DEVELOPMENT OF MANAGEMENT UNITS FOR EXCAVATION, CONSTRUCTION AND DEMOLITION WASTE, WHICH CONTIRBUTE TO THE SUSTAINABLE DEVELOPMENT OF GREECE

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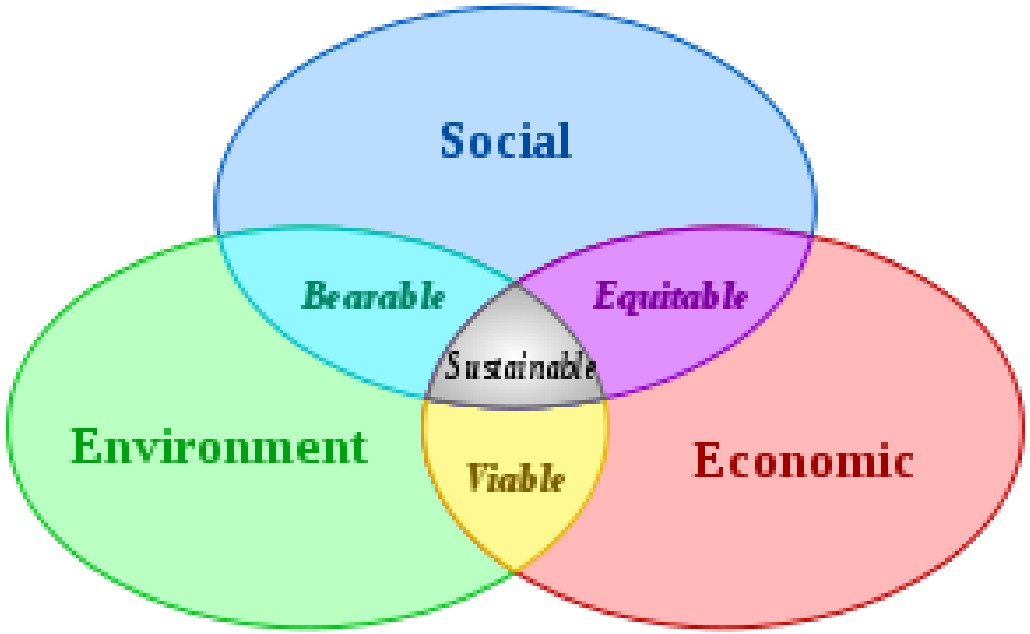
Sustainable Development



U.N.
1987

Sustainable Development
is the development that meets the needs of the present
without compromising the ability of future generations
to meet their own needs

Green products in Greece

- Green loans
- Green insurance
- Ecological cleaners
- Ecological mattresses
- Ecological paints

Main sectors of Sustainable Development

- RES
- Water management
- Biological agriculture
- Ecotourism
- **Waste management and recycling**

Legal framework for waste management

- **E.U.:**
  - Strategy for waste management COM(2005)666, setting **3** main principles :
    - prevention (reducing waste generation)
    - reuse and recycle (utilize waste)
    - final disposal (landfill, incineration)
- 12 priority waste streams:
  1. Municipal and biodegradable
  2. Industrial
  3. Hazardous
  4. **Construction and demolition**
  5. Mining
  6. WEEE
  7. Packaging
  8. ELVs
  9. Tires
  10. Batteries
  11. Used oils
  12. Agricultural

Legal framework for ECDW management

- **Absence of specific European legislation :**
  - Currently there is no specific waste regulation, as in other wastes (e.g. batteries)

- **Framework Directive on waste 2008/98/EK :**
  - Includes ECDW
  - Sets a target for 70% recycling of their weight by 2020

- JMD 36259/2010 measures, terms and program for the alternative management of waste from excavation, construction and demolition
  - included in the overall framework of alternative management of waste as set by Law 2939/2001 for producers responsibility
  - Special Bodies are set up and licensed, called Waste Management Systems, which collect fees from waste producers.

Excavation, construction and demolition waste (ECDW)

- **Generated quantities:**
  - ~25-30% of the total generation of waste in the E.U.

