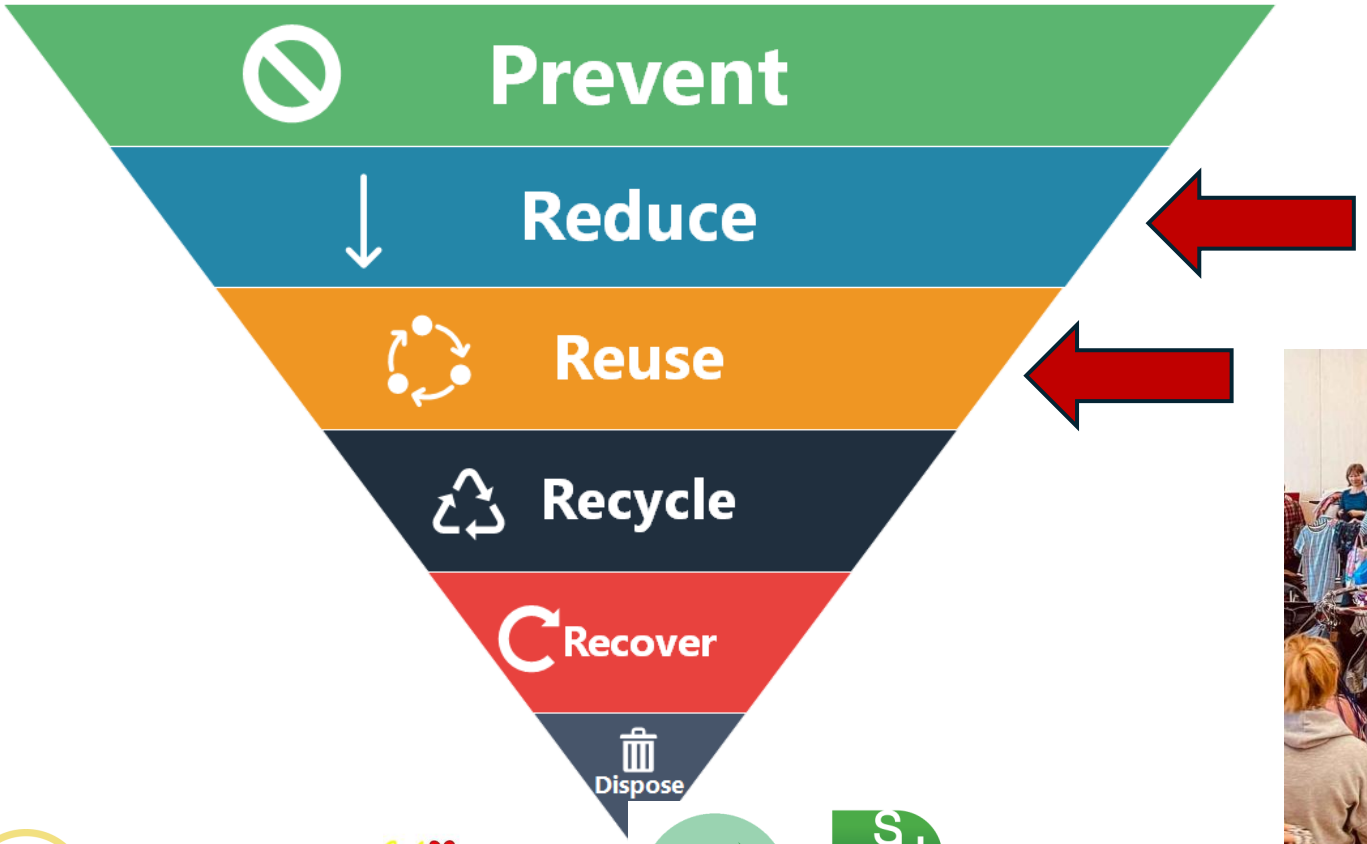


Solid Waste Management Hierarchy



The R Concept

Solid Waste Management Hierarchy





Thailand – Returnable bottles



Community – Clothing swap

Solid Waste Management Hierarchy

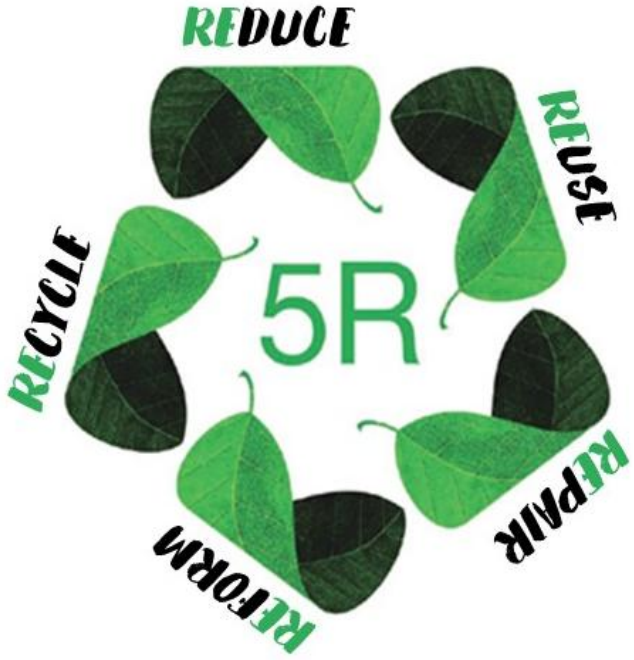


Solid Waste Management Hierarchy

3 Rs



5 Rs



7 Rs

- Rethink
- Reduce
- Reuse
- Recycle
- Repair
- Reject
- Return

Not only 3Rs but also…

“Recycling” — From waste to new materials and products
Upcycling vs Conventional Recycling vs Downcycling



Upcycling
Waste → higher-value or improved-function product



Conventional Recycling
