

Center for Negative Carbon Emissions

Carbon Dioxide Emissions: A Waste Management Paradigm

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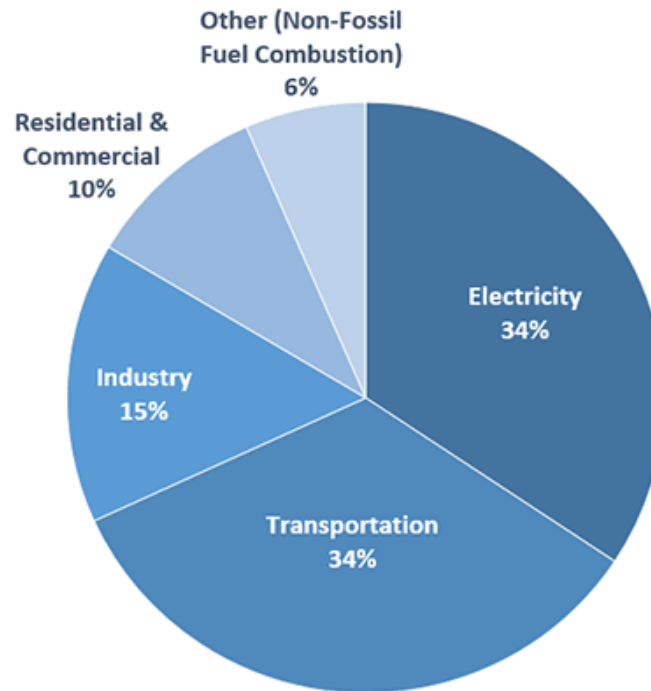
Klaus S. Lackner, Ph.D.



What we know about CO₂

- Combustion of fossil fuels
- Clean Air Act (CAA)

2016 U.S. Carbon Dioxide Emissions, By Source



U.S. Environmental Protection Agency (2018). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016

15.1 trillion pounds

Total US greenhouse gas emissions (CO₂ eq.)
in 2014

81.6%

Percentage of all US greenhouse gas
emissions from human activities in 2016 that
are from CO₂

1,000 + years

Lifetime of CO₂ in the atmosphere

What we know about Waste

- Resource Conservation and Recovery Act (RCRA)
- Solid Waste
- Hazardous Waste

The term “**solid waste**” means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities...”

Any **discarded material** that is:

- 1) Abandoned,
- 2) Inherently-waste-like,
- 3) Military munitions, or
- 4) Recycled

Is CO₂ waste?

- Abandoned
- Inherently waste-like
 - By-product of energy production
- Recyclable



Climate Change is a Waste Management Problem

Lackner, Klaus S., and Christophe Jospe. "Climate Change is a Waste Management Problem." *Issues in Science and Technology* 33, no. 3 (Spring 2017).

**How can the EPA
manage CO₂ as a
waste?**

CAA vs. RCRA

Air pollutant

- Maximum allowable concentration, emission standards
- Permits
- Atmosphere

Waste

- Open dumping is prohibited
- Permits
- Authorized landfills, injection sites



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**We need a “landfill”
for the CO₂ we
produce**

Solutions

- Carbon Capture and Storage
- Safe Drinking Water Act
 - Class VI injection wells
- CO₂ streams are solid waste
- Social Acceptability

**We have to clean up
after ourselves**

Thank you!

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<https://cnce.engineering.asu.edu>



References

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 - <http://issues.org/33-3/climate-change-is-a-waste-management-problem/>