Climate Impacts from the Waste Sector & Application of LCA for Assessing Impacts With the Emission Quantification Tool (EQT).

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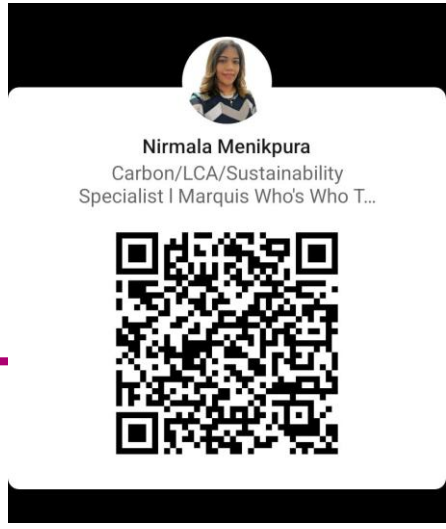
Workshop: Climate Impact Assessment in the Waste Sector Using IGES EQT Version III – 16-17 June 2025
Lahore, Pakistan

IGES Institute for Global Environmental Strategies



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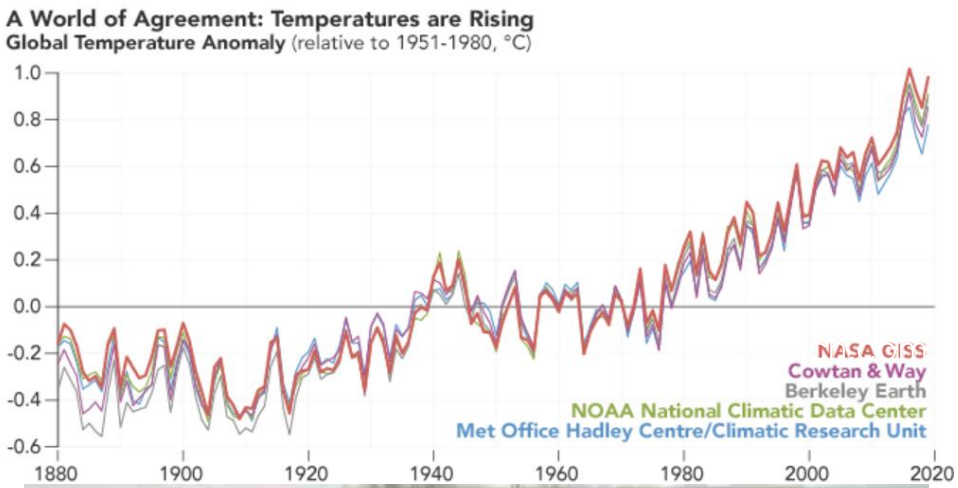
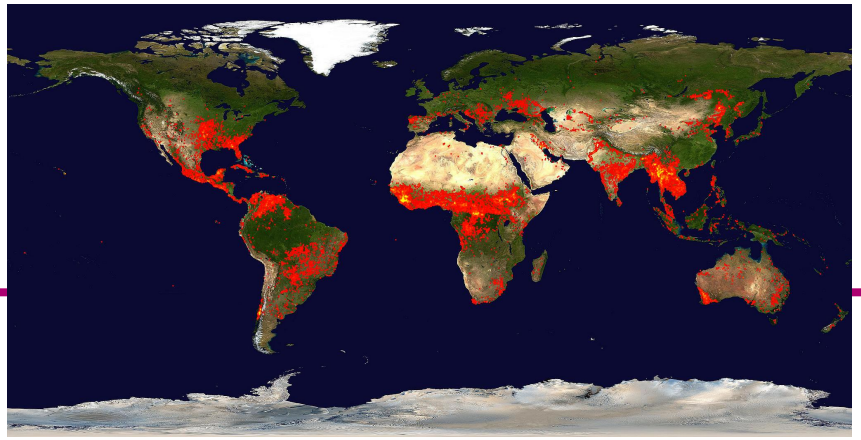
Part I : Overview of the climate change

- "The scientific evidence is unequivocal: climate change is a threat to human wellbeing and the health of the planet. **Any further delay in concerted global action will miss the brief, rapidly closing window to secure a livable future**". (IPCC,2024)

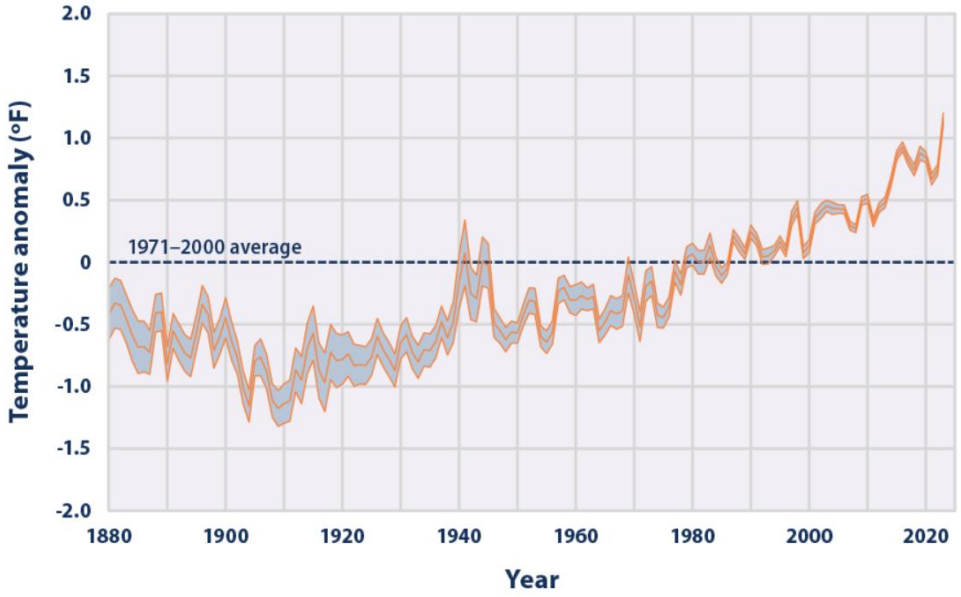
“No challenge poses a greater threat to our planet and to future generations than climate change”





Evidence of Climate Change

Warming Oceans



Average Global Sea Surface Temperature, 1880–2023

The oceans have absorbed much of this increased heat, with the top 700 meters (about 2,300 feet) of ocean showing warming of more than 0.4 degrees Fahrenheit since 1969.

Glacier collapse buries most of Swiss village

-The village of Blatten has been devastated after a massive chunk of the Glacier collapsed into the valley.

-Climate change is turning warnings into real-life tragedies.

-Scientists now fear that all Swiss glaciers could vanish within a century.

Evidence of Climate Change

Decreased Snow Cover

Satellite observations reveal that the amount of spring snow cover in the Northern Hemisphere has decreased over the past five decades and that the snow is melting earlier.

Evidence of Climate Change: Antarctica is turning green !

- Vegetation covered less than 0.4 square miles of the Antarctic Peninsula in 1986 but had reached almost 5 square miles by 2021.
- As fossil fuel pollution continues to heat up the world, Antarctica will keep on warming

Evidence of Climate Change

Sea Level Rise

Global sea level rose about 8 inches in the last century

Extreme Events

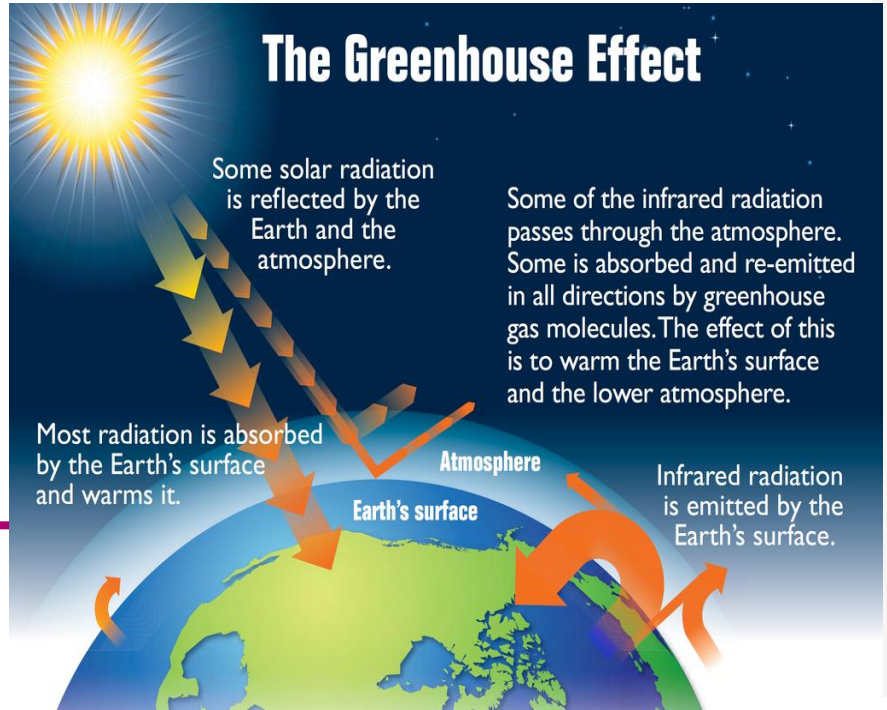
The number of record high temperature events has been increasing, while the number of record low temperature events has been decreasing