Waste → material for comparable applications



Downcycling
Waste → lower-grade or less versatile material

Recycling – From waste to new materials and products
Upcycling vs Conventional Recycling vs Downcycling



Thailand – Upcycling the Oceans Thailand

Used PET bottles and discarded fishing nets collected from marine and coastal areas are transformed into fibers, clothing, bags, and other value-added fashion products through a collaboration between GC and its partners.

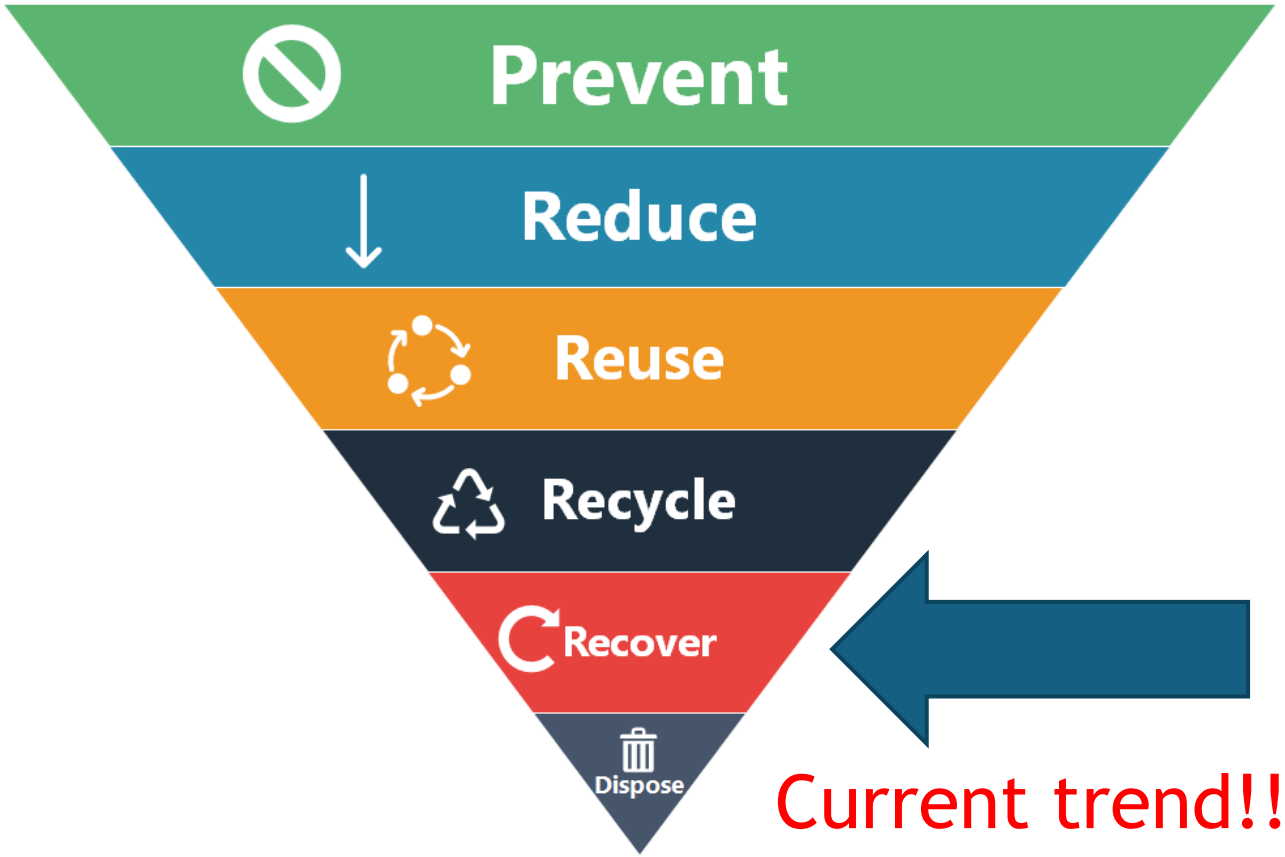
Recycling – From waste to new materials and products
Upcycling vs Conventional Recycling vs Downcycling