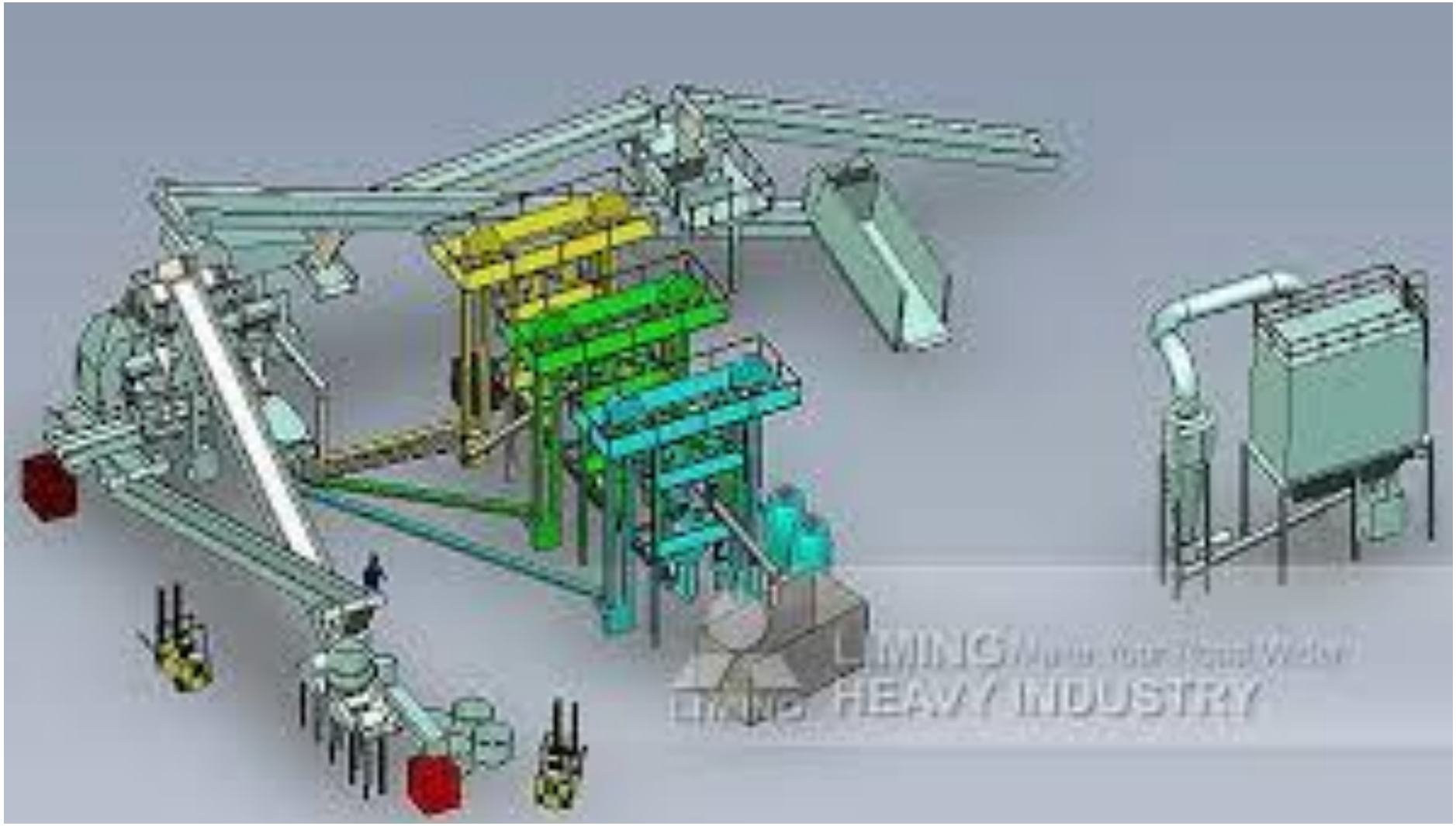
- **Characteristics:**
  - High recycling potential
  - Comprise of materials which can be utilized, such as bricks, cement, gypsum, wood, glass, metals, plastic, soil etc

- **Sources:**
  - Buildings and public infrastructures
  - Partial or total demolition of buildings
  - Construction and maintenance of infrastructure (e.g. road works)