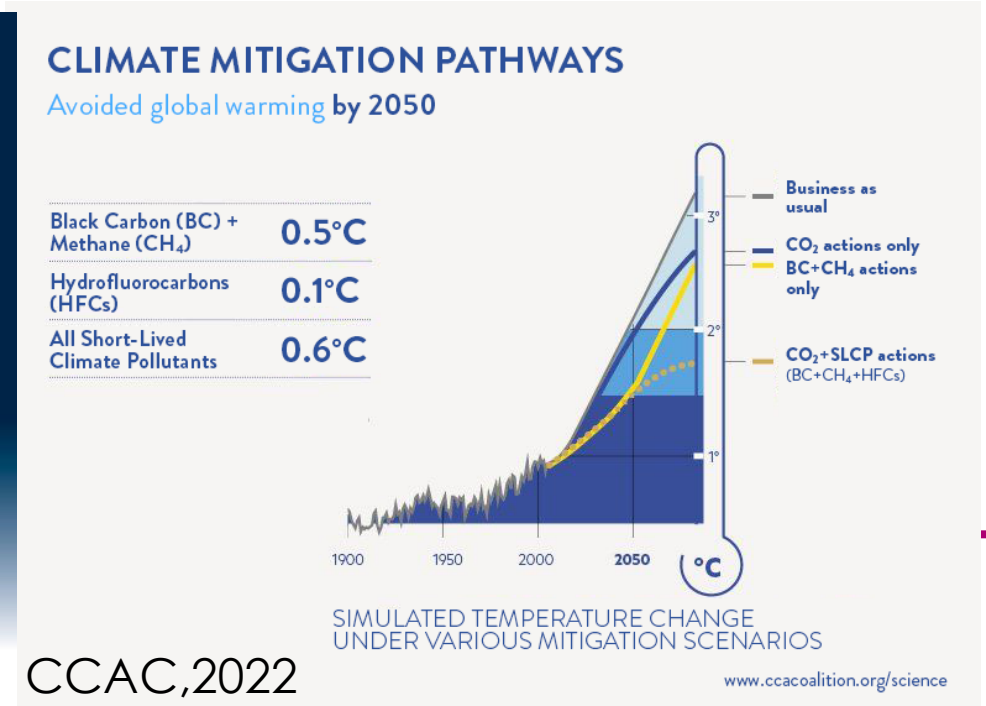
The greenhouse gas content of the atmosphere is being altered by human activity

The result of this change is global warming

Impact of Greenhouse gases (GHGs) and Short-Lived Climate Pollutants (SLCPs) on Climate Change

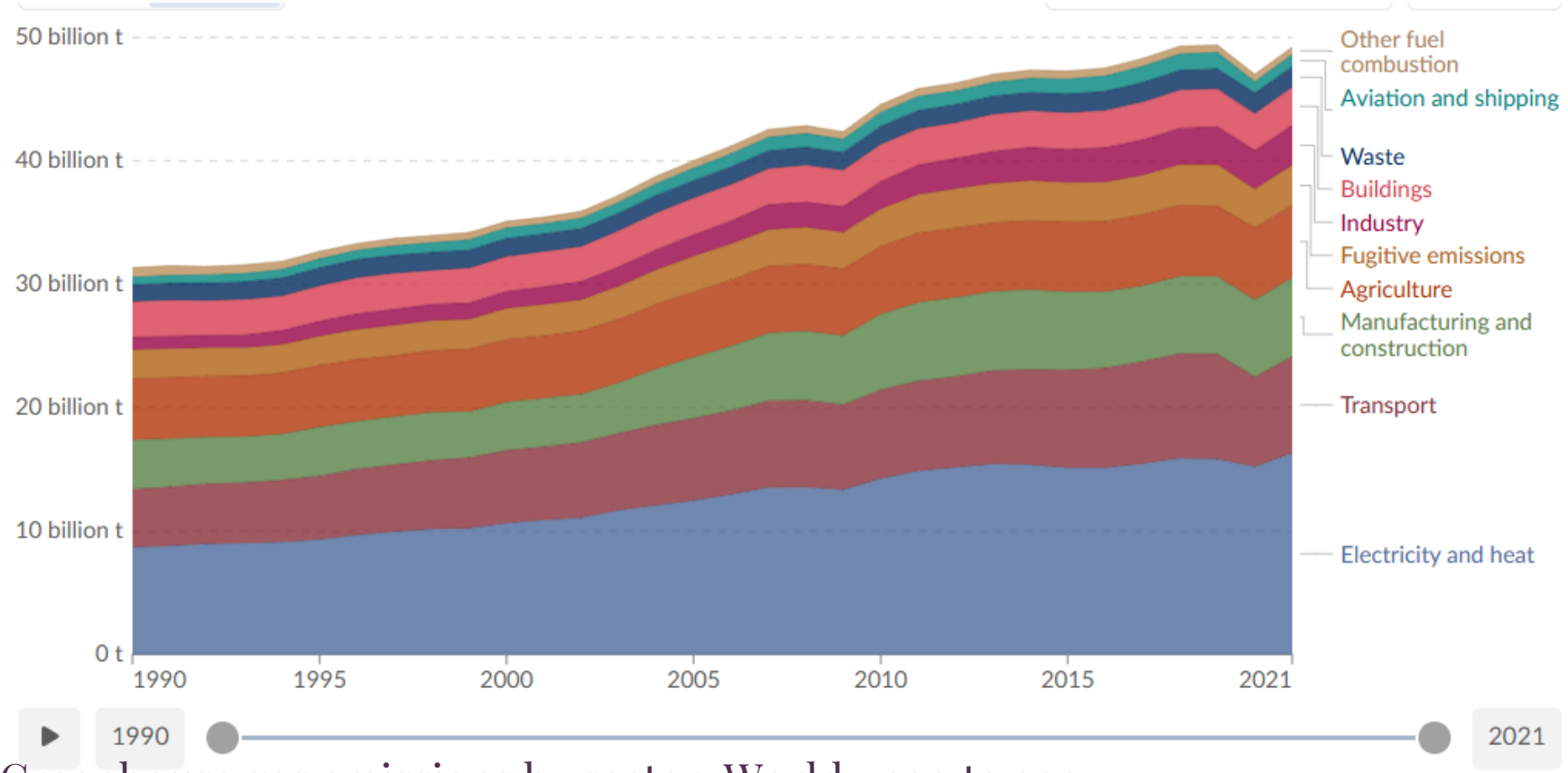
- Mitigating CO_2, CH_4 and Black Carbon (BC) is very important to achieving the 1.5◦C target by 2050
- SLCPs responsible for up to 45% of current global warming





CCAC,2022

More Greenhouse Gases → a Warmer Earth



Greenhouse gas emissions by sector, World, 1990 to 2021

Global Warming Potentials (GWP) of GHGs and SLCPs

Type of Gas	GWP20	GWP100
CO_2	1	1
CH_4- biogenic	84	28
CH_4-fossil	85	30
N_2O	264	265
BC	2100	590

GWP values of 100-year time horizon has been used in many studies

GWP is presented as $kgCO_2$-eq

Emissions of Short-Lived Climate Pollutants (SLCPs)

METHANE (CH_4)

Methane emissions caused by human activities are one of the most significant drivers of climate change. Methane is also the main precursor of tropospheric ozone, a powerful greenhouse gas and air pollutant.

SOURCES

Methane is one of the fastest growing greenhouse gases in the atmosphere. Human activity causes 2/3 of emissions.

IMPACTS

CLIMATE

Responsible for 40% of warming since the industrial revolution

86x times more powerful than carbon dioxide over a 20-year period

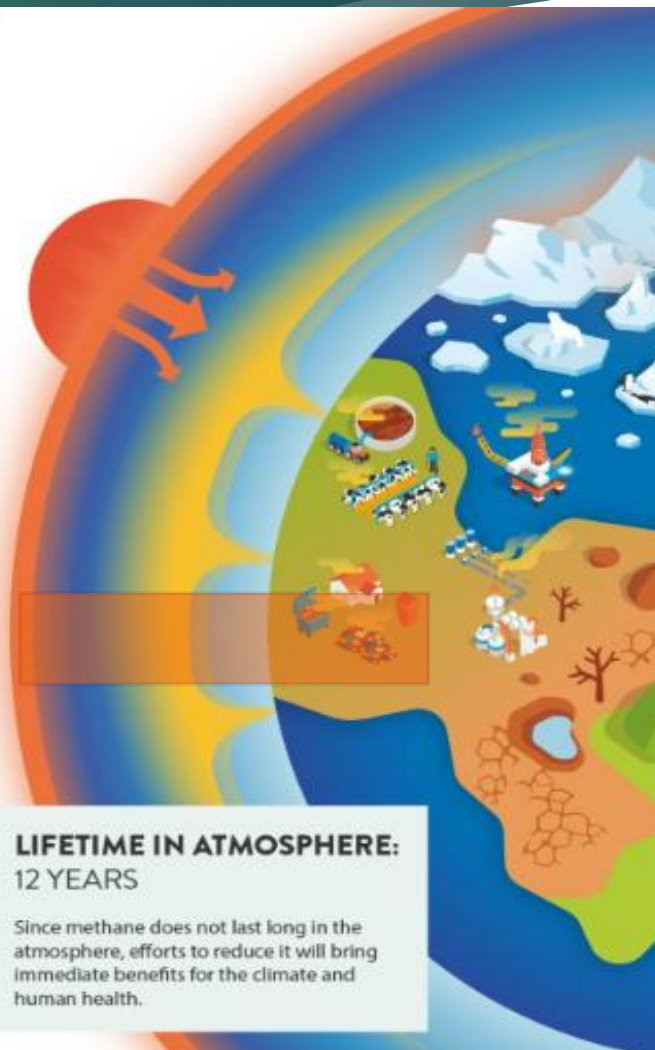
HEALTH

Increasing emissions are driving a rise in tropospheric ozone air pollution, which causes 1+ million premature deaths annually. Methane is responsible for roughly 1/2 of these deaths.

