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A brief introduction to the Global WtERT Council (GWC)

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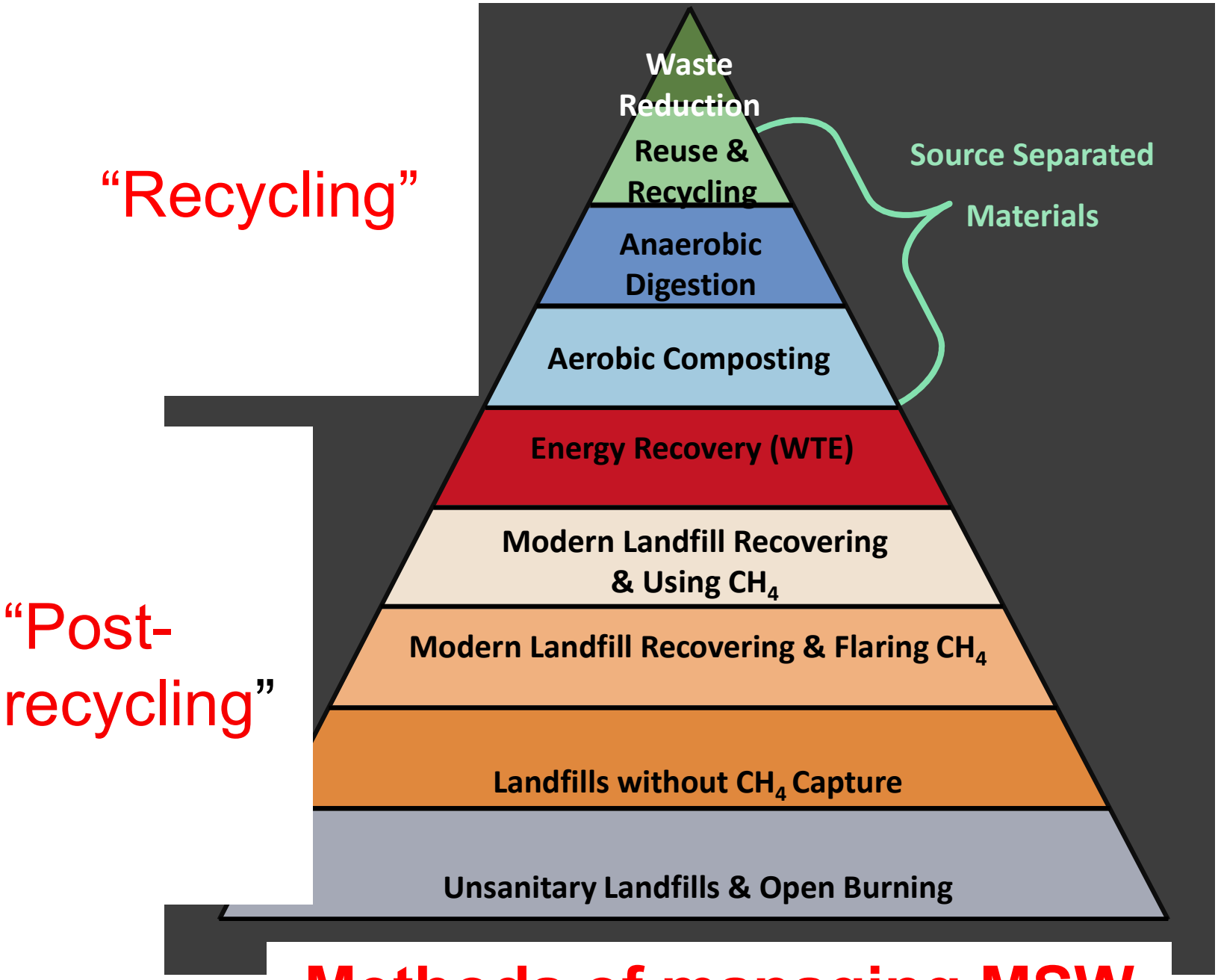