ECDW management in the EU

- Lack of specific legal framework and targets in a pan-european level up to 2008, led to significant differences between Member States
- Developing countries in the South: stared only recently and do not surpass 10% recycling
- Developed countries in the North:
  - Achieve high recycling rates exceeding 90% (e.g. Denmark)
  - Operate special ECDW management units for more than 10 years, which utilize these waste, in order to produce secondary materials
  - Have created a market for secondary materials, which supports **Sustainable Development** of their economy

ECDW management units in the EU



ECDW management units in the EU

ECDW management units in the EU

ECDW management units in Greece

- **7 Systems** of Alternative Management of ECDW have been licensed by the National Recycling Organization (EOAN): www.eoan.gr

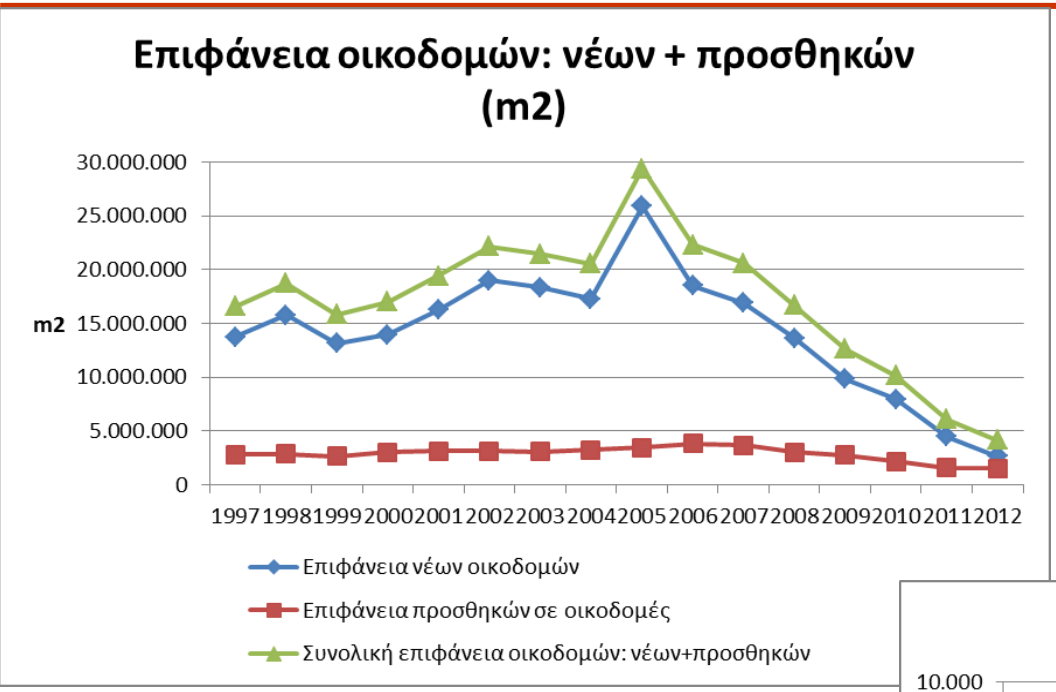
- These Systems collect ECDW from the building construction sector and utilize them. They operate special Units, where ECDW are:
  - Sorted in recyclable materials (e.g. metals, plastic, etc) which are then sold
  - Process and produce secondary materials for the building construction sector (e.g. gravel)

- Financial recession has had a significant impact in the building construction sector. Subsequently it lowered the generated quantities of ECDW in Greece, thus had a negative impact on the operation of these Units, making them non-viable (financially)

Model to estimate the generated quantities of ECDW in Greece

- The Research Team of UEST NTUA has developed various activities (national and European projects and studies), in order to manage and utilize ECDW.
- Especially for Greece it has implemented research and PhD thesis, related to ECDW Management Units.
- A Model was developed to estimate the generated quantities of ECDW, which is based on publicly available data of the Statistical Service:
  - Surface of new buildings and additions
  - Demolition licenses

Available data for constructions and demolitions in Greece



Equation to calculate the generated quantities of demolition waste in Greece

$$\text{ΑΠΚΤΔ} = \text{ΑΡΚΤΔ} * \text{ΑΟΚΤΔ} * \text{ΕΚΤΔ} * \text{ΟΚΤΔ} * \text{ΠΑΚΤΔ}$$

where:

- ΑΠΚΤΔ: demolition waste in tons
- ΑΡΚΤΔ: number of demolitions (= licenses from Statistical Service data)
- ΑΟΚΤΔ: average number of floors of each demolished building (1,3)
- ΕΚΤΔ: average surface of demolished buildings (130 m^2)
- ΟΚΤΔ: average volume of waste from each demolished building (0,8 m^3)
- ΠΑΚΤΔ: average density of waste from each demolished building (1,6 tn/m^3)

Equation to calculate the generated quantities of excavation waste in Greece

ΑΠΕΚΣ = ΑΡΝΚ * ΕΕΚΣ * ΒΕΚΣ * ΠΑΕΚΣ

where:

- ΑΠΕΚΣ: excavation waste in tons
- ΑΡΝΚ: number of new constructions of buildings (Statistical Service data)
- ΕΕΚΣ: average surface of constructed buildings and thus the average excavation surface (equal to ΕΚΤΔ)
- ΒΕΚΣ: average excavation depth (3 m)
- ΠΑΕΚΣ: average density of excavation waste (1,4 tn/m^3)

Equation to calculate the generated quantities of construction waste in Greece

$$АПК = (ENK + EK) * OAK * ПАК$$

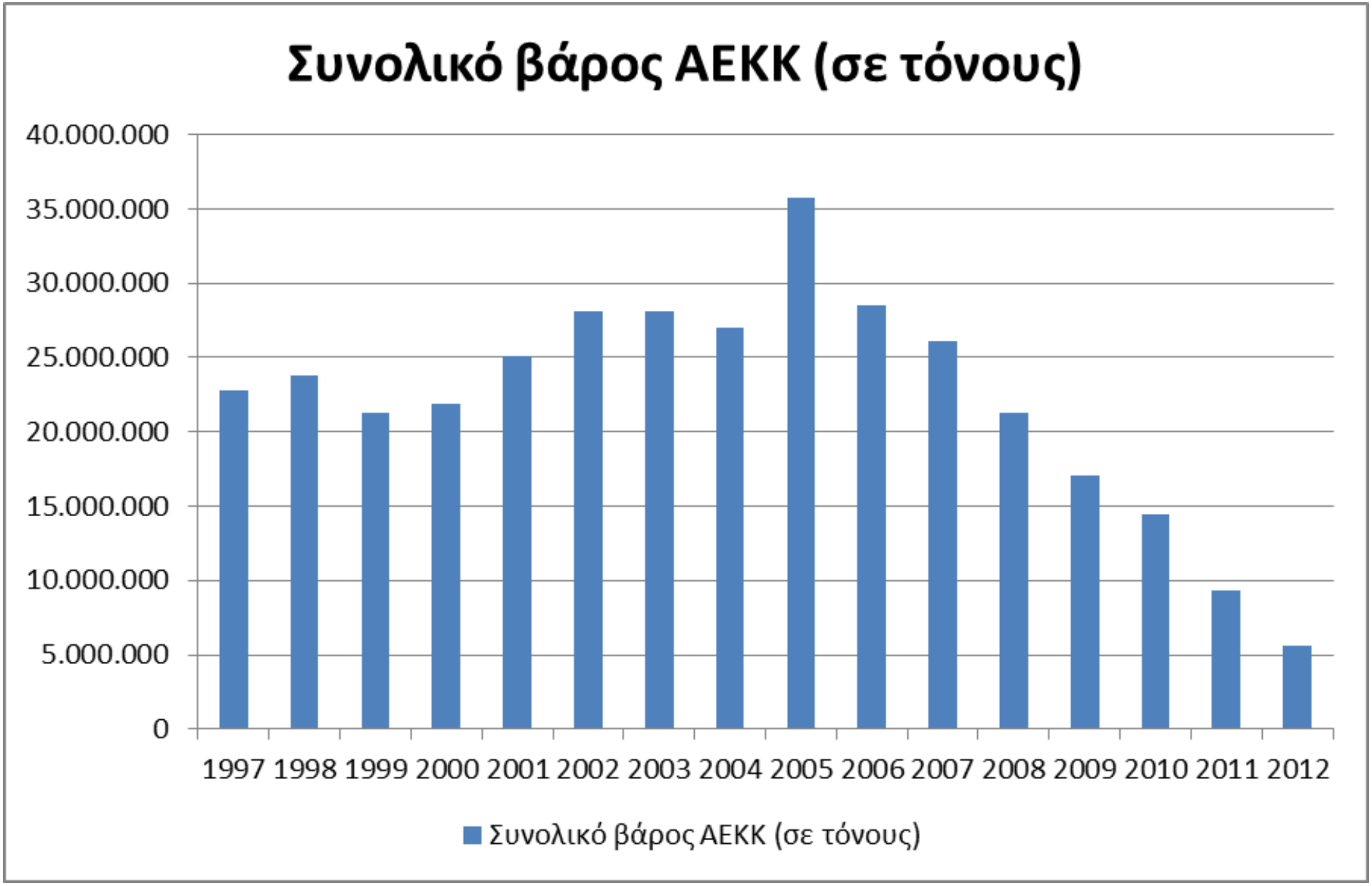
where:

- АПК: construction waste in tons
- ENK: surface of new buildings constructed (Statistical Service data)
- EK: surface of additions constructed in existing buildings (Statistical Service data)
- OAK: average volume of waste generated from each construction (0,06 m^3 / m^2)
- ПАК: average density of construction waste (1,6 tn/m^3)

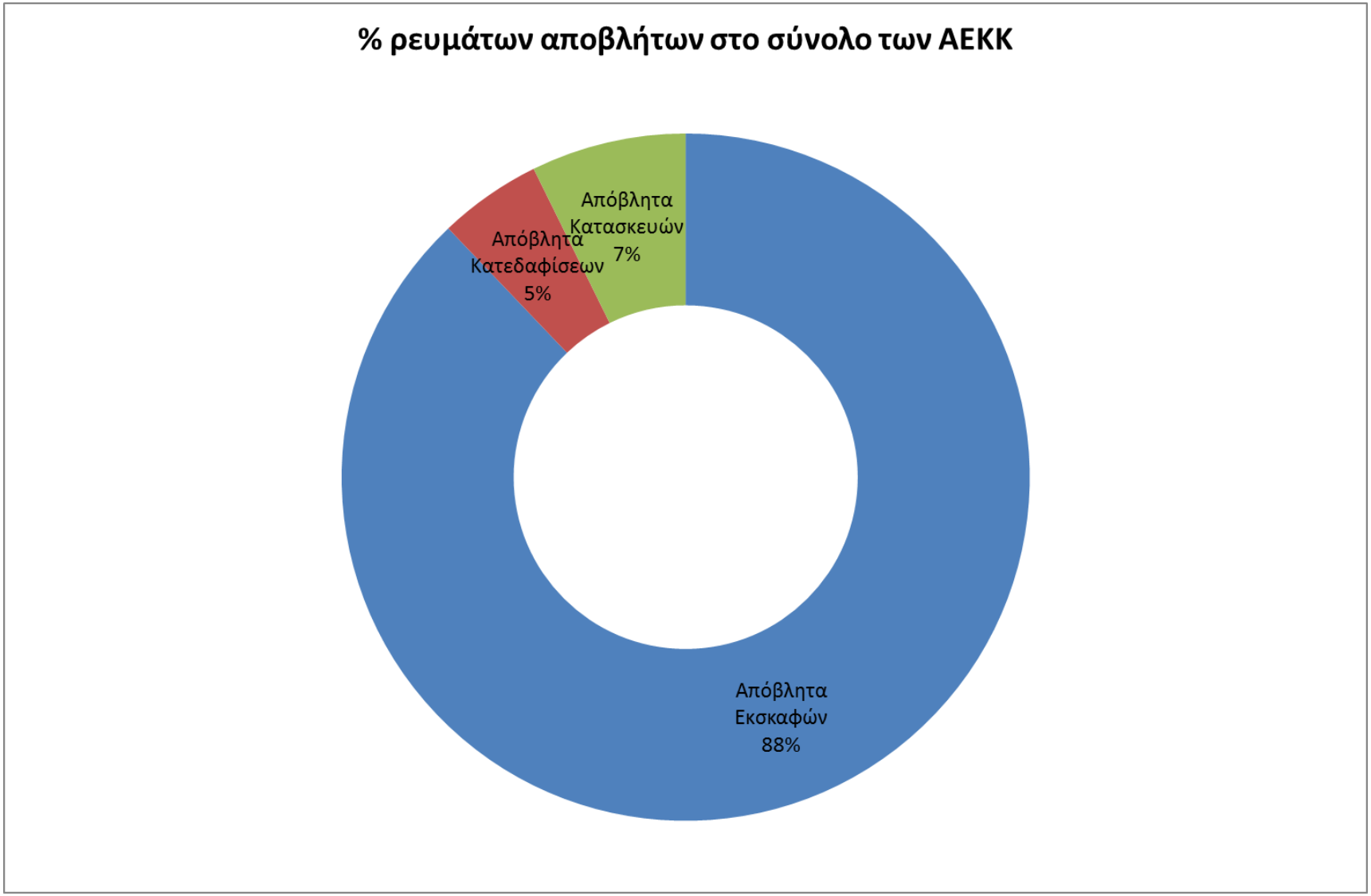
Methodology to develop the Model and equations