- Respiratory diseases
- Heart disease
- Damaged airways and lung tissue

AGRICULTURE & ECOSYSTEMS

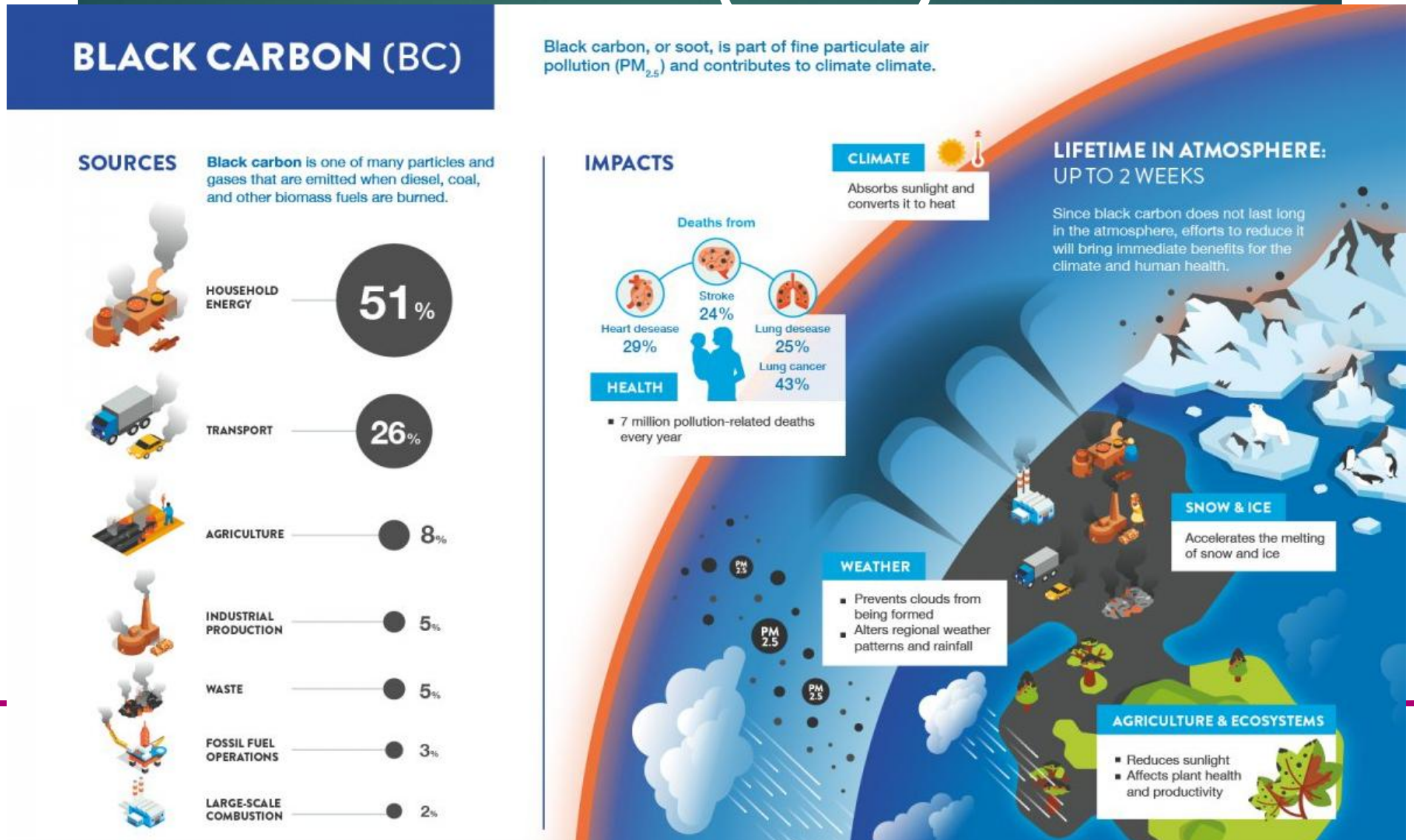
Up to **15%** annual yield losses



LIFETIME IN ATMOSPHERE:
12 YEARS

Since methane does not last long in the atmosphere, efforts to reduce it will bring immediate benefits for the climate and human health.

Emissions of Short-Lived Climate Pollutants (SLCPs)

