NATIONAL TECHNICAL UNIVERSITY OF ATHENS
SCHOOL OF CHEMICAL ENGINEERING
UNIT OF ENVIRONMENTAL SCIENCE & TECHNOLOGY (UEST)

The Zero Waste Concept towards integrated waste management

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Outline

- Introduction
- Integrated waste management
- Resource efficiency
- Zero Waste perspective

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Introduction: Waste & natural resources

- Each year in the European Union:
  - 7.3 billion tonnes of resources are consumed
  - 3 billion tonnes of waste are generated,
  - 40% is being re-used or recycled, the rest ends up at landfill or is partly incinerated.

Introduction: Waste & natural resources

- If this quantity of waste was recycled then:
  - the equivalent of 148 million tonnes of CO_2 emissions could be avoided annually;
  - Around 5.25 billion euro would be saved from the recovery of recyclables such as paper, glass, plastics, aluminium and steel per year.
  - 500,000 new jobs at least would be created.

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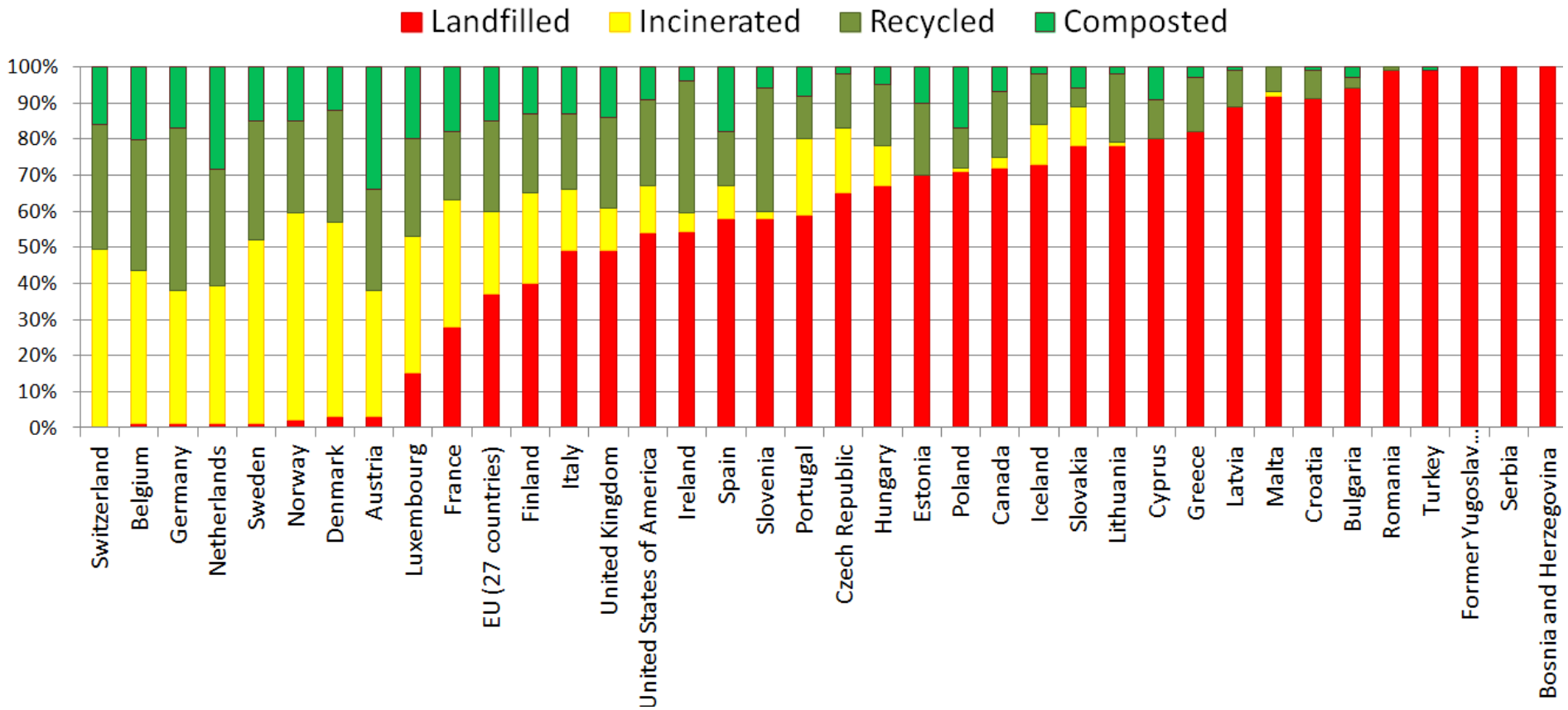
MSW management (EU27+ Canada & USA)