Philippines – Pag-Asa sa Basura

A collaborative initiative by World Vision and P&G Philippines that collects used plastic sachets and upcycles them into school chairs. The project has reportedly delivered 1,040 chairs to 26 schools, promoting plastic waste reduction and supporting education through circular economy practices.

Solid Waste Management Hierarchy



Current trend!!!





Landfill Mining

Solid Waste Management Hierarchy



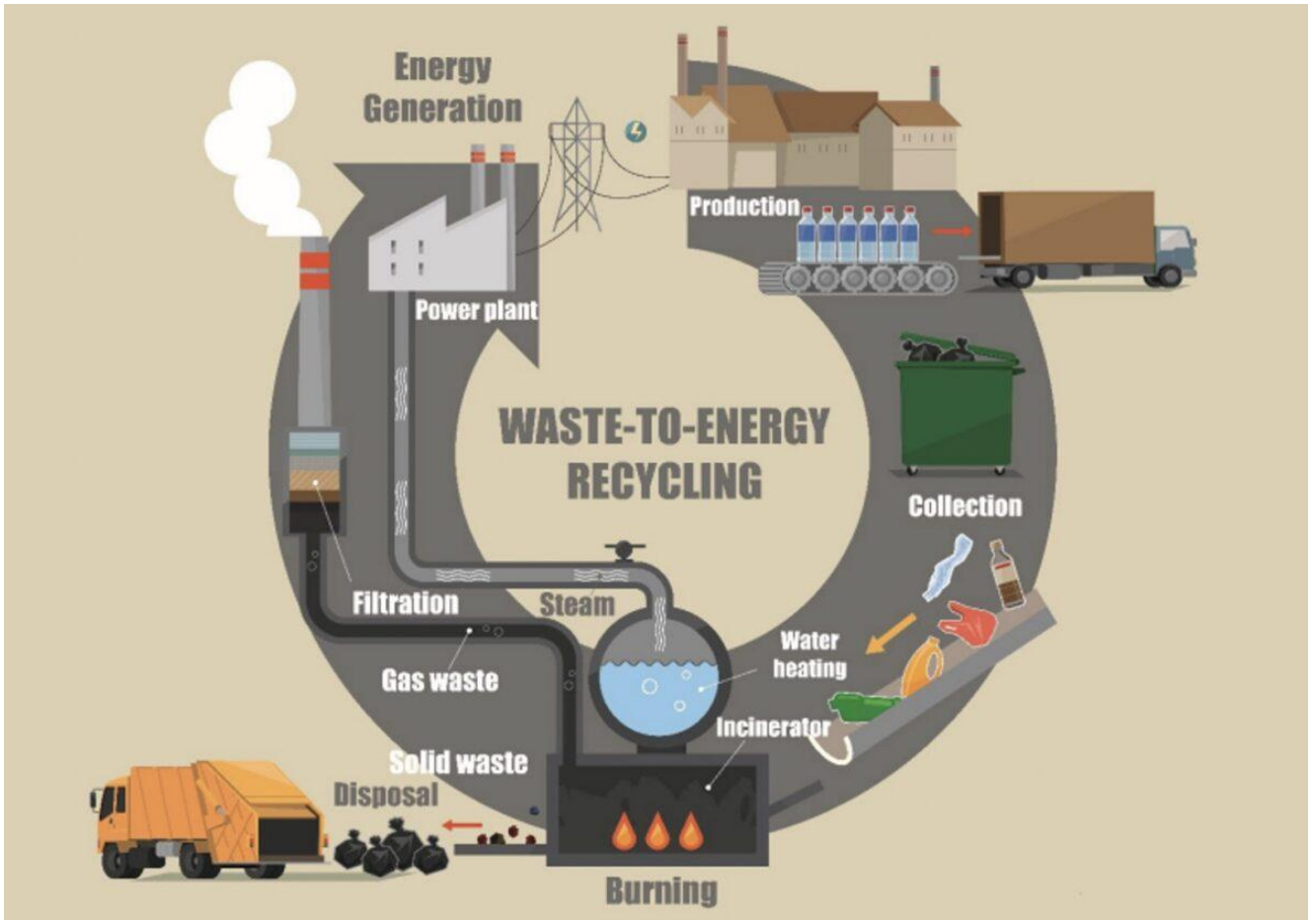
Singapore — Waste-to-Energy

Singapore uses waste incineration plants to generate electricity, reducing waste volume by approximately 90% before disposing of the remaining ash at Semakau Landfill. This case demonstrates how energy recovery reduces landfill demand, although CO_2 emissions, air pollution, and residual ash management remain environmental challenges.

https://blogs.ntu.edu.sg/sao-earthlinkntu/2017/07/23/waste-to-energy-plant/?utm_source=chatgpt.com