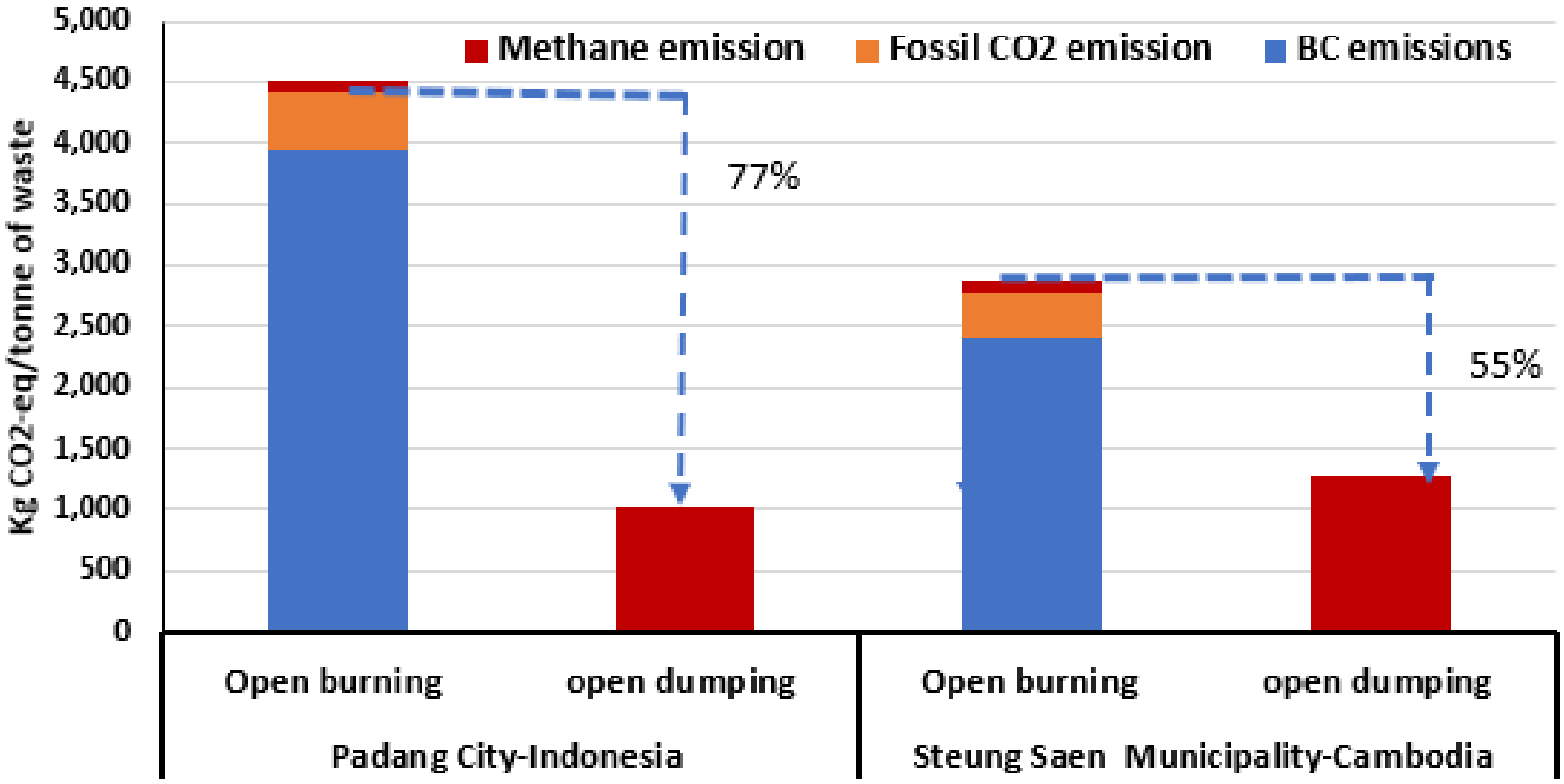


Open burning and climate change

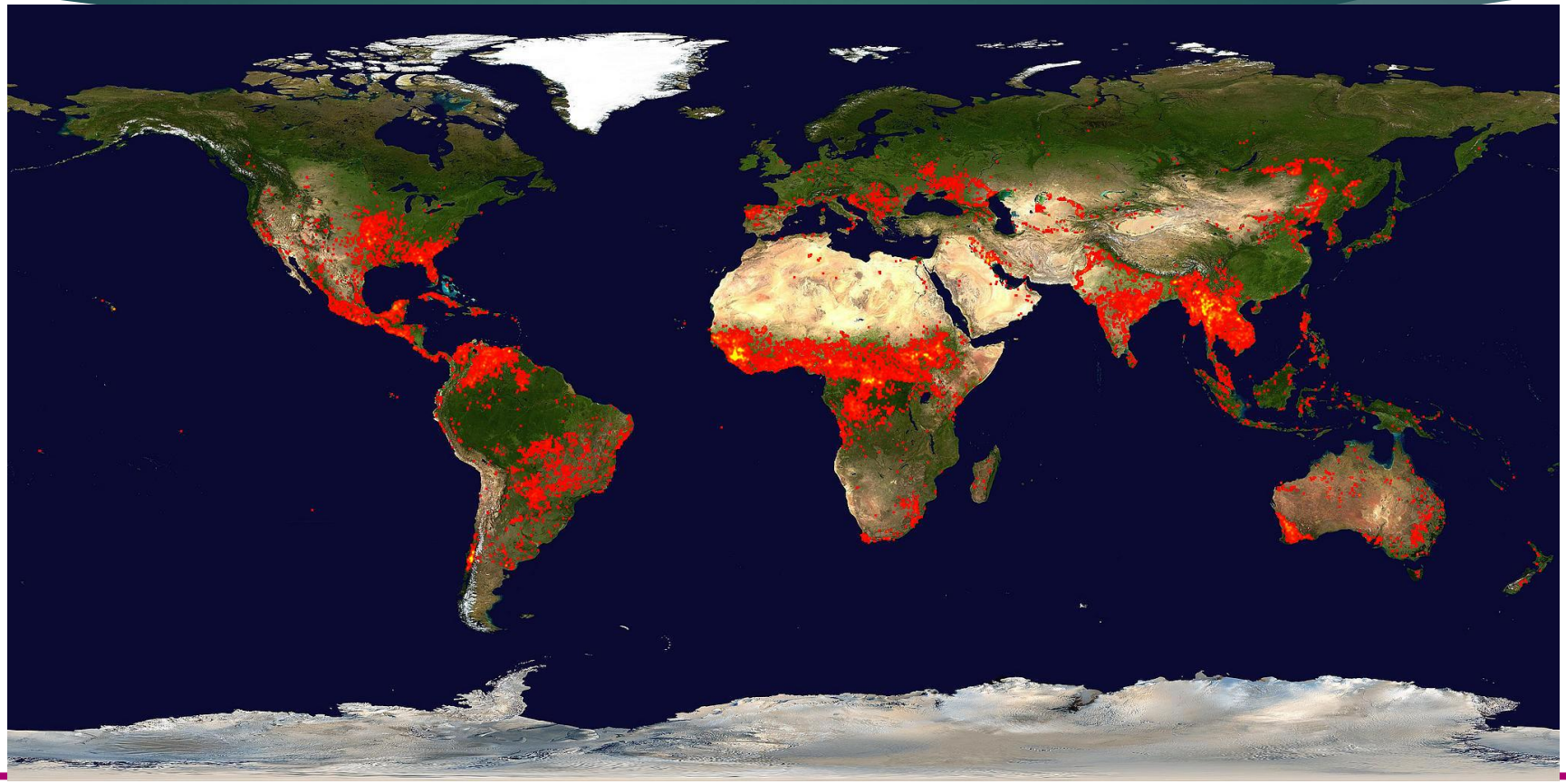
Open Burning is one of the major causes for Climate change

Black carbon emission from open burning is casing a significant impact

Climate impact from open burning even worse than open dumping



Forest burning and accelerating climate crisis



The NASA earth data fire map

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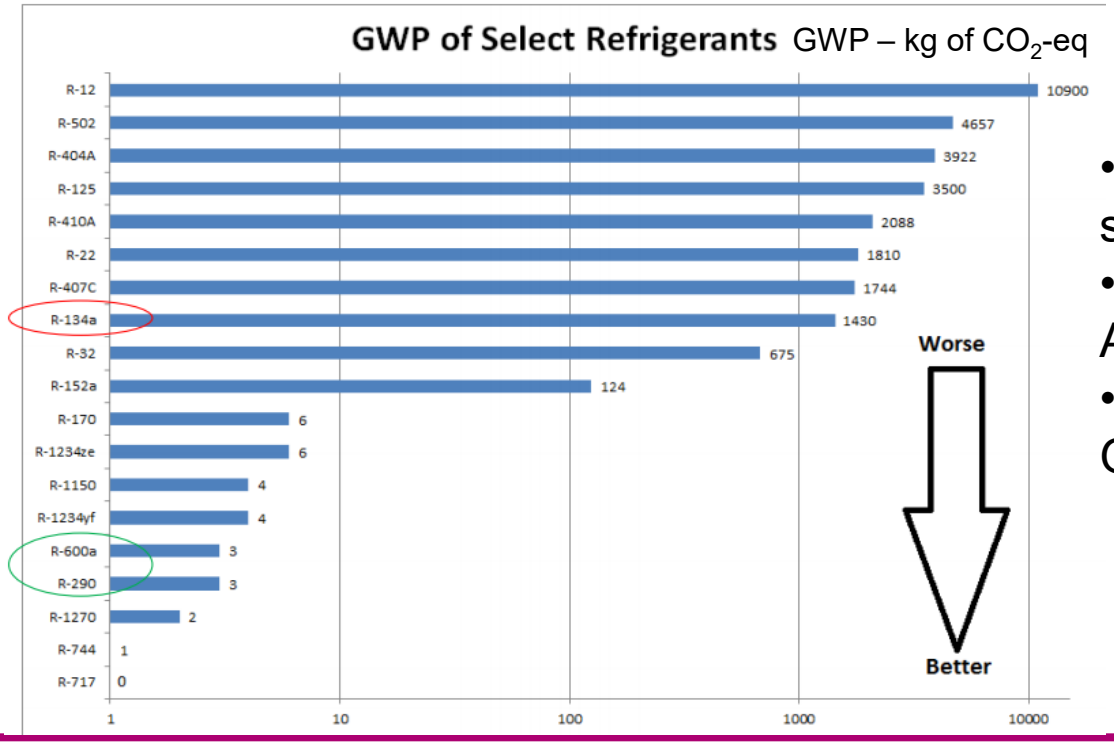
Food waste impacts on accelerating climate crisis

Methane emissions from food waste degradation from disposal site is significant

GWP per tonne of food waste is 1200-1300 kg CO_2-eq

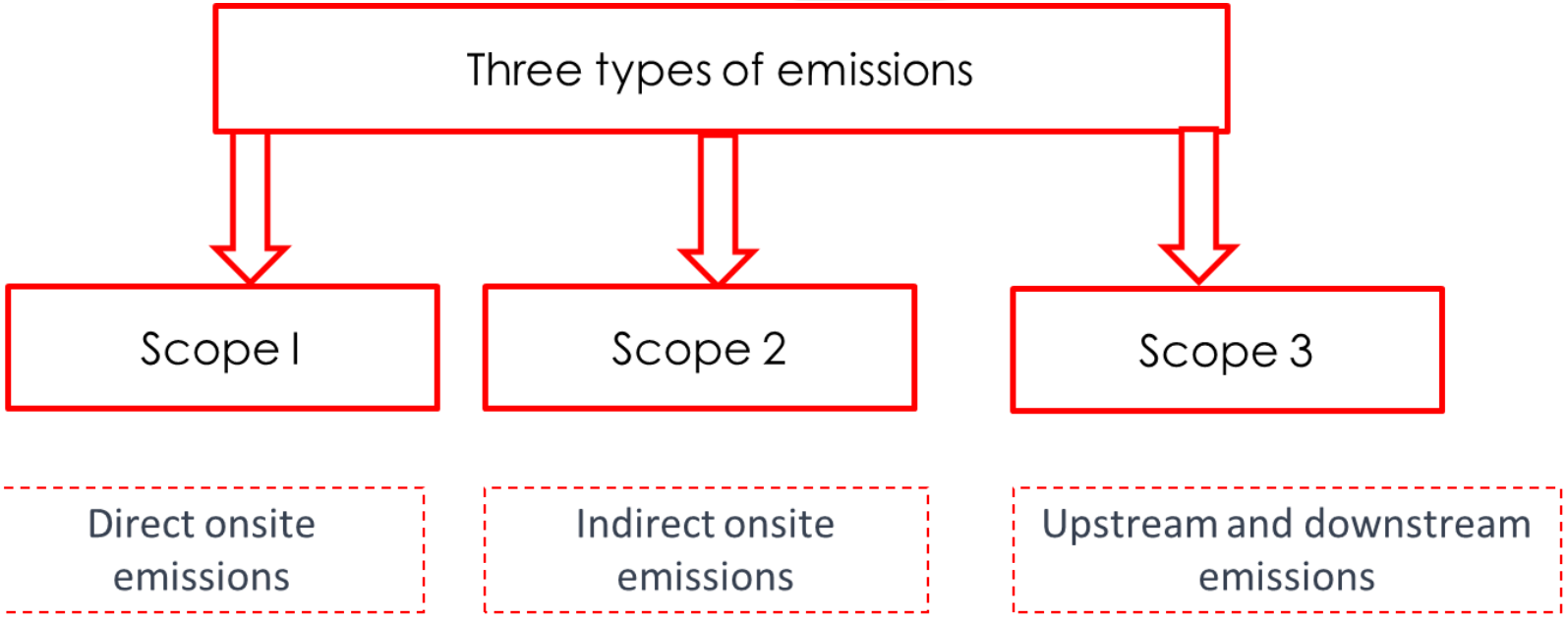
Global warming potential (GWP) of Refrigerants

Importance of natural refrigerants



- CFCs/HCFCs: High GWP → Not suitable
- HFCs: Moderate GWP → Acceptable in specific cases
- HFOs/Natural Refrigerants: Low GWP → Preferred

Towards Net Zero ?