Source: *Eurostat, press release 33/2013 (March 2013)*

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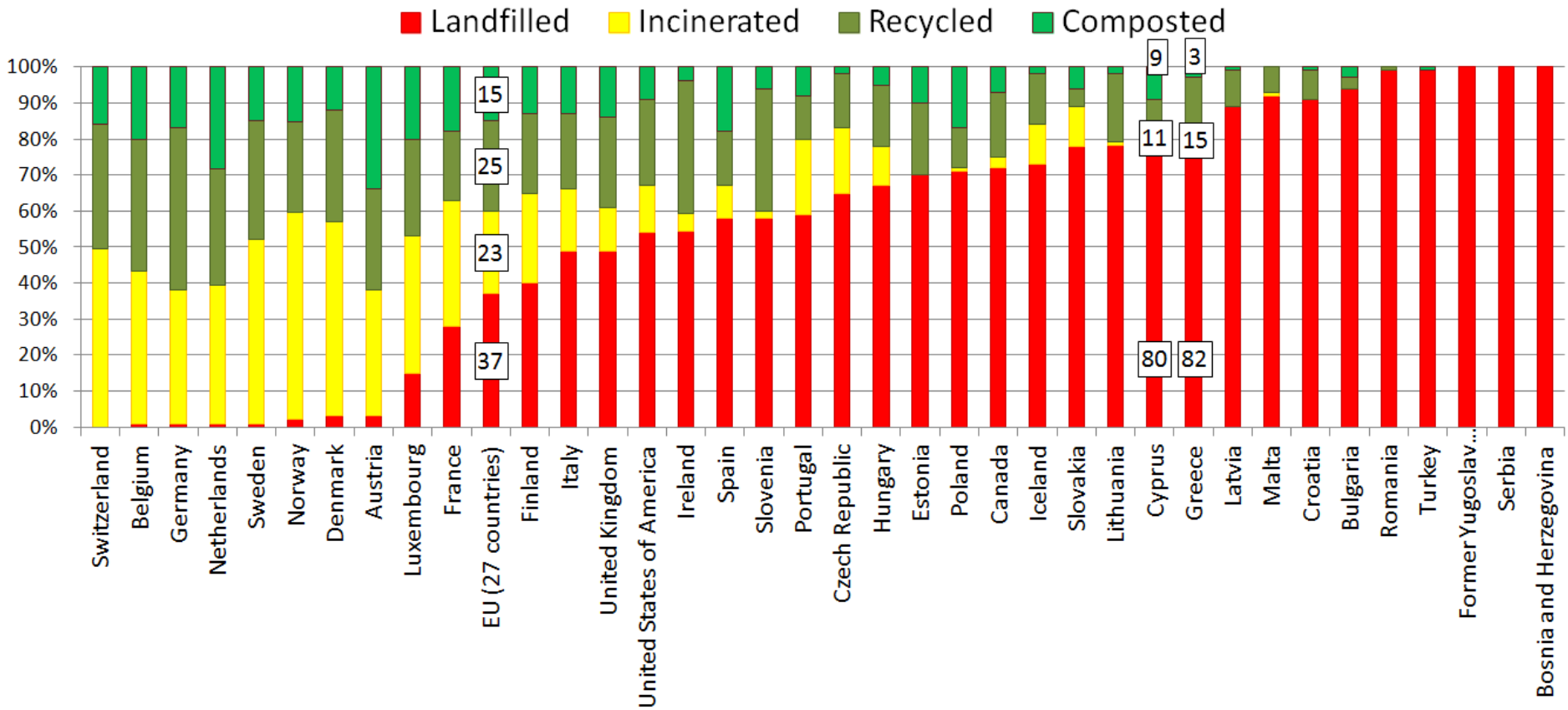


Source: *Eurostat, press release 33/2013 (March 2013)*

Ranking EU27 countries

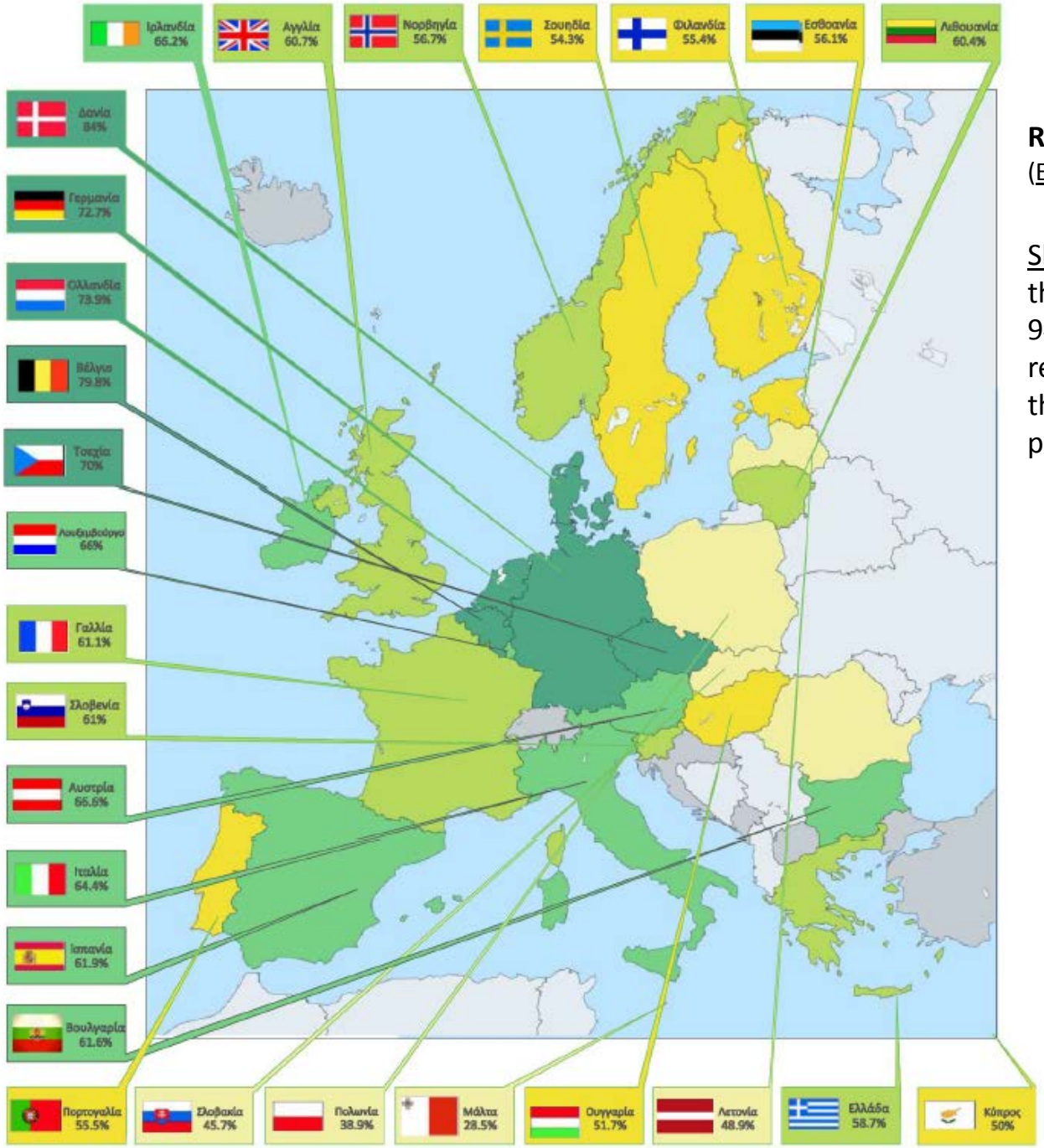
Worst performing countries	Best Performing countries
Estonia (EE), Slovakia *(SK)*, Italy *(IT)*, Latvia *(LV)*, **Cyprus** *(CY)*, Romania *(RO)*, Lithuania *(LT)*, Malta *(MT)*, Bulgaria *(BG)* and **Greece** (*GR*).	Austria (*AT*), the Netherlands (*NL*), Denmark (*DK*), Germany (*DE*), Sweden (*SE*) and Belgium (*BE*)

A new report from the European Commission (July 2012) shows how municipal waste is managed in the EU27 by grading Member States via 18 criteria using green, orange and red flags.