Methods of managing MSW

Sustainable Waste Management: The Global Experience

- There are only two alternatives to manage post-recycling solid wastes:

  a) combustion with energy and metals recovery (Waste-to-Energy (WTE) or

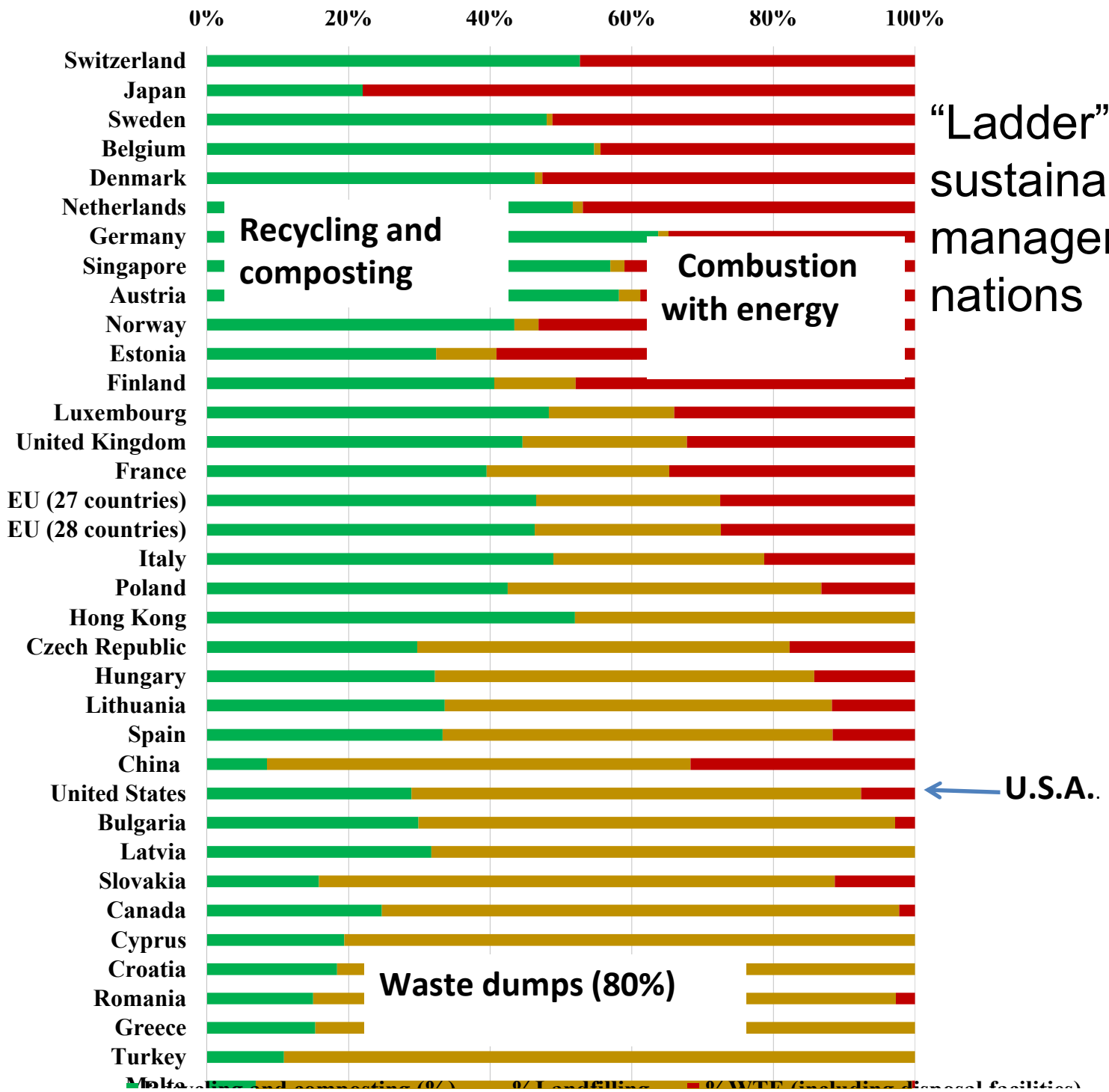
  b) b) landfilling with landfill gas recovery (LFGTE)

- All countries and states that use these methods also have strong recycling efforts.