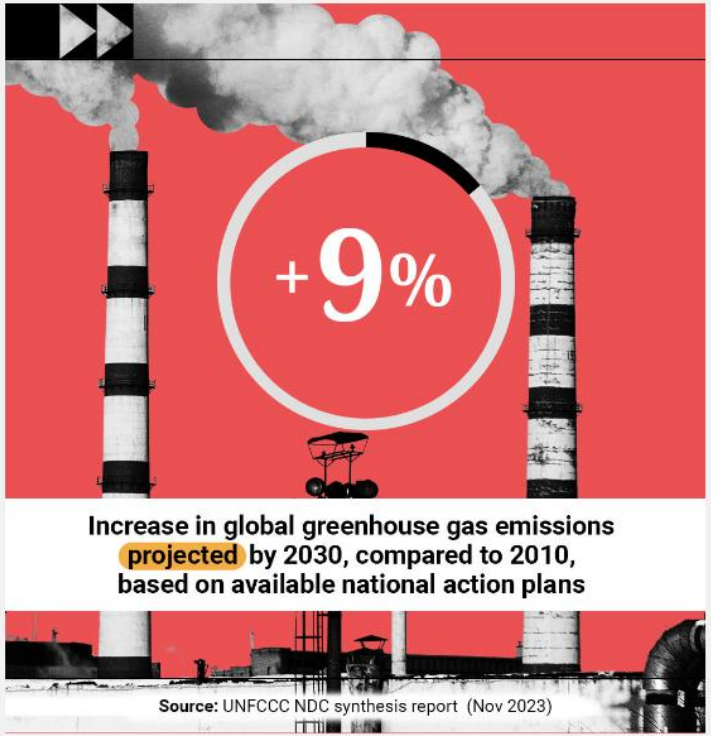


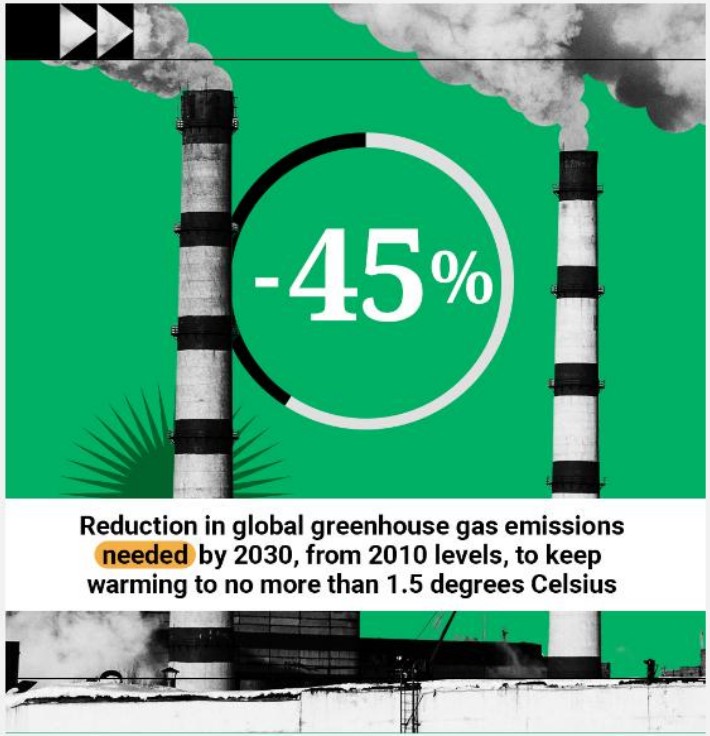
- **Net zero puts forth the idea that companies will first cut their emissions and then only purchase offsets for that which absolutely cannot be reduced. This is called 'true net zero'**

Are we on track to reach net zero by 2050?

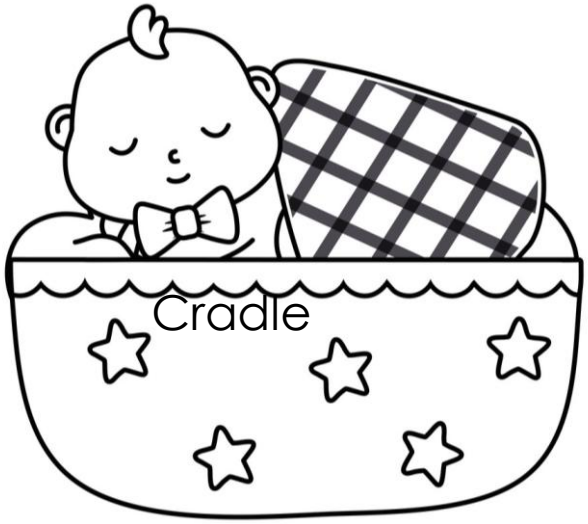
Global GHG emissions from Pakistan 0.93%

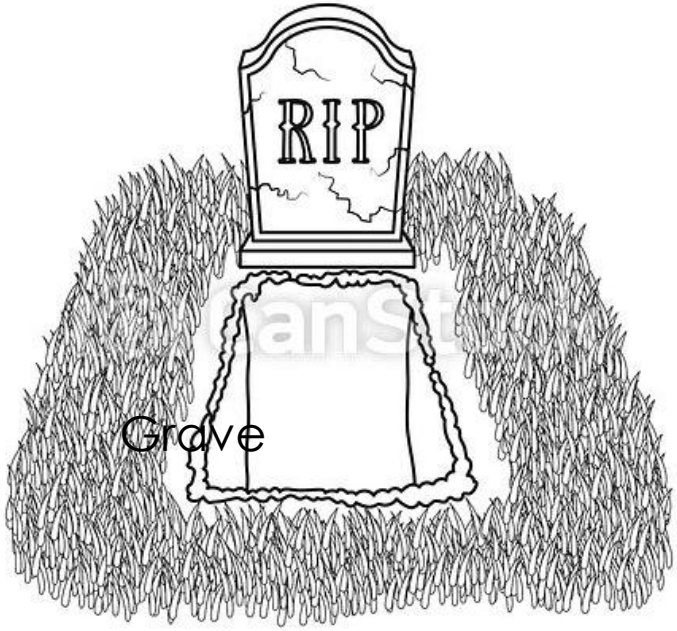
Target: 50% emission reduction by 2050 and aims to shift to 60% renewable energy by 2030





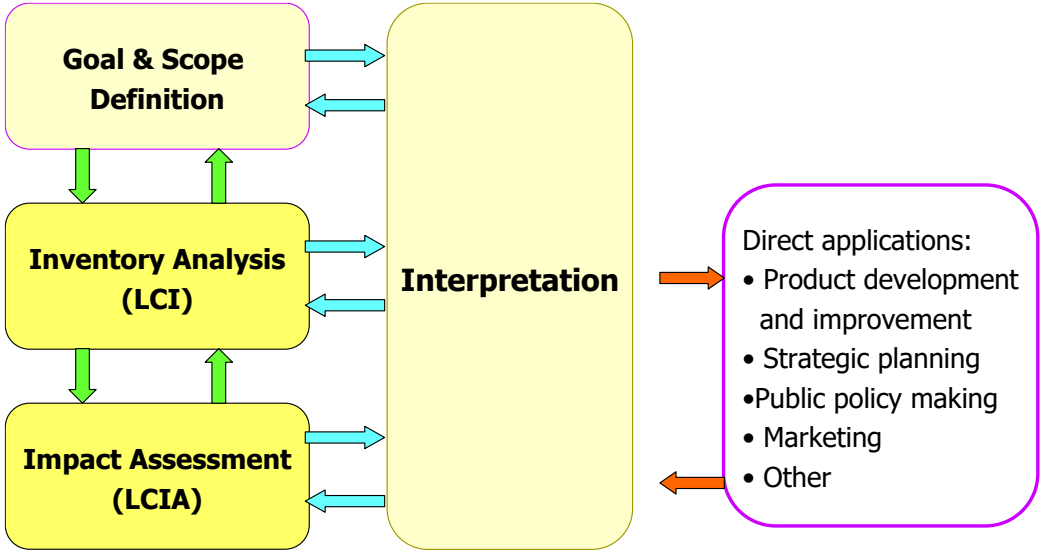
Part II: Life Cycle Assessment : Holistic approach for systematic carbon/climate impacts assessment