Solid Waste Management Hierarchy





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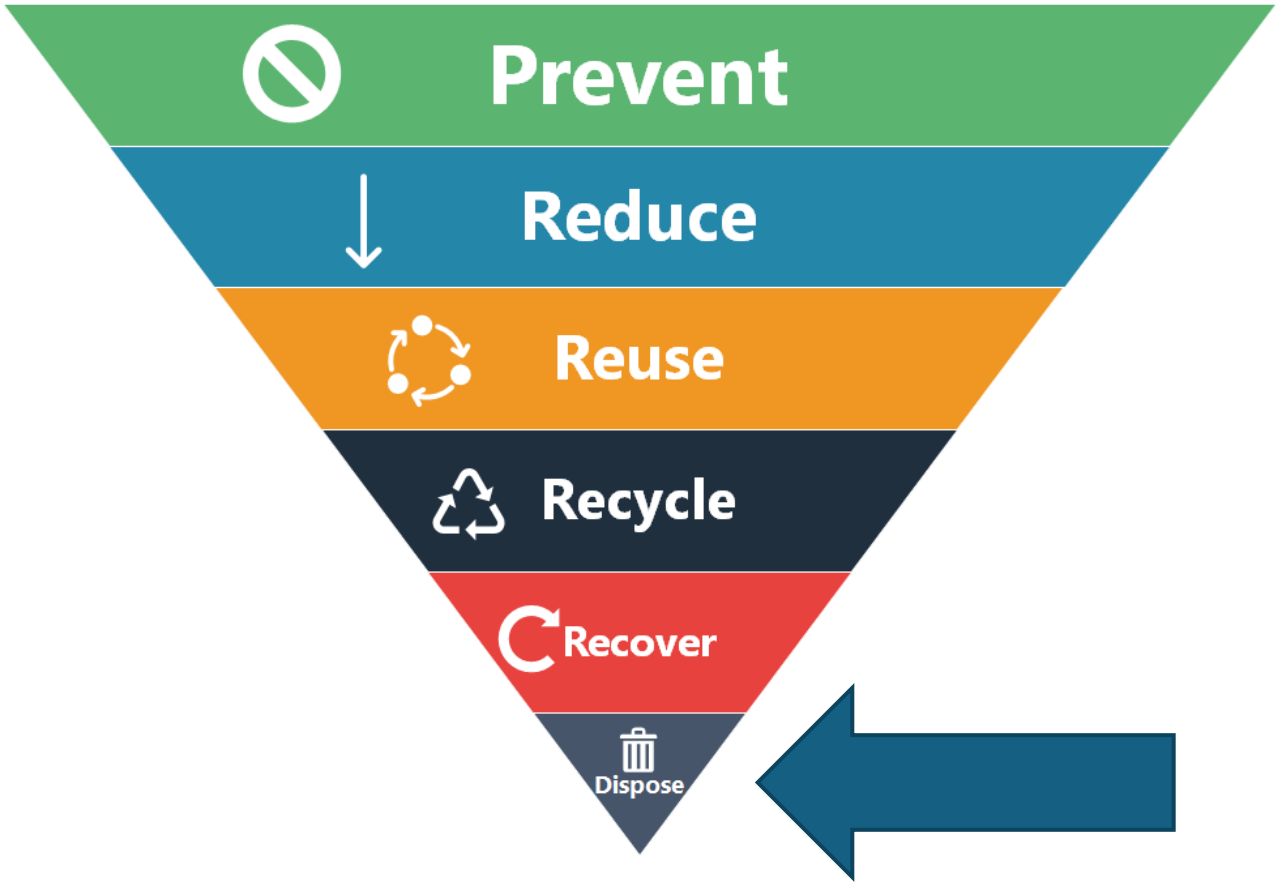
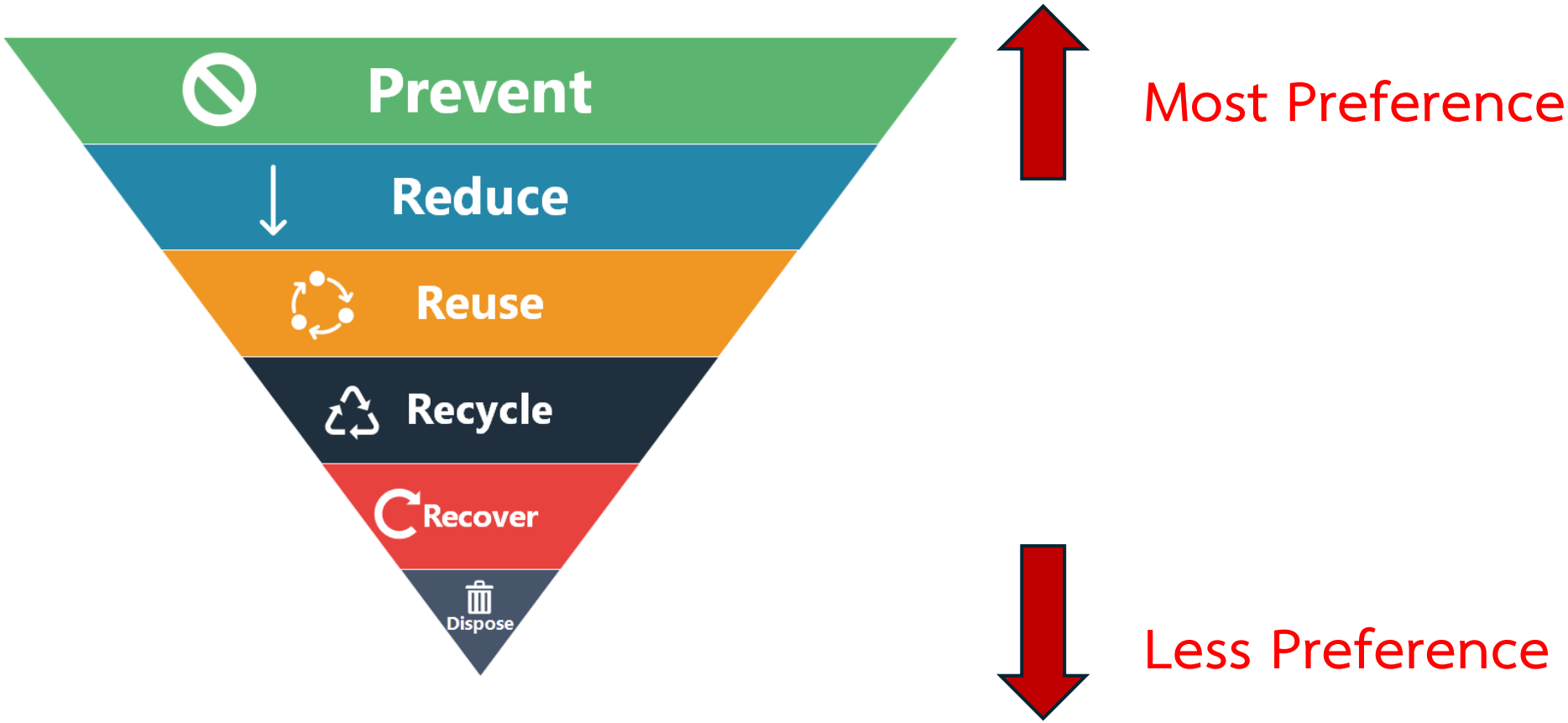
Solid Waste Management Hierarchy



Landfill Waste Disposal

Waste Management Hierarchy



If most of the waste is well managed by several processes, none of it will go to the landfill site

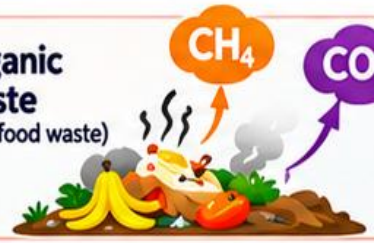
That is “Zero Waste”

From Proper Waste Management to Zero Waste and Net Zero

Applying the **Waste Management Hierarchy** effectively reduces greenhouse gas (GHG) emissions, creates a **Zero Waste** society, and drives the achievement of **Net Zero** for Thailand and the world.