Environment Commissioner has stated:

"*The picture that emerges from this exercise confirms my strong concerns. Many Member States are still landfilling huge amounts of municipal waste – the worst waste management option – despite better alternatives, and despite structural funds being available to finance better options.*

Valuable resources are being buried, potential economic benefits are being lost, jobs in the waste management sector are not being created, and human health and the environment suffer. This is hard to defend in our present economic circumstances."



Recycling rates for packaging waste - %
(Eurostat: Online data code [ten00063])

Short Description: 'Recycling rate' for the purposes of Article 6(1) of Directive 94/62/EC means the total quantity of recycled packaging waste, divided by the total quantity of generated packaging waste.

Data for 2010

Legend	Cases
28.5 - 48.9	6
48.9 - 56.1	6
56.1 - 61.1	6
61.1 - 66.6	6
66.6 - 84.0	5
Data not available	6

Minimum value:28.5
Maximum value:84.0

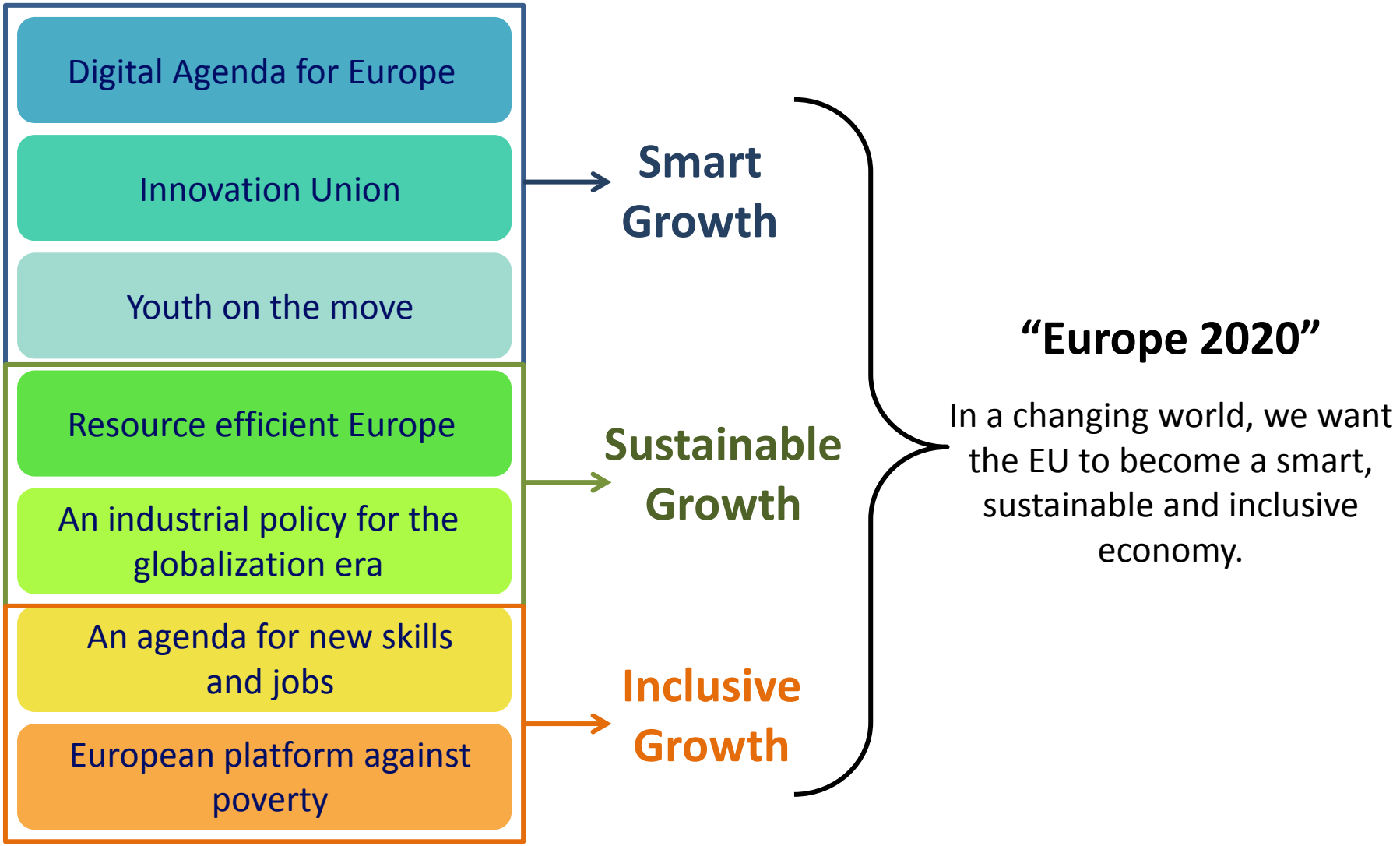
Source: *Deliverable A.3.1 (LIFE11 ENV/GR/000950)*

Europe 2020:
the EU growth strategy

Europe 2020

- Five key **targets** have been set to be achieved by the end of the decade. These cover:
  - employment;
  - education;
  - research and innovation;
  - social inclusion and poverty reduction
  - climate/energy.
- The strategy also includes seven '**flagship initiatives**' providing a framework through which the EU and national authorities mutually reinforce their efforts in areas supporting the Europe 2020 priorities.

