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The Relationship Between Solid Waste Management and Global Warming

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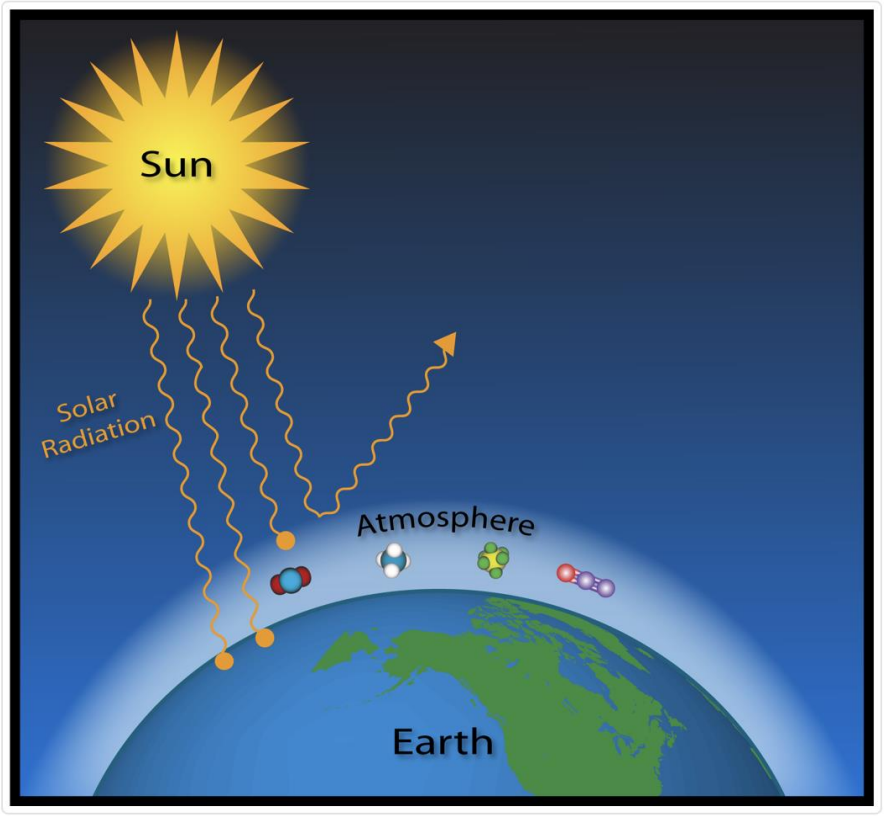
Atmosphere and Greenhouse Gases

- Main components of the atmosphere: N_2 (78%), O_2 (21%), argon, CO_2, etc.
- Natural role of greenhouse gases: Make the Earth habitable
- Rising greenhouse gas concentrations → Global warming

Fig: NOAA – Basics of the Carbon Cycle and the Greenhouse Effect

What is Global Warming?

- Long-term temperature increase
- Main causes: Fossil fuels, agriculture, solid waste
- Consequences: Sea level rise, ecosystem degradation



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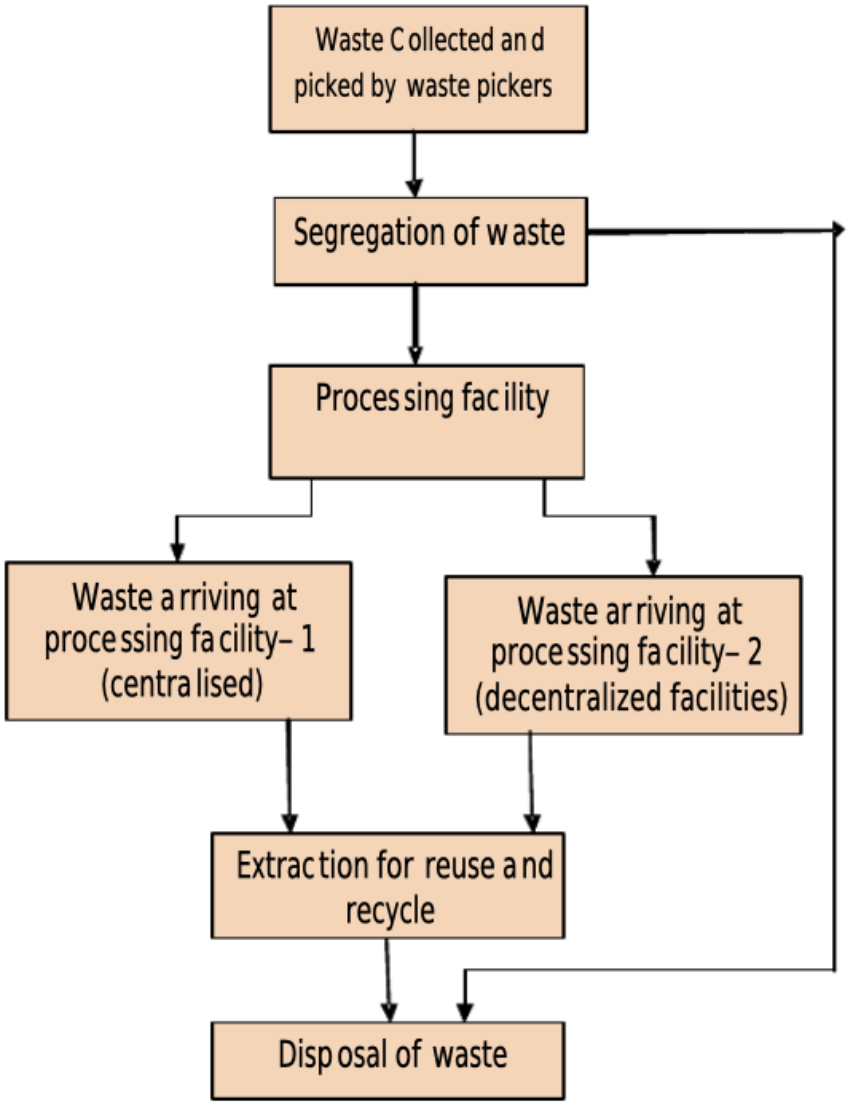

Fig: ResearchGate – Workflow of solid waste management system

Solid Waste Management and Its Effects

- Energy consumption in production, transportation, and storage processes
- Methane (CH_4) emissions from landfills
- Impacts on carbon sinks (forests, coal deposits)

Emissions by Waste Types

- Recycling: Lower emissions
- Composting: Emissions of CH_4 and CO_2
- Incineration: Emissions of CO_2 and N_2O
- Landfilling: CH_4 emissions and carbon storage

Processes That Create the Most Emissions

- Highest emissions: Landfilling (CH_4)
- Incineration: Waste with high fossil content → CO_2 emissions
- Recycling: The method with the lowest emissions

Fig: Simplified schematic of a MSWM system

Technological Solutions and Applications

- MBT (Mechanical Biological Treatment), anaerobic digestion, and gas collection systems
- Modern thermal facilities (examples from the EU and Japan)
- Net emission reductions through energy recovery

Management Strategies and Policies

- Zero waste and reduction policies
- Recycling targets (e.g., 35%)
- Carbon footprint monitoring and reporting systems

Conclusion and Recommendations

- Solid waste management → Effective in combating global warming
- Recycling, reduction, and advanced technology investments
- The active role of municipalities is critically important

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