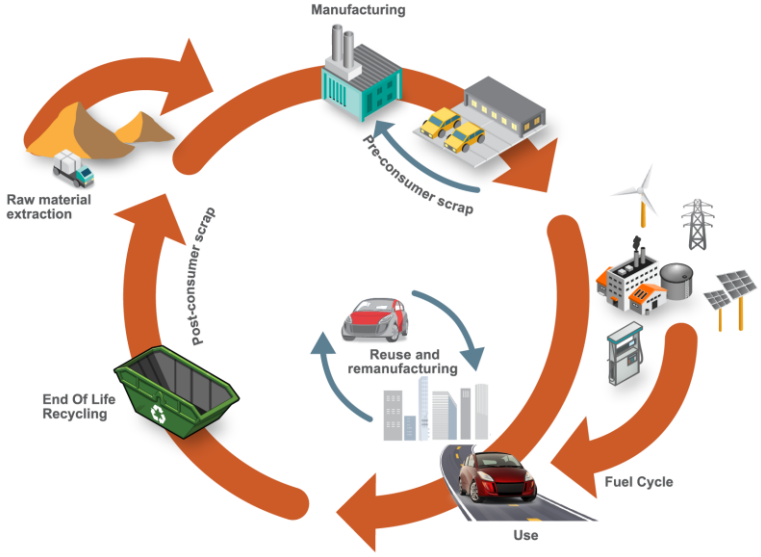




The Concept of Life Cycle Assessment (LCA)

- LCA is "a technique for assessing the environmental impacts associated with a product, service at all stages in their life cycle – from extraction of resources, through the production and use of the product, reuse, recycling or final disposal" (source: ISO 14040)





Key stages of an LCA

1.Goal and Scope

1. *Objective:* Define study objectives and system boundaries.
2. *Importance:* Establishing the purpose and context of the assessment.

2.Inventory Analysis

1. *Objective:* Compile a comprehensive inventory of inputs and outputs at each life cycle stage.
2. *Example:* Raw material extraction, manufacturing, transportation.

3.Impact Assessment

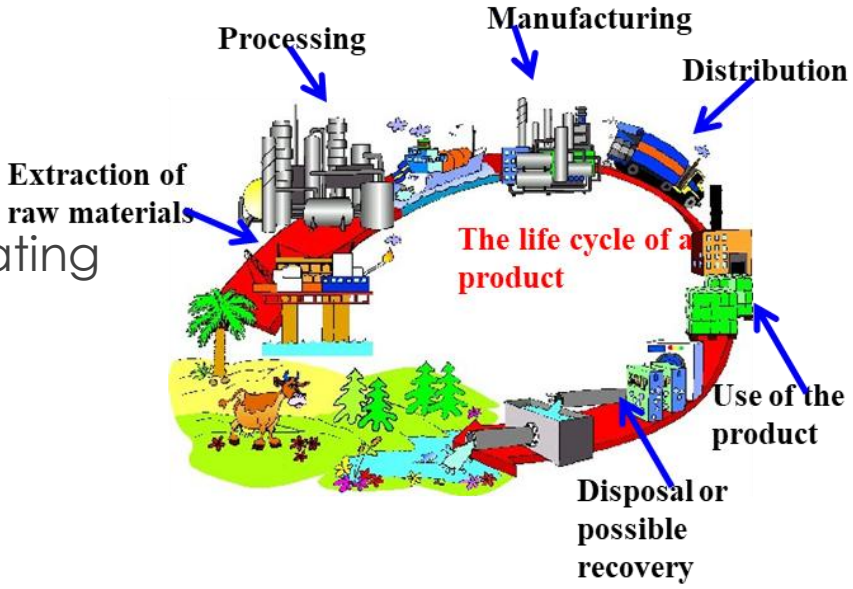
1. *Objective:* Evaluate potential environmental impacts identified in the inventory.
2. *Example:* Climate change, human toxicity. Acidification, Eutrophication

4.Interpretation

1. *Objective:* Analyse findings, draw conclusions, and communicate results.
2. *Importance:* Supporting informed decision-making.

Why LCA?

- A tool to provide tangible information to stakeholders
- Connected to "national sustainability agenda"
- Methodology for estimating and mitigating carbon and other impact
- Helps to identify priorities easily,
- Ensure to target policies effectively

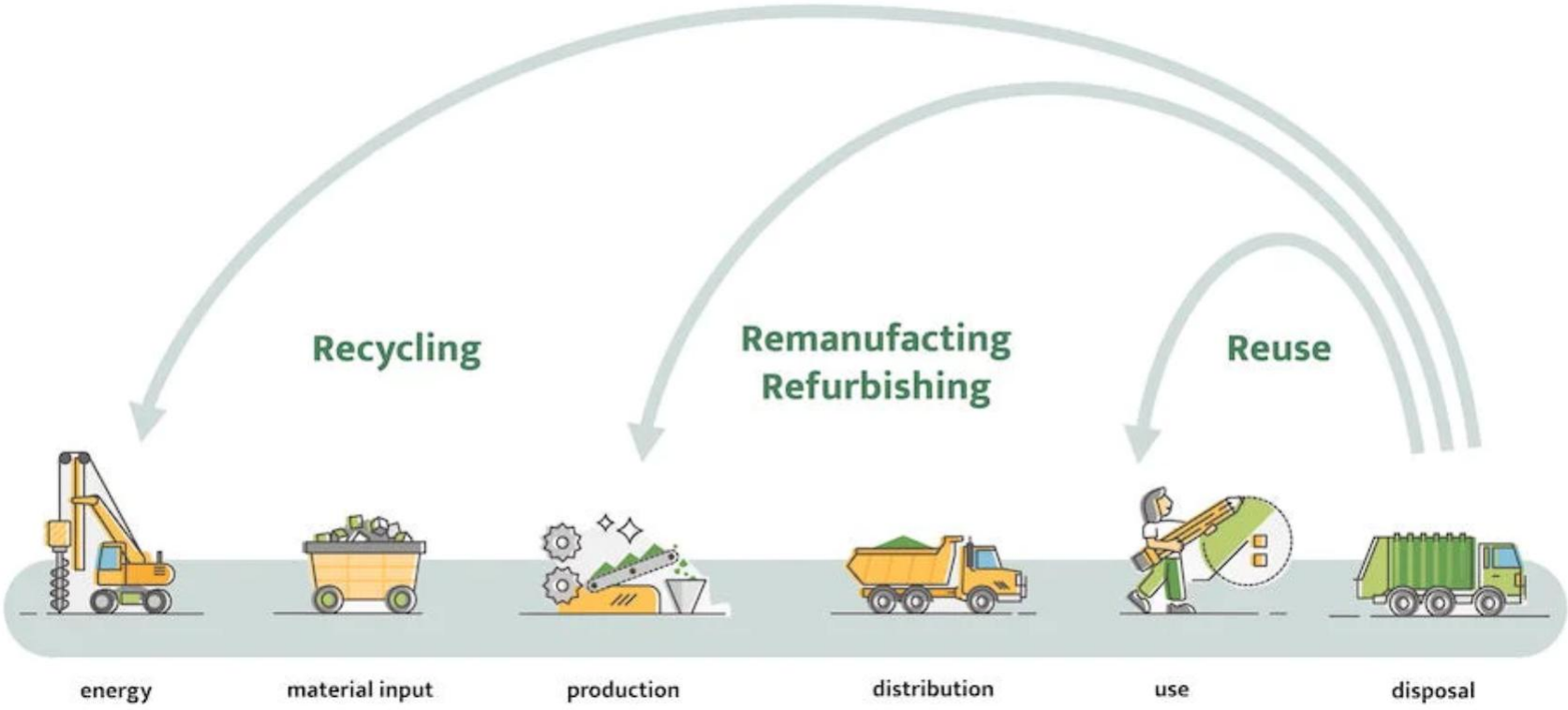


LCA allows decision-makers to compare two products and select the product that has the lowest impact

How is LCA used?