7 Flagship Initiatives



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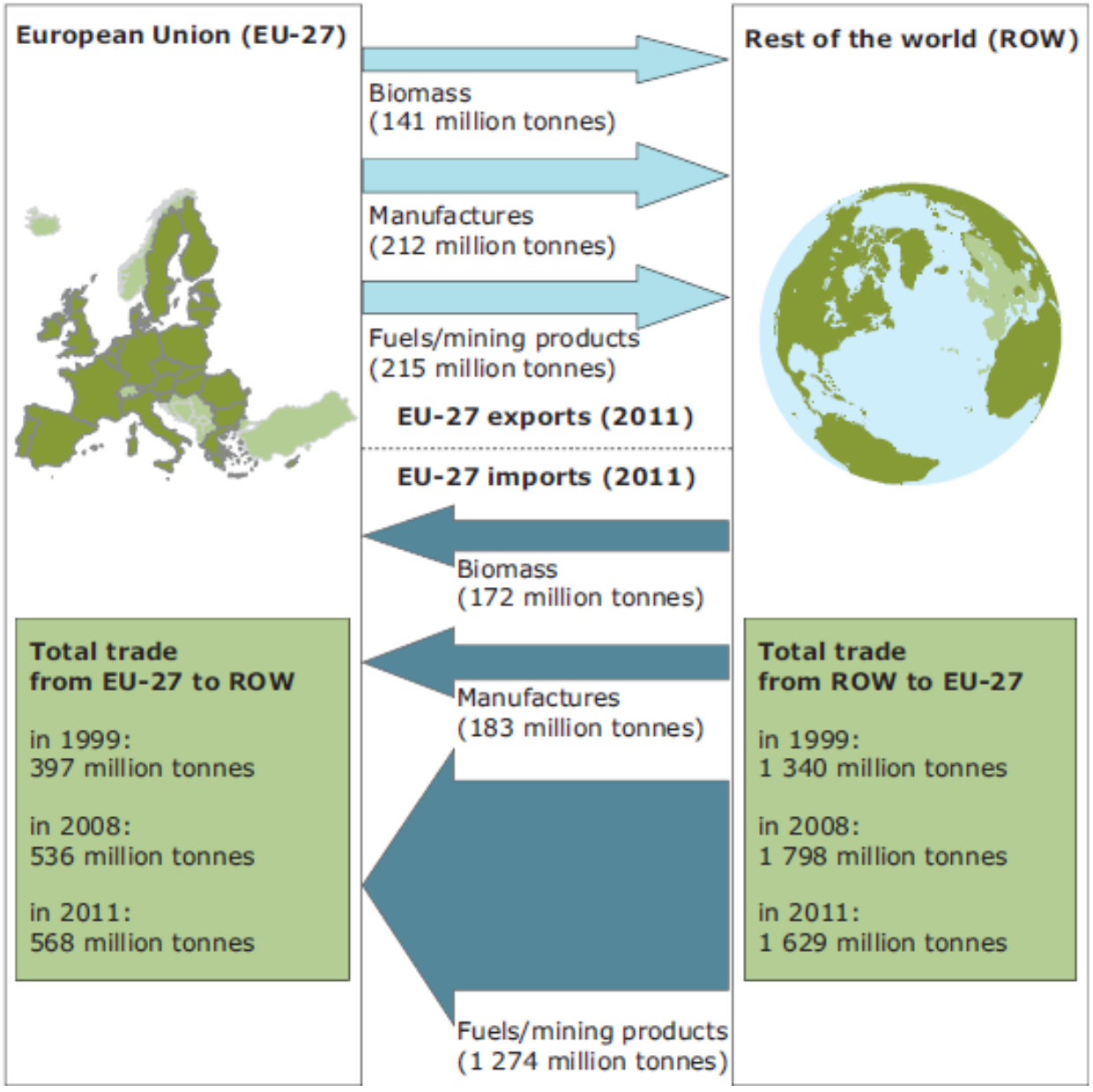
Role of waste in resource supply