- Visit 30 worksites of buildings construction (i.e. the majority of buildings in Greece) in municipalities of the northern part of Athens (= high construction activity)
- Visit 1 quarry in Attica, which receives ECDW from building constructions
- Monitoring and measurements

ECDW generated quantities in Greece

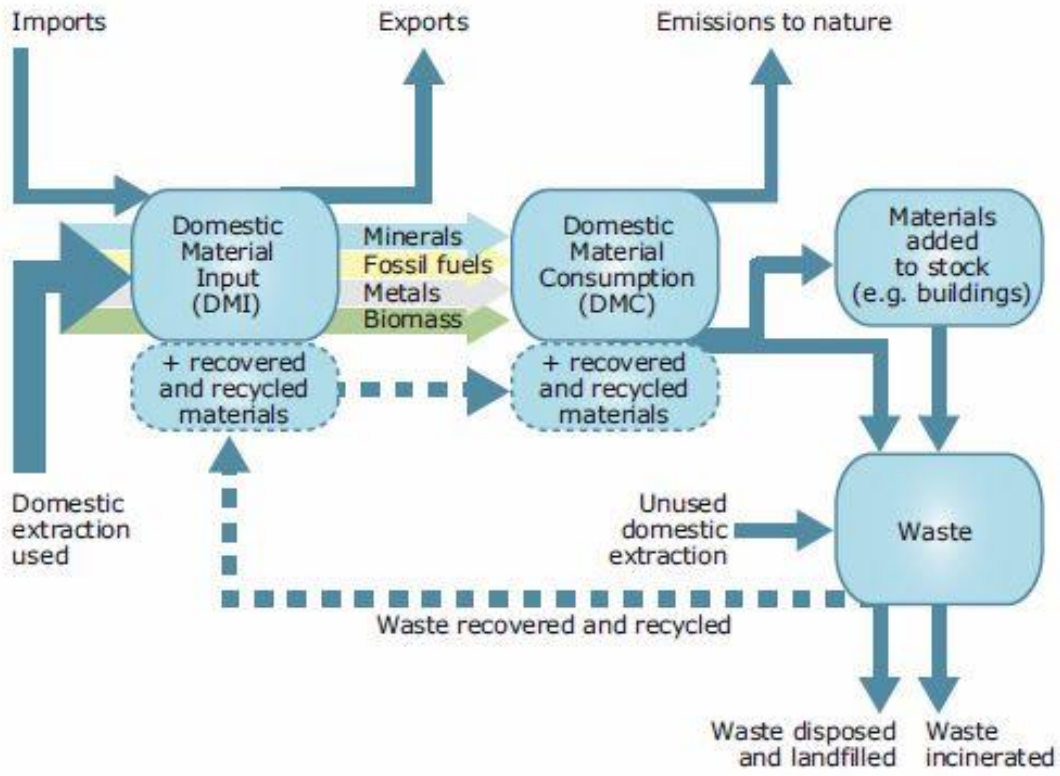


ECDW generated quantities in Greece



Resource management

- **From waste management to resource management:**
  - In Denmark where ~90% of ECDW are recycled, they consist only ~6% of the total materials used in new constructions.