If waste is not properly managed, it emits GHGs

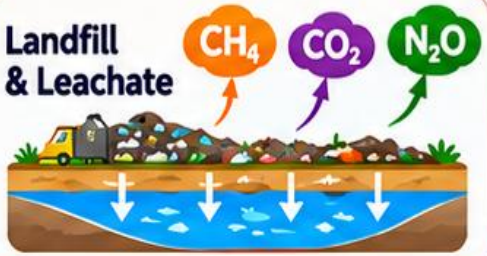
Organic Waste (e.g., food waste)



Open Burning of Waste



Landfill & Leachate



Waste Management Hierarchy (Priority Order)

More Preferred (Higher Benefit)

1. **Prevention / Reduce** → Avoid waste generation at the source
2. **Reuse** → Extend product life and use again
3. **Recycle** → Convert waste into new materials
4. **Recovery** (e.g., Waste-to-Energy, (WTE)) → Recover energy from waste
5. **Proper Disposal** (Last Resort) → Safely and environmentally controlled disposal

Less Preferred (Lower Benefit)

Zero Waste (A Circular Society)



- Minimize waste generation
- Keep resources in circulation (Circular Use of Resources)
- Avoid GHG emissions from unnecessary waste

Net Zero (Net GHG Emissions = 0)

CO_2 (net)

A balance between GHG emissions and removals (e.g., forests, carbon sinks)



Thailand's Targets

- Reduce GHG emissions by **30–40%** by 2030 (from BAU)
- Achieve **Net Zero** by 2065

Global Target

- Achieve **Net Zero** by 2050 (Paris Agreement) to keep global warming within 1.5°C

1.5°C

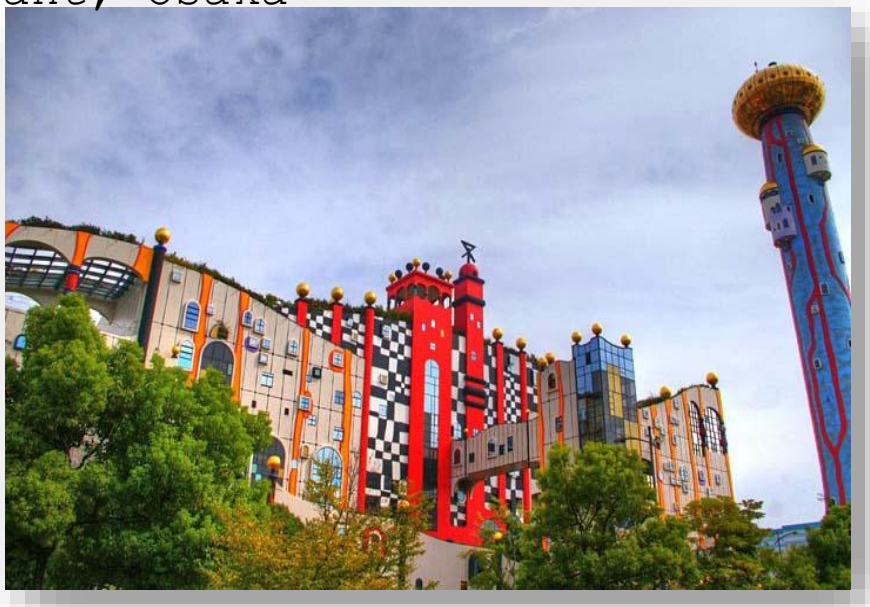
Waste → GHG Emissions (CH_4, CO_2, N_2O, CO) → Global Warming & Climate Change

Proper Waste Management → Zero Waste → Net Zero → A More Sustainable and Climate-Resilient World

Lao PDR – Luang Prabang landfill



Japan – Maishima Waste-to-Energy Plant, Osaka



These are solid waste disposal Treatment technology !!!!!



Thailand – Klang District Thailand



Japan – MBT Mito plant