Most deeply rooted misconceptions in the U.S.

1) Humans do not cause global warming (despite all scientific evidence and several national multi-billion dollar disasters)

2) You do not need either landfilling or waste-to-energy. All that is needed is smart 100% recycling (despite the fact that no city or country has even come halfway close to this goal)



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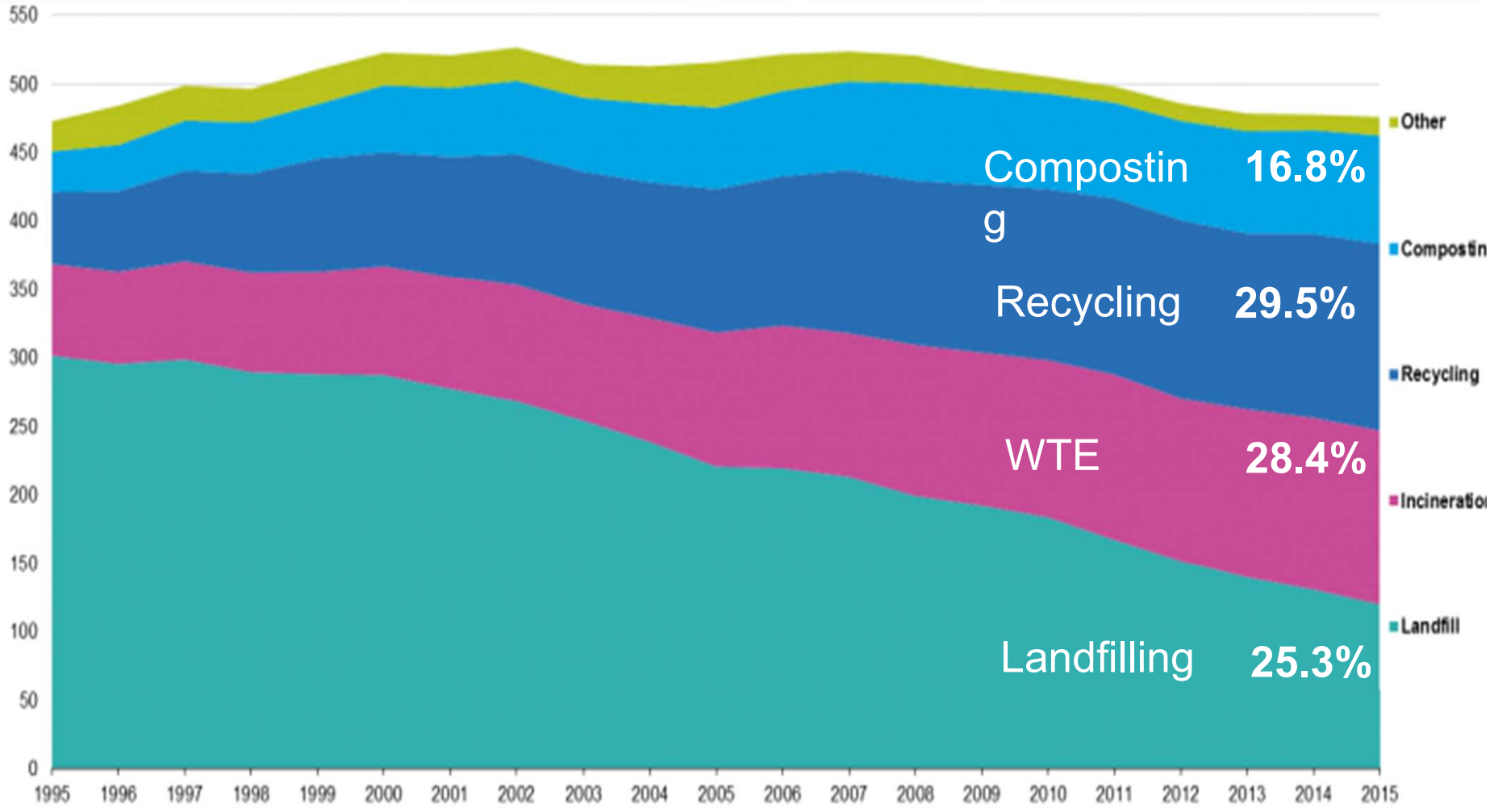
Changes in E.U. generation & disposition of MSW, 1995-2015