- By manufactures
  - Product development
  - Product improvement
  - Product comparison
- By supply chain managers
  - Choose company they should source from
- By public policymakers
  - Support for regulatory measures and policy instruments
  - Environmental labelling

Part III: Assessing the climate impact from the waste sector in LCA perspective



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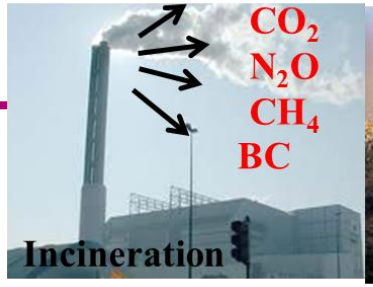
Assessing the climate impact from the waste sector in LCA perspective

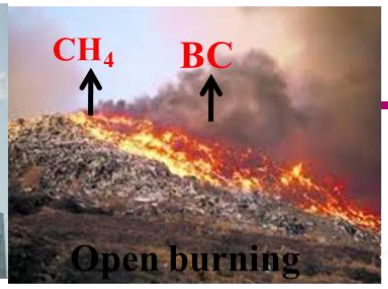
All the activities in waste management emit GHGs and SLCPs throughout the life cycle

Waste Collection and transportation

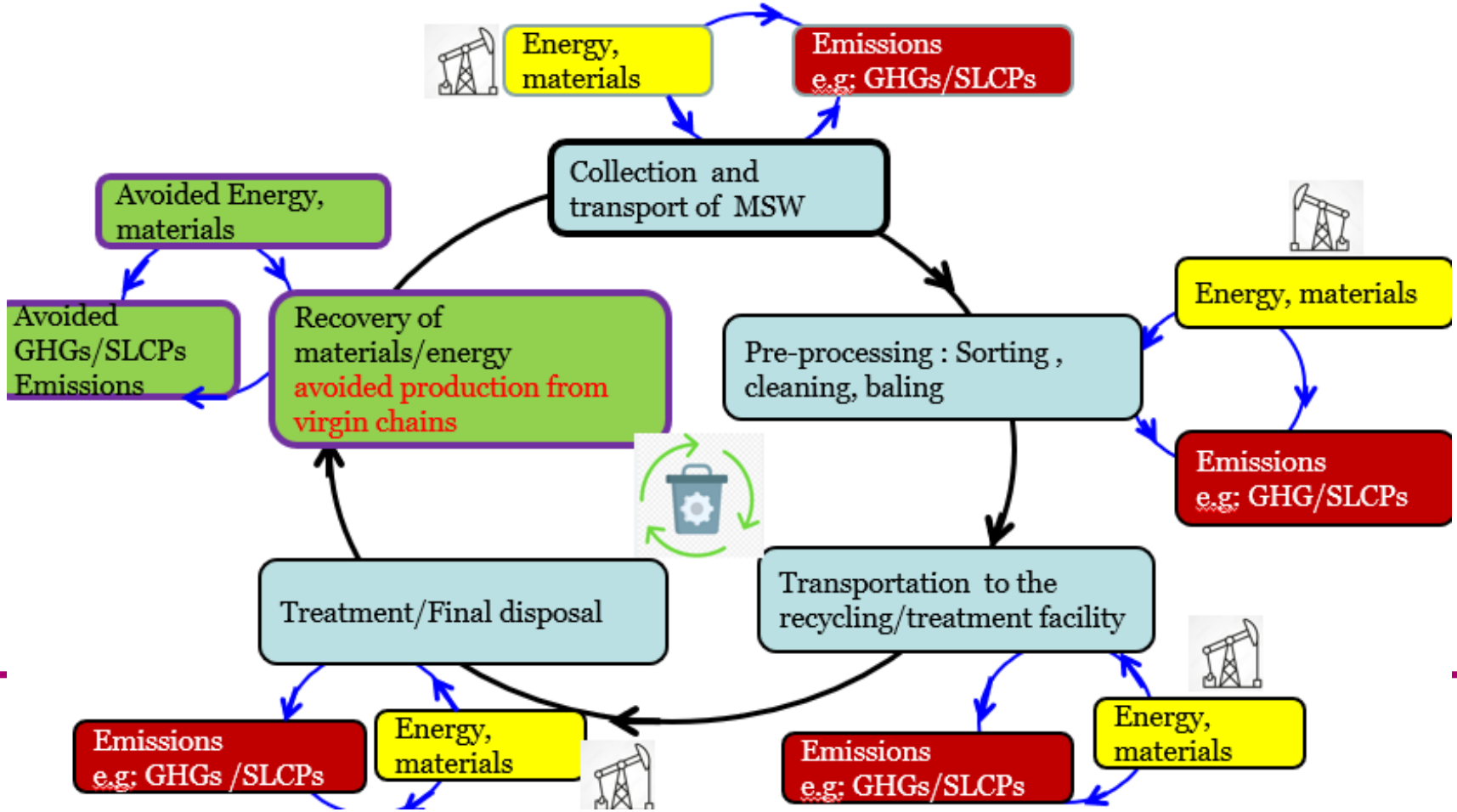
Operation activities

Treatment/final disposal





Assessing the GHG/SLCP savings potentials through resource recovery

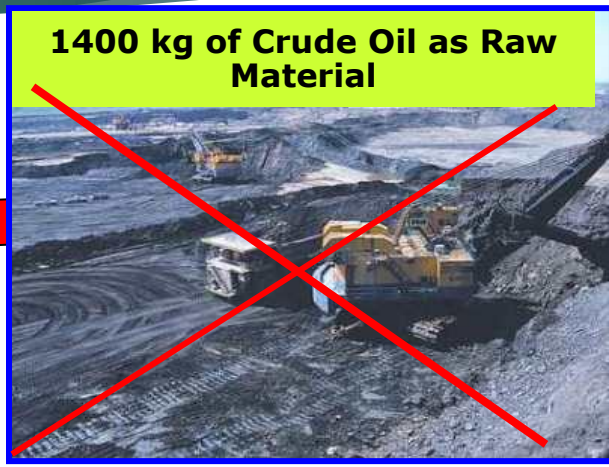


Application of LCA- Quantification of emissions and avoidance

1000 kg of Waste Plastic

900 kg of Recycled Plastic

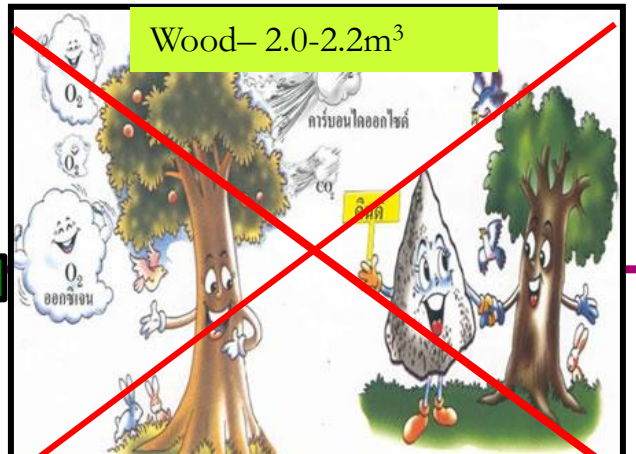
1400 kg of Crude Oil as Raw Material



Waste Paper – 1000 kg

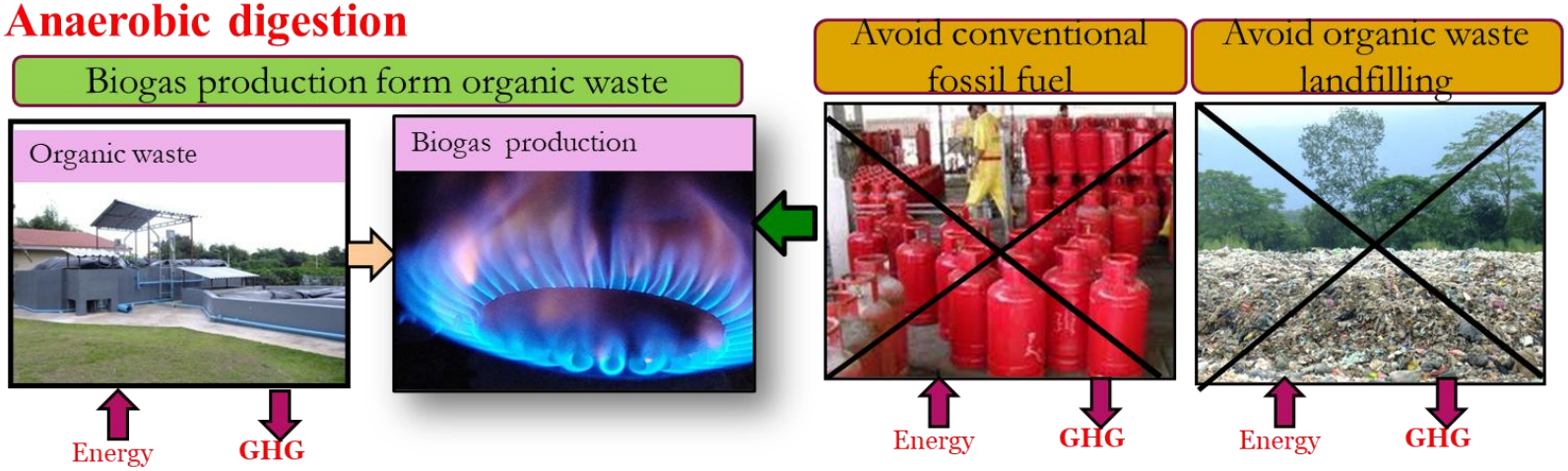
Recycled Paper – 850-900 kg

Wood– 2.0-2.2m^3

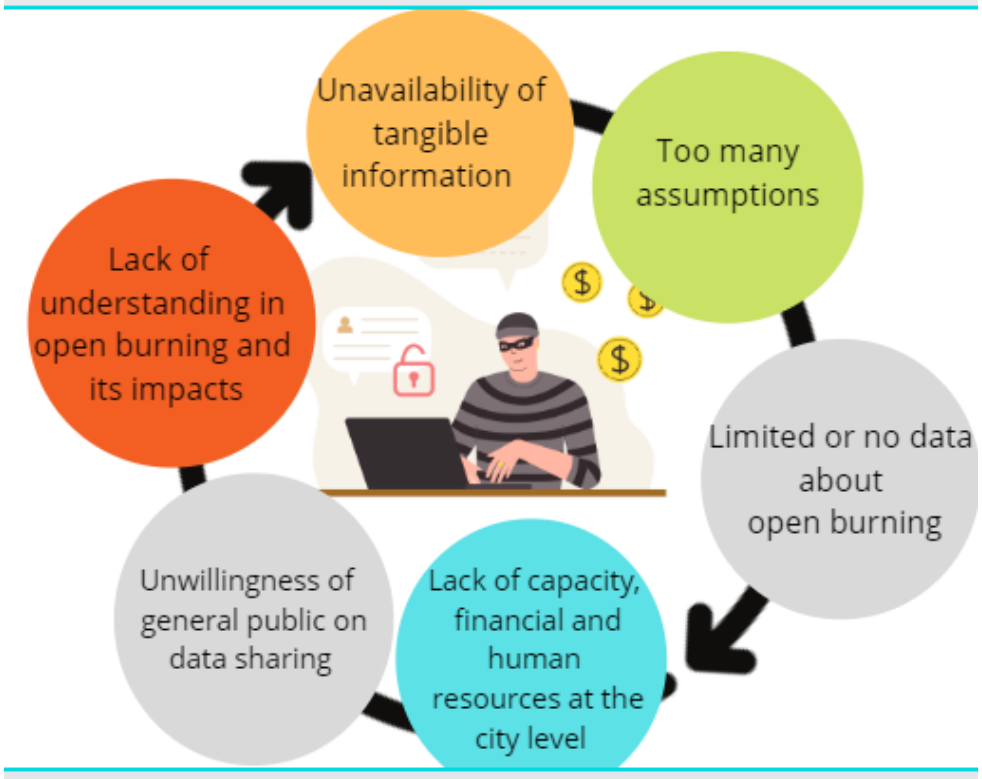


Application of LCA- Quantification of emissions and avoidance

Anaerobic digestion



Composting



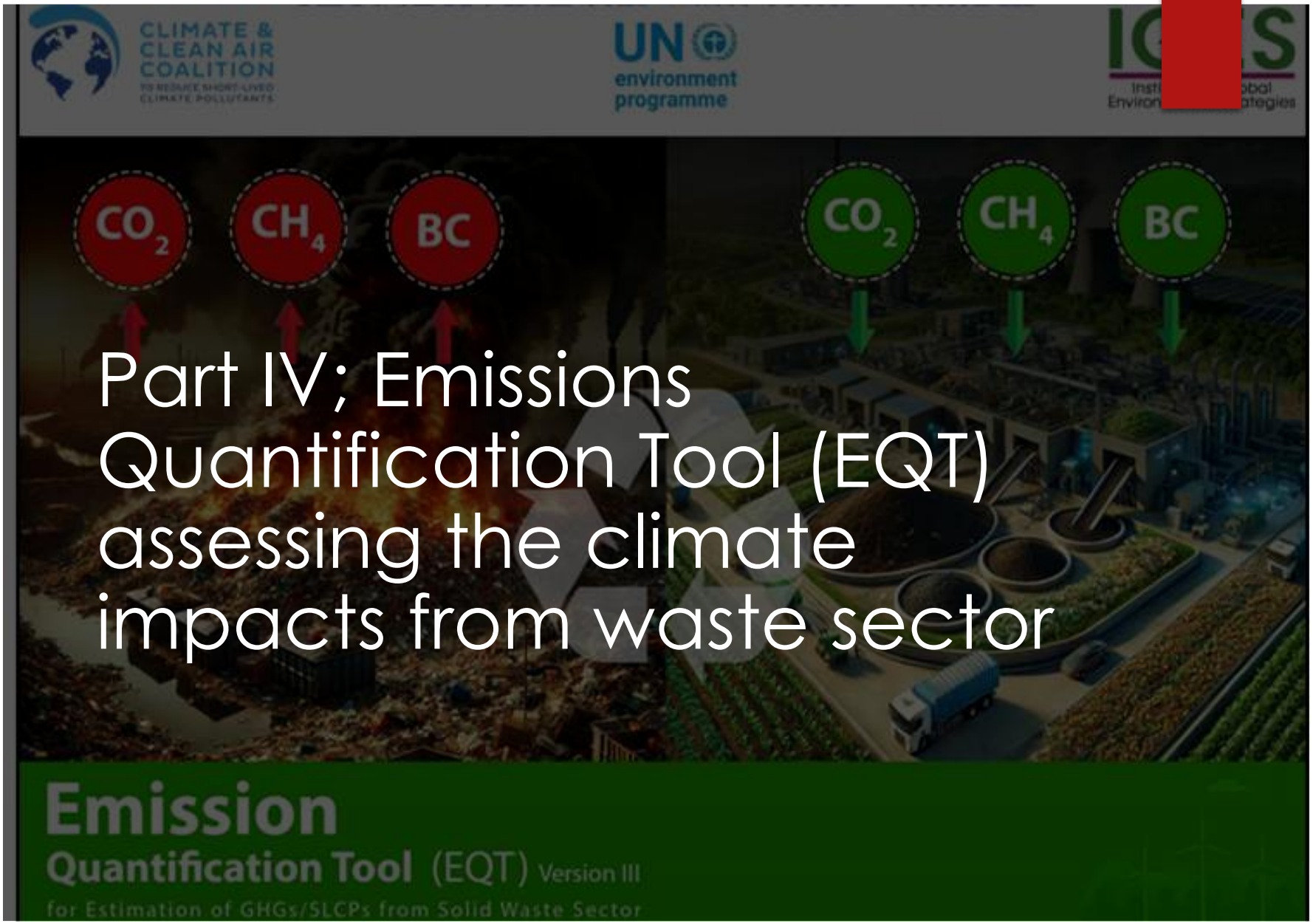
Causes for climate impacts from waste management and possible solutions

Awareness-raising and capacity development at city level

Allocate fund and resources for data gathering/surveys at city level

Cities/municipalities must accept the responsibility for enforcement of laws

Introduce alternatives for waste avoidance at burning places



Part IV; Emissions Quantification Tool (EQT) assessing the climate impacts from waste sector

Objectives: Emissions Quantification Tool (EQT)

Emission quantification tool

Decision making tool

User Manual

- Undertake a rapid assessment of GHGs and Short-Lived Climate Pollutants (SLCPs) from BAU with alternative solutions and find the most suitable options for the city.
- Keep records and monitor the progress made on mitigating GHGs and SLCPs emissions from chosen waste management options

Features of the Emission Quantification tool : User friendly

- This tool is simple and step by step guidance has been provided to users in all the sheets on how to enter the data and obtain the results