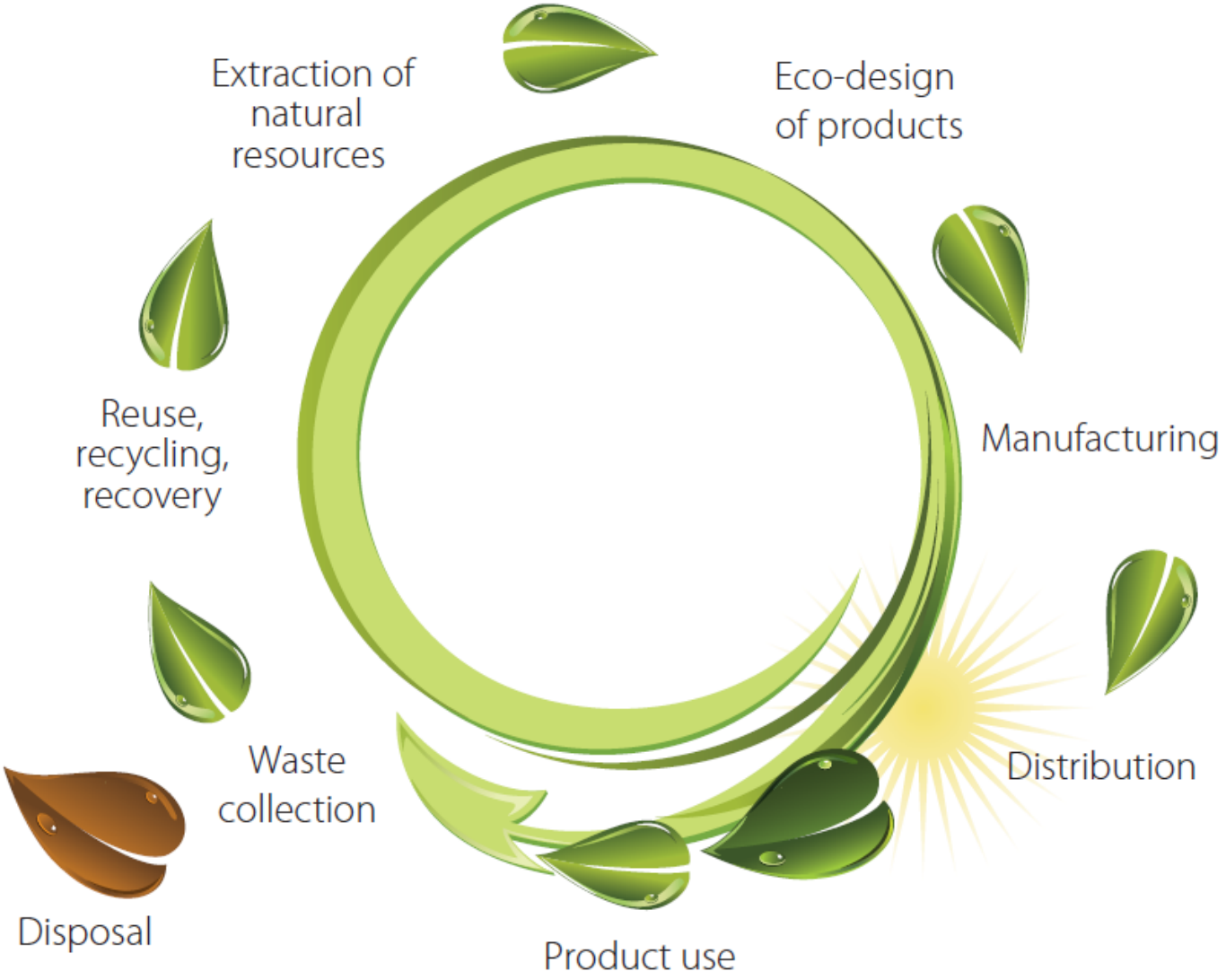
- Much of the waste we throw away can be recycled. Recycling reduces the amount of waste that ends up in landfill sites, while cutting down on the amount of material needed from the natural environment.

- This is important because Europe is dependent on imports of scarce raw materials, and recycling provides EU industries with essential supplies recovered from waste such as paper, glass, plastic and metals, as well as precious metals from used electronic appliances.

Source: *Material resources and waste — 2012 update (2012)*

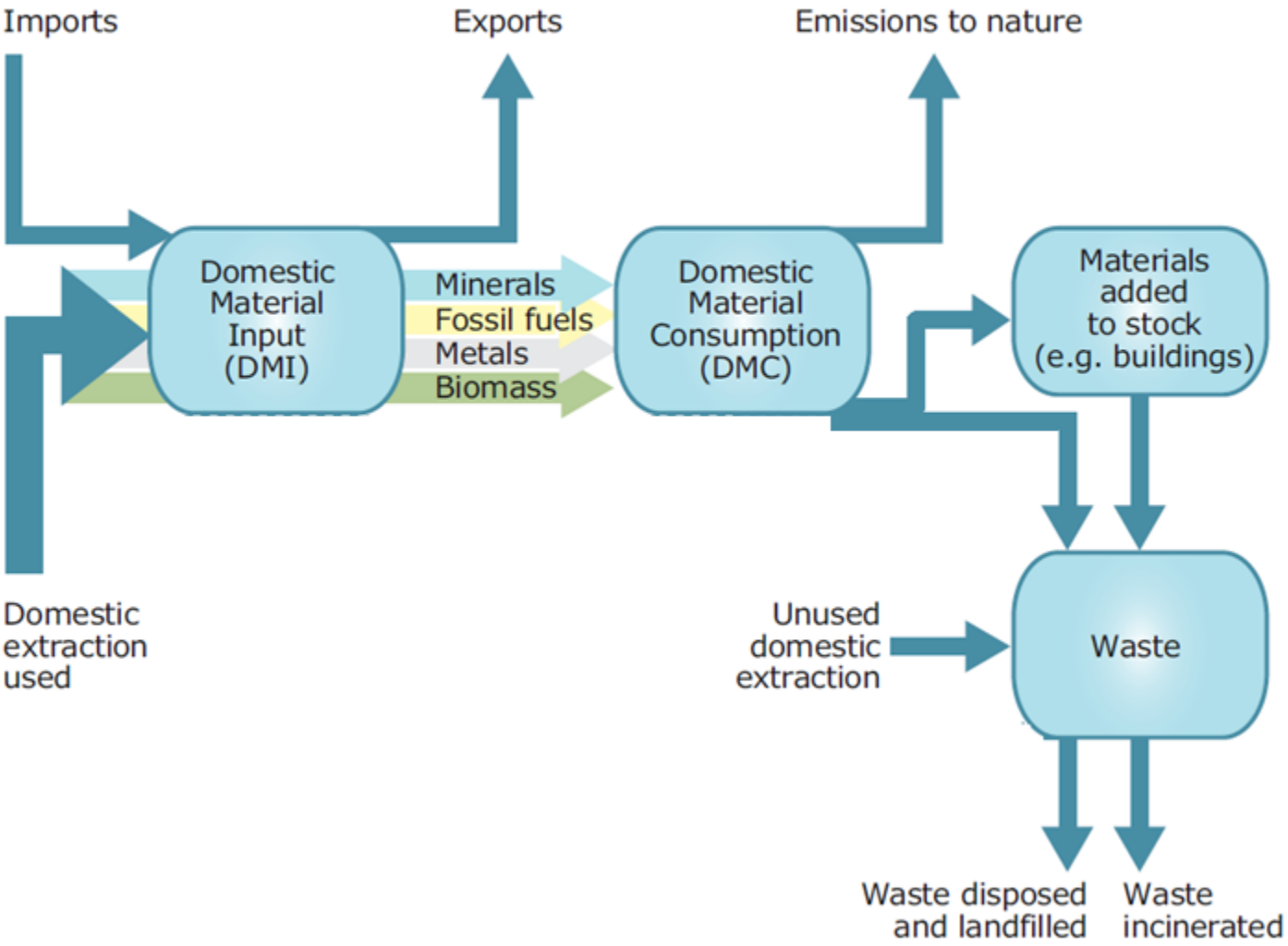
EU-27 physical trade balance with the rest of the world, 2011