(Eurostat data, August 2017)



2015 MSW generation: 243 million tons; 2015 EU population: 510 million

y-axis: kg per capita (Figure by EEC-Columbia University

Origins of WtERT

- The Waste-to-Energy Research and Technology Council (WtERT) was founded in 2002 by the Earth Engineering Center of Columbia University and the U.S. Energy Recovery Council.
- Over the years, universities and research institutes in other countries, have formed sister WtERT organizations.
- As of now, we have sister organizations in Brazil, China, Chile, Colombia, Germany, Greece, France, India, Italy, U.K., and the U.S.

The mission of Global WtERT Council (GWC)

- In 2011, the Global WtERT Council (GWC) was registered as a U.S. non-profit corporation with the mission to
- • identify the best available technologies for the recovery of materials and energy from urban, industrial and other residues of human activity
- • stimulate research and development in sustainable waste management, and
- • disseminate this information by means of the web pages, publications, and conferences of its sister organizations.

Major accomplishments of GWC

- Sixteen years later, WtERT is the most widely cited academic association in the area of sustainable waste management.
- Its major accomplishments are many published studies of materials and energy recovery technologies and the WTE Guidebook (see Google), by now is available on the web, in four languages (English Portuguese, Spanish, and Greek); a Chinese edition will be published this year.
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Other accomplishments of GWC

- Waste-to-energy volume of ***Encyclopedia of Sustainable Science and Technology*** (Springer, pub.)
- Inclusion of waste to energy in 3-volume ***Renewable Energy Sources*** (Springer, pub.)
- Several pre-feasibility studies of WTE plants and of waste management methods
- First state-by-state (bottom up!) survey of waste management in the U.S., first in Greece, first in U.K.

Examples of other contributions of GWC:

- Quantifying land use of Landfilling: 1 square meter of land for every 10 tons landfilled
- Quantifying Greenhouse Gas benefit of WTE vs landfilling: 1 ton CO2 per ton of MSW to WTE
- Range of required capital investment per ton of annual capacity