- Special skill is not required and ability to work with excel would be sufficient
- Each and every sheet has designed a way that users can easily move among the sheets , enter the data and obtain the results on their preferred waste treatment options

Emission Quantification Tool (EQT): A Pathway to Climate-Friendly Waste Solutions

The Emission Quantification Tool (EQT) was developed by the **Institute for Global Environmental Strategies (IGES)** as a science-based tool designed to empower policymakers and practitioners to estimate emissions, plan climate-friendly systems, and monitor achievements. Initially launched in 2013 in collaboration with the **Climate and Clean Air Coalition - Municipal Solid Waste Initiative (CCAC-MSWI)**, the EQT was one of the pioneering tools for measuring both greenhouse gas (GHG) and short-lived climate pollutant (SLCP) emissions in the waste sector.

Since its launch, the EQT has undergone continuous improvement based on user feedback and evolving national and global requirements. In 2018, Version II introduced significant updates to enhance functionalities and usability. The latest **Version III, released in 2025** in partnership with the **UNEP International Environmental Technology Centre (UNEP-IETC)**, includes advanced features to further support GHG and SLCP quantification at both city and national levels.

This tool is available to users free of charge. To help us understand how it is being used and to improve future versions, we kindly ask you to complete this short survey. Your cooperation allows us to track usage across sectors and regions, and to ensure the tool continues to meet user needs.

Download User's Manual - Emission Quantification Tool (EQT) for Estimating Short Lived Climate Pollutants (SLCPs) and Other Greenhouse Gases (GHGs) from Waste Sector (PDF 2.9MB)

Emission Quantification Tool (EQT) Version III
for Estimation of GHGs/SLCPs from Solid Waste Sector — Download

- Introduction
- The Emission Quantification Tool (EQT): Driving Climate Action in Waste Management
- What is the Emission Quantification Tool (EQT)?
- What are the Key Features of the EQT?
- Why Use the EQT?
- Contact

How to download EQT ?

DOWNLOAD LINK: HTTPS://WWW.IGES.OR.JP/EN/PROJECTS/WASTE-EQT

THANK YOU

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