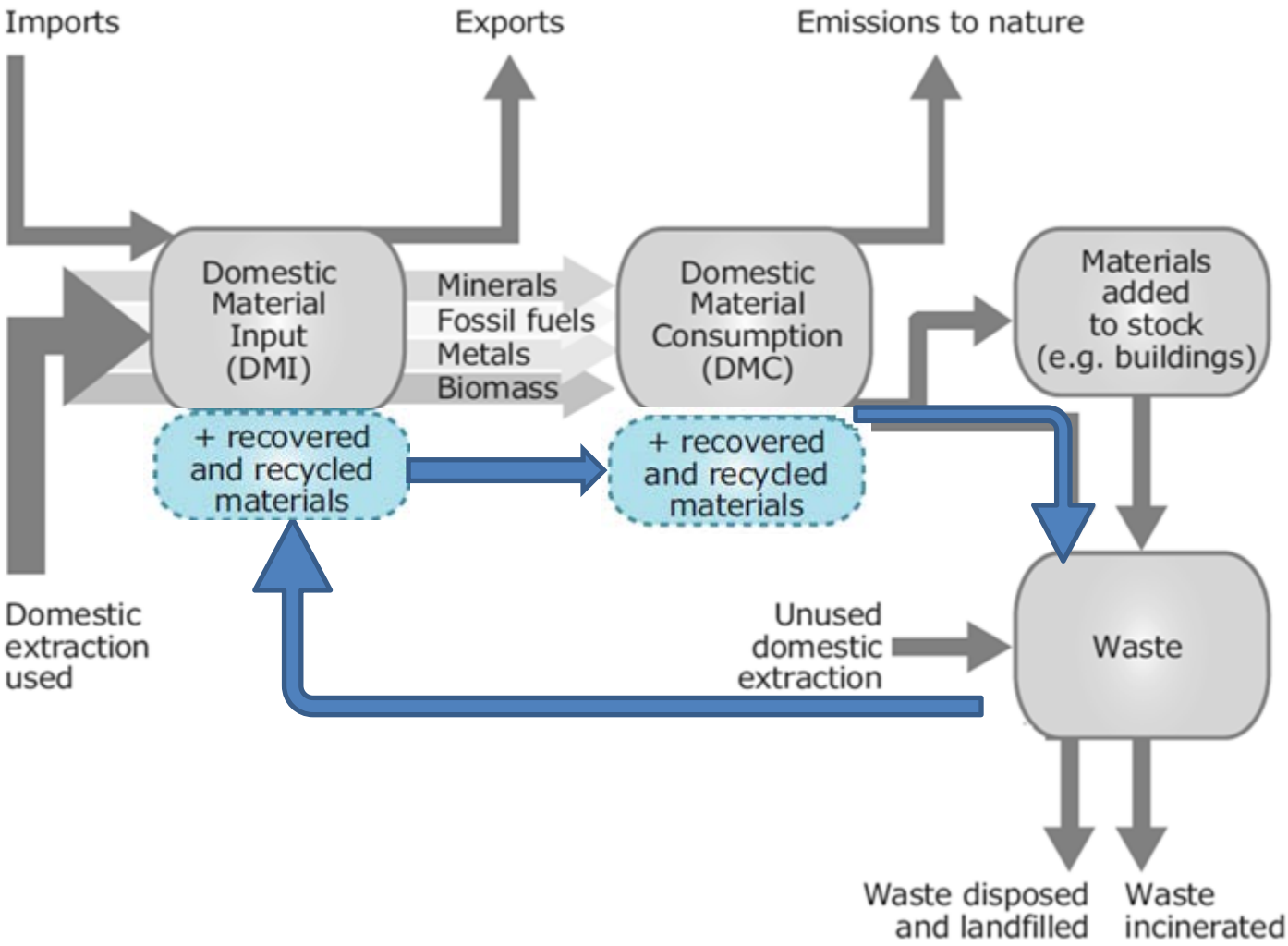

Extraction of natural resources
Eco-design of products
Manufacturing
Distribution
Product use
Waste collection
Disposal
Reuse, recycling, recovery

Links between the use of material sources and waste

Linear lifecycle



Closed-loop lifecycle



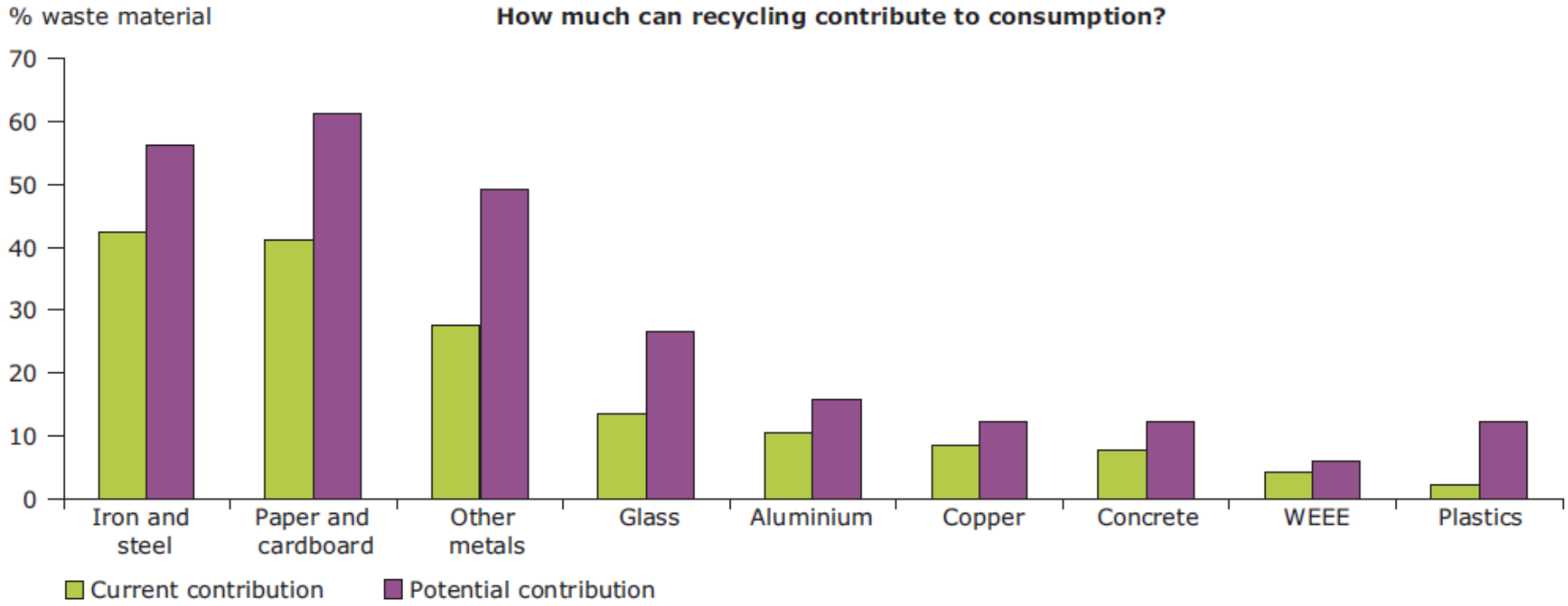
Is it possible to meet 100% of our resource demand through recycling?