Some successes and failures of WtERT

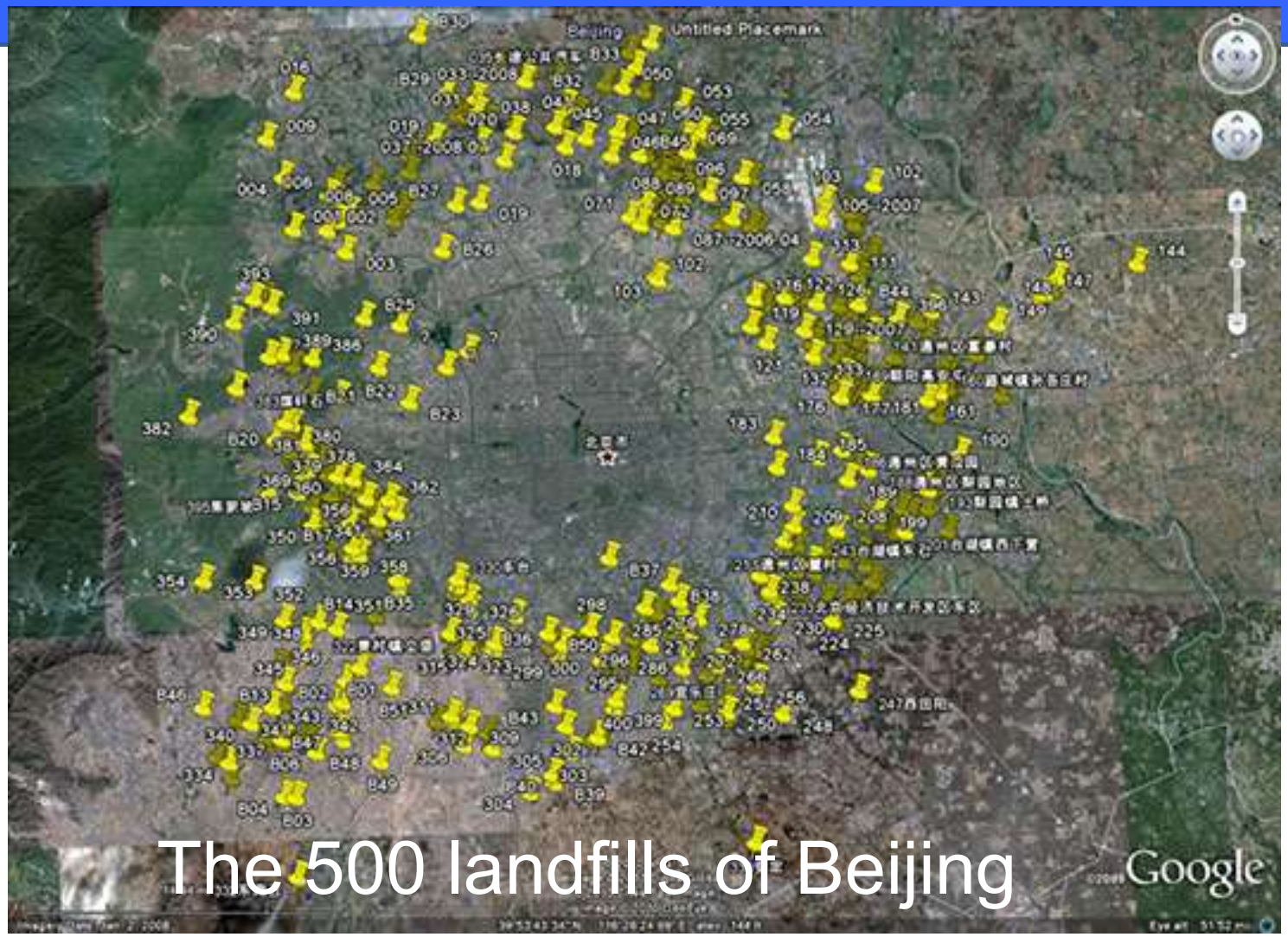
- Study on recovery of landfill gas (450 citations; S)
- Very few new WTE plants in the U.S. (F)
- Four new WTE plants in India (S)
- No WTE plants in Greece despite a lot of effort (F)
- Two new WTE plants announced in Australia (S)
- Two WTE plants in Dubai and Abu Dhabi (S)
- 200 new WTE plants in China (S)

Remaining obstacle to expansion of WTE, both in developing countries and, also, in the U.S.

- **Initial capital investment:** Repayment of the capital investment, per ton of MSW processed, is the major cost item of a WTE plant, affecting the gate fee of WTE vs landfilling

- This is true even for the U.S., where the WTE gate fee (e.g. $60/per capita) is a minute fraction (1/600) of the GDP per capita, because investors in waste management infrastructure are either companies or municipalities. There is little state and no federal participation.

