CONGRESO NACIONAL FUNDACIÓN LABORAL DEL CEMENTO Y EL MEDIO AMBIENTE

Recuperar residuos como garantía de futuro

WASTE CO-PROCESSING IN CEMENT PLANTS

THE EUROPEAN EXPERIENCE

Madrid, 30 October 2012

Dr. Jean-Marie Chandelle

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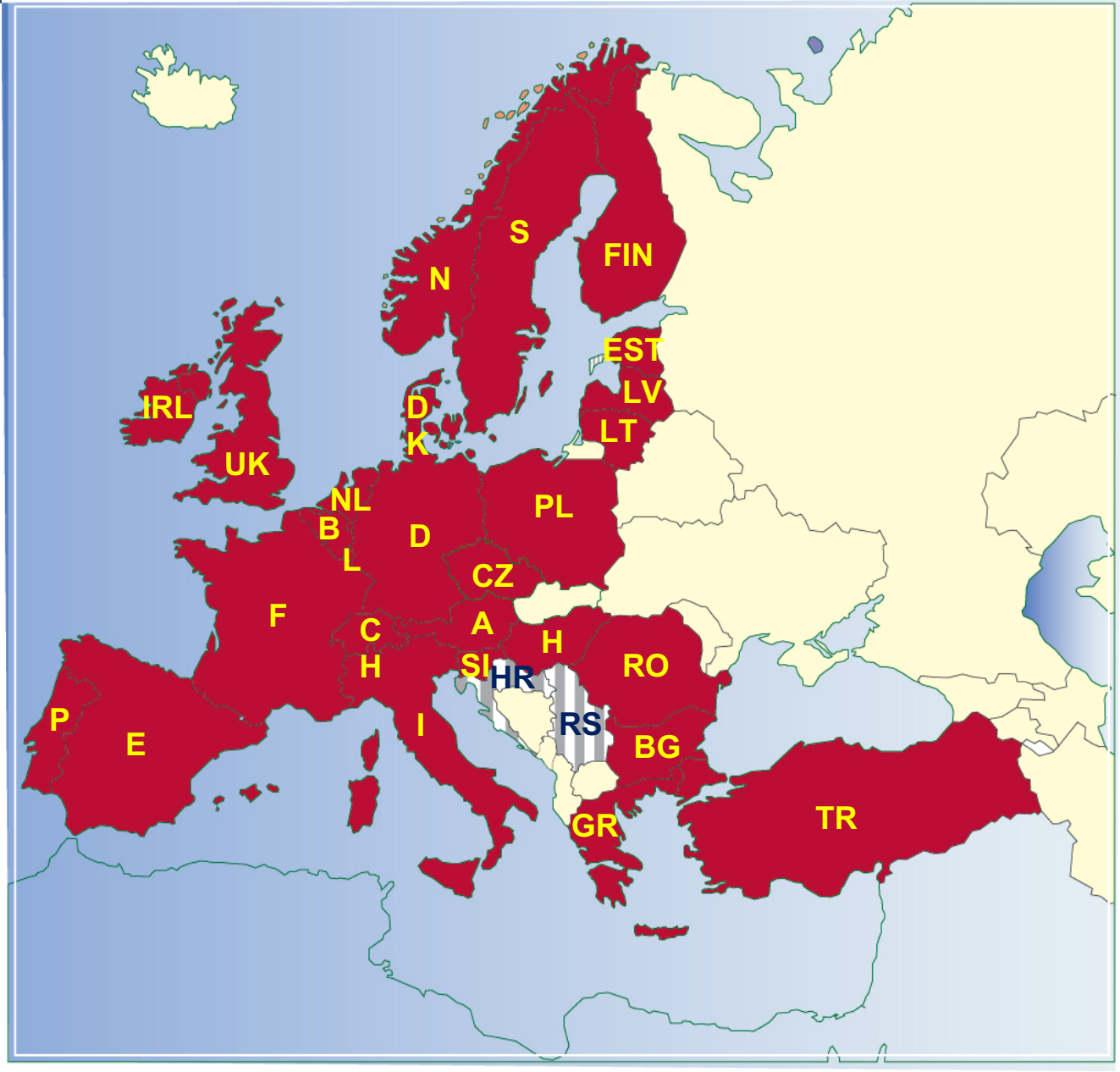

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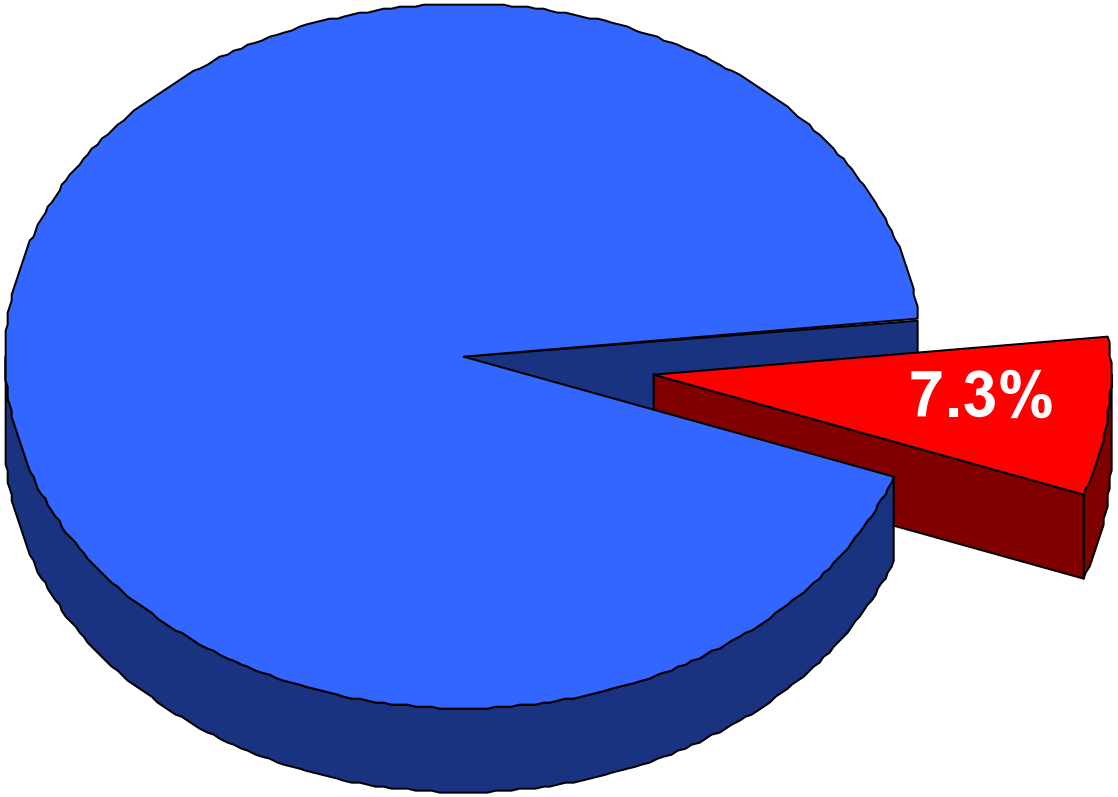
WORLD CEMENT PRODUCTION - 2011

3.6 Billion tonnes