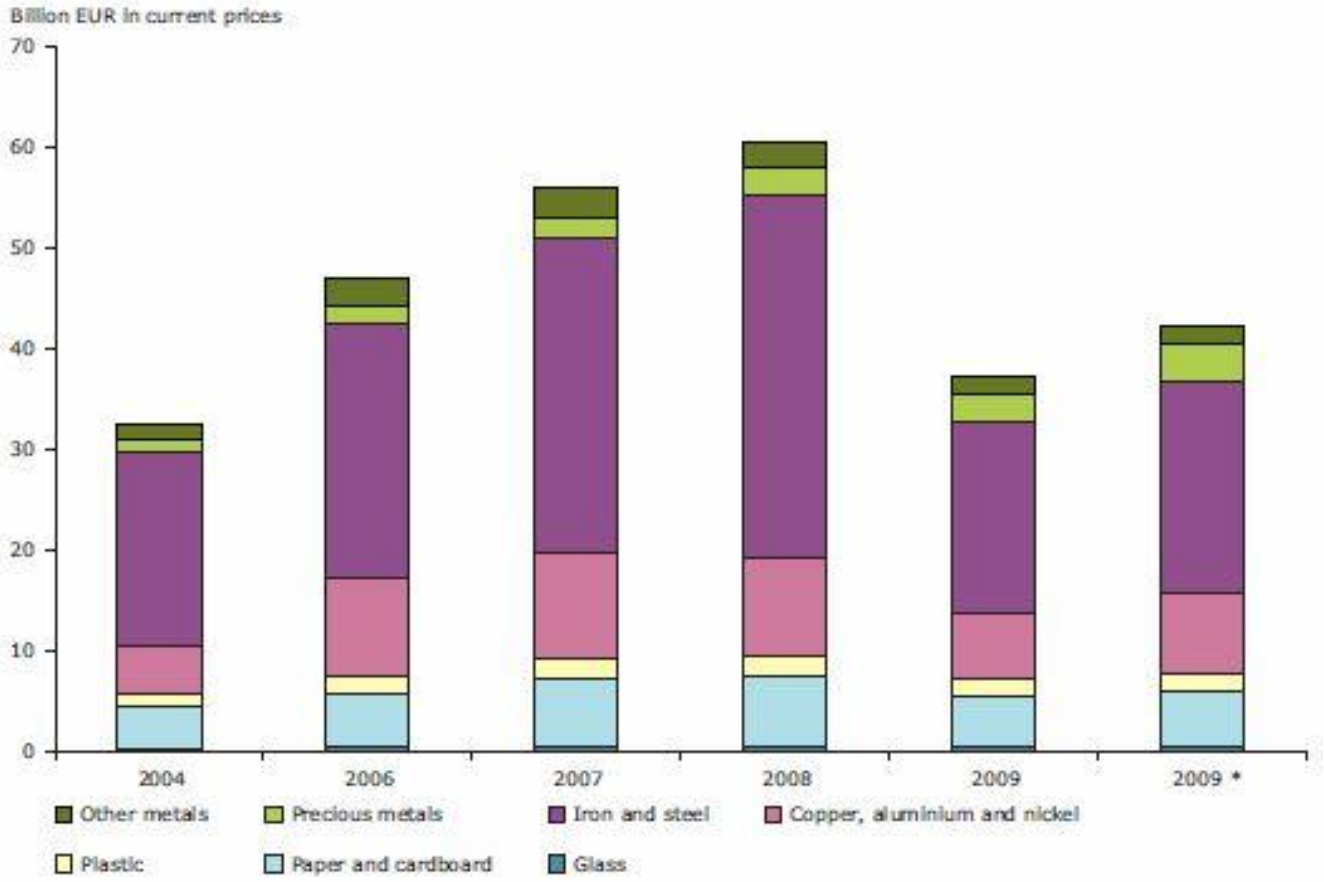


Source: European Environment Agency.

- **From resource management to commodities management**

Contribution of recycling to the economy

- **Number of employees:** in the recycling sector increased steadily ~7% annually, through 2000-2007
- **Sales of recycling materials in the E.U.**



Conclusions

- Large improvement potential in Greece
- More Units needed (after the recession)
- Serve the environment, serve the economy
- Set legislation for secondary materials (e.g. obligation to be used in large public infrastructure projects), in order to create the market for these materials

Questions & answers

Thank you for your attention!

For further information:

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