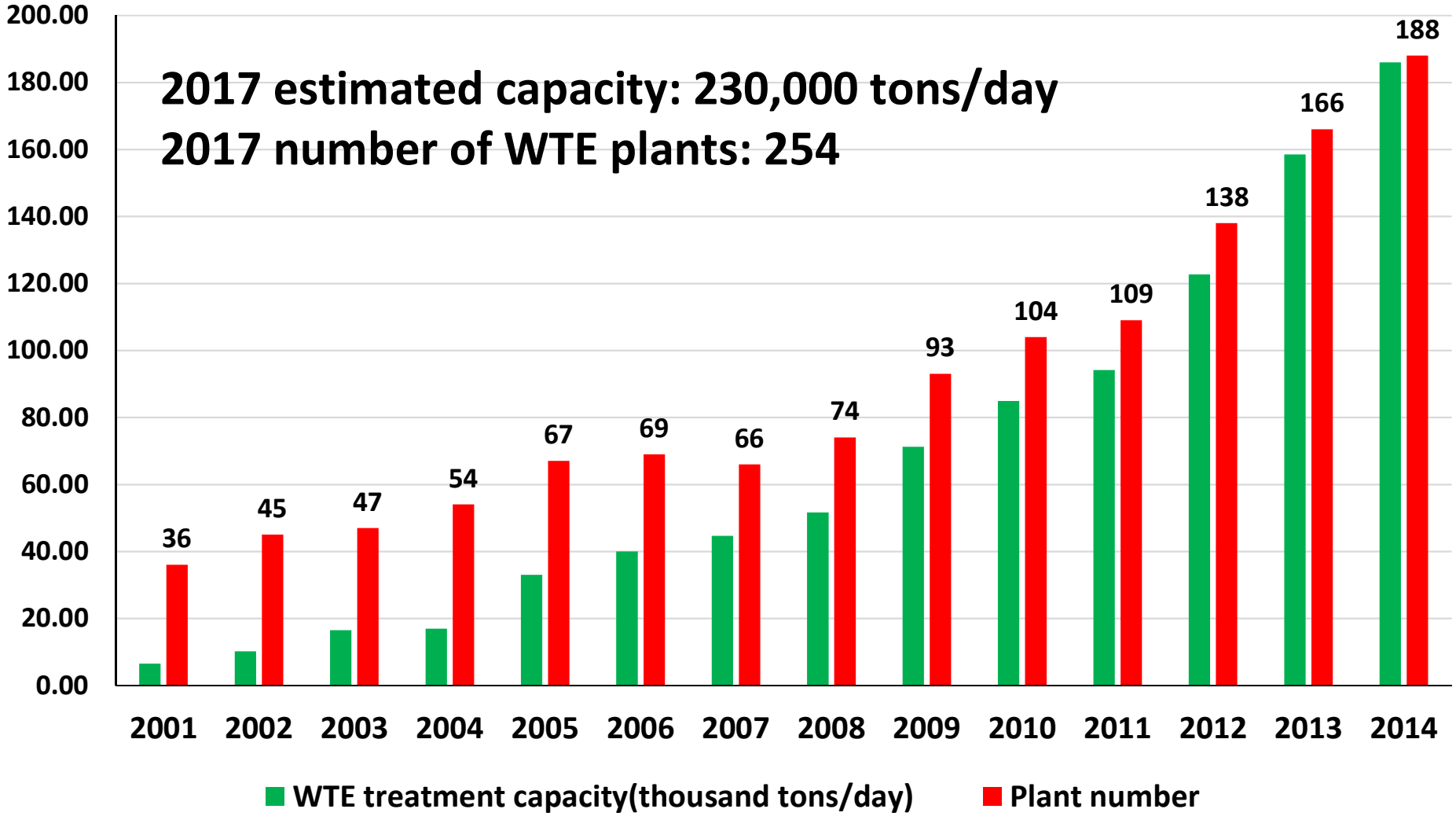
China is the first developing country to realize that an alternative to landfilling is needed



The 500 landfills of Beijing

Source: Extraordinary film by Wang Juliang, shown at CU by EEC

21st century growth of WTE industry in China



Yating Yu, EEC/Columbia University, 2016

In the course of the last fifteen years, China has become a major player in the global WTE industry

- China has demonstrated that it is possible to reduce the capital cost of WTE plants by means of :
  - Industrial and academic R&D
  - Rapid growth of industry (30 plants/year), instead of building one plant at the time
  - Assembly line manufacturing of WTE equipment
  - Favorable national policy (e.g., $30/MWh credit to WTEs)

Lower CAPEX can make the WTE technology cost-competitive with sanitary landfills (even in the U.S.)

- As the use of WTE grows in the developing world, it will force developed countries, such as the U.S., Canada and Australia, to re-evaluate WTE vs sanitary landfilling, *especially with regard to GHG emissions*
- Some developing nations can skip the sanitary landfill stage and move directly from **waste dumps** to **WTE power plants**.

A new energy challenge: What to do with Non-Recycled Plastics (NRP)

- The Chinese ban on “recycled” plastics has certified the known fact that <10% of the global plastic wastes are actually recycled

- Two possible routes for Non-Recycled Plastics (NRP):
  - Plastics to Energy power plants (PTE)
  - Pyrolysis of NRP to synoil

GLOBAL WTERT COUNCIL

Thanks!

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