The answer is no.

- This is partly because the growing EU economy is accumulating goods, for example in the construction sector. This accumulation acts as long-term storage for materials that will not be available for recycling for many years.
- In addition, there are technical limits for recycling, which vary depending on the material, and the quality of recycled materials often does not (yet) fully match demand. As a result, some materials are considered to be 'downcycled' rather than recycled.

What is the room left for recovery improvement by group of resource?

Recycling's current and potential contribution to meeting EU demand for various materials



Note: The calculation of EU consumption is described in detail in ETC/SCP, 2011. The reference year for concrete is 2004.

(*) The current and potential contribution figures are both based on the infrastructure available in 2006. Future changes in collection rates, improved recycling structures and market conditions could significantly influence the potential contribution figures.

Source: http://www.eea.europa.eu/publications/earnings-jobs-and-innovation-the

Integrated waste management and Zero Waste Concept

- EU waste management policies aim to reduce the environmental and health impacts of waste and improve Europe's resource efficiency. The long-term goal is to turn Europe into a recycling society, avoiding waste and using unavoidable waste as a resource wherever possible.
- Most modern societies have been implementing integrated waste management systems to recycle and recover resources from waste. In certain cases recycling rates up to 84% have been achieved (for packaging waste).
- The transition from a linear lifecycle (extract-consume-waste) to a closed-loop process has been recognized. Hence, Zero Waste strategies are growing in popularity as best practice.

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Zero Waste Societies:
a dream or a realistic vision?

What is Zero Waste?

•"Zero Waste is a goal that is both pragmatic and visionary, to guide people to emulate sustainable natural cycles, where all discarded materials are resources for others to use.

•Zero Waste means designing and managing products and processes to reduce the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them.

•Implementing Zero Waste will eliminate all discharges to land, water, or air that may be a threat to planetary, human, animal or plant health. "

Definition of Zero Waste as that adopted by the Zero Waste International Alliance

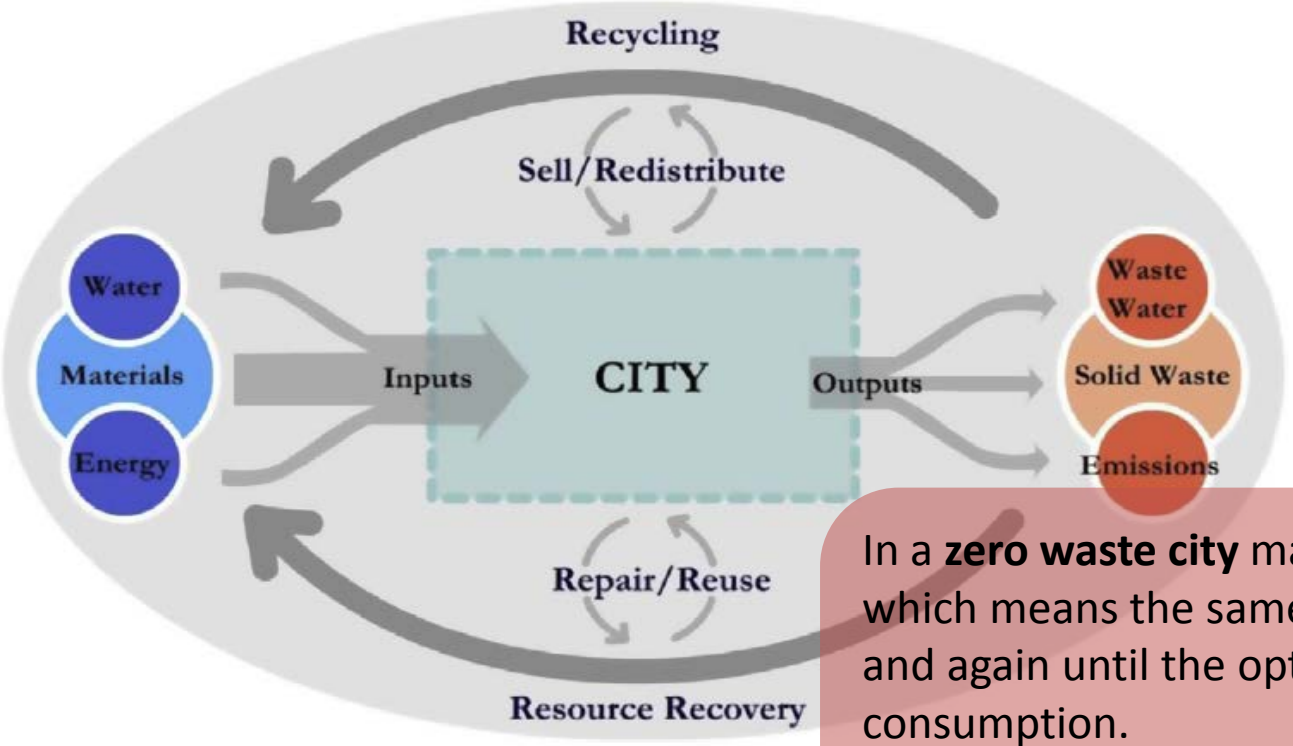
Conditions to become a Zero Waste municipality (1/2)

- Have a plan on how to achieve Zero Waste
- Establish benchmarks and a timeline to minimize residual waste which should include: e.g. less than 100kg in next 5 years and less than 50kg in next 10 years (per capita)
- Work with a Residual Separation and Research Facility (RSRF)
- Engage the community to promote Zero Waste

Conditions to become a Zero Waste municipality (2/2)

- Commit to educate and train professionals, policy makers and citizens into Zero Waste
- Implement green procurement policies and expand Zero Waste infrastructure
- Support and promote Zero Waste procurement policies and programs
- Report progress to the rest of the network on a yearly basis.

The Zero Waste Concept



In a **zero waste city** material flow is circular, which means the same materials are used again and again until the optimum level of consumption.

No materials are wasted or underused in circular cities.

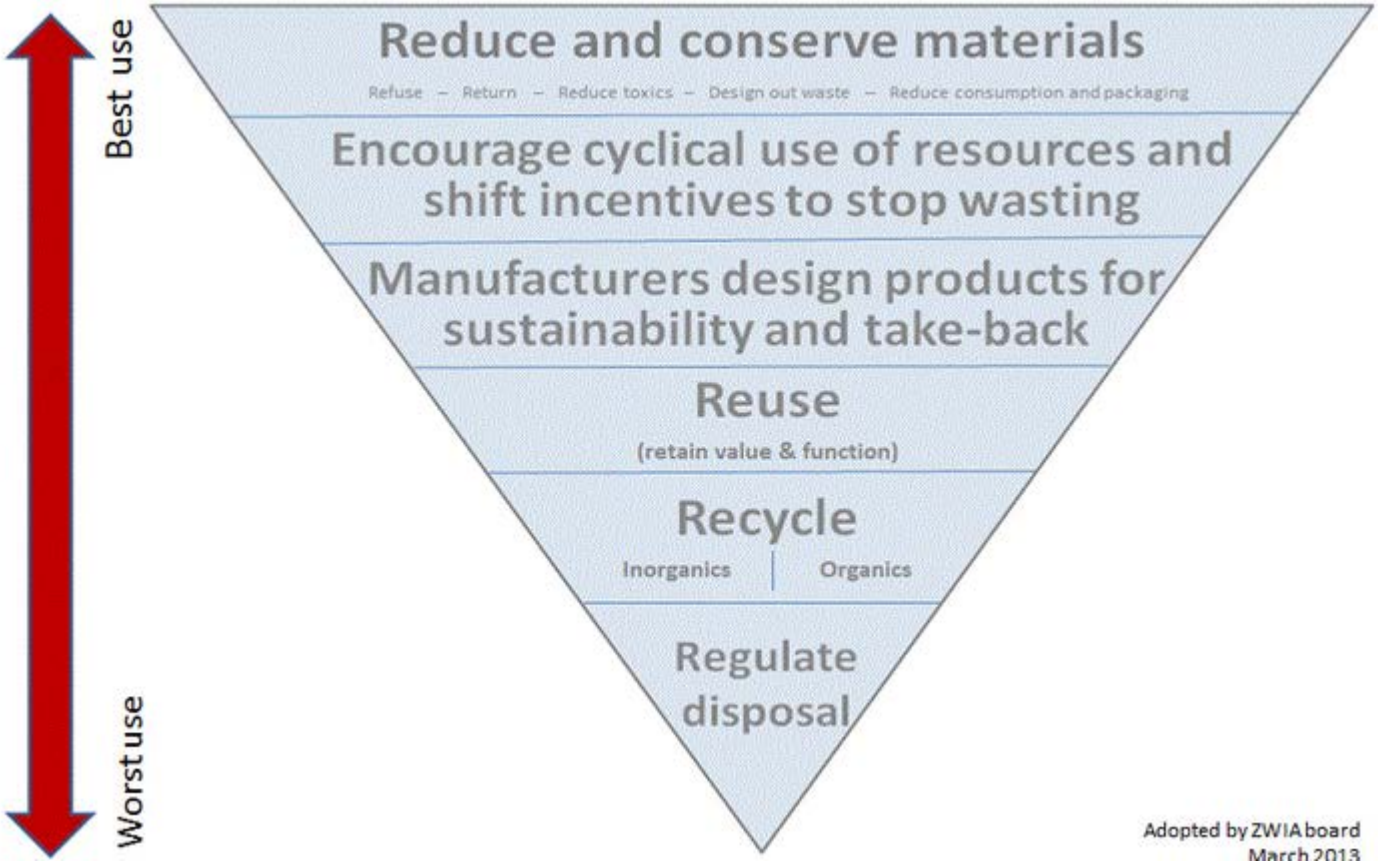
Zero Waste Municipalities

North & South America:	14 cities
Other USA:	9 cities
Canada:	9 cities
Australia:	7 cities
Asia:	8 cities
Europe:	>40 cities

More than 200 municipalities have declared and committed to a zero waste objective across Europe.

http://www.zerowasteeurope.eu/zw-municipalities/

Zero Waste Hierarchy



Conclusions

- Waste represents a considerable loss of resources in the form of materials and energy.
- Recycling can reduce the amount of waste that ends up in landfill sites, while cutting down on the amount of material needed from the natural environment.
- The life-cycle thinking must be integrated in the design stage of the products
- Linear consumption patterns must be abandoned and replaced by life-cycle thinking.

Conclusions

- Zero Waste strategies will ensure resource efficiency and sustainable development.

- It is imperative to realize the role that we all as individuals, householders, businesses and local and national governments **have to play**.

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www.cyprus2016.uest.gr

Thank you for your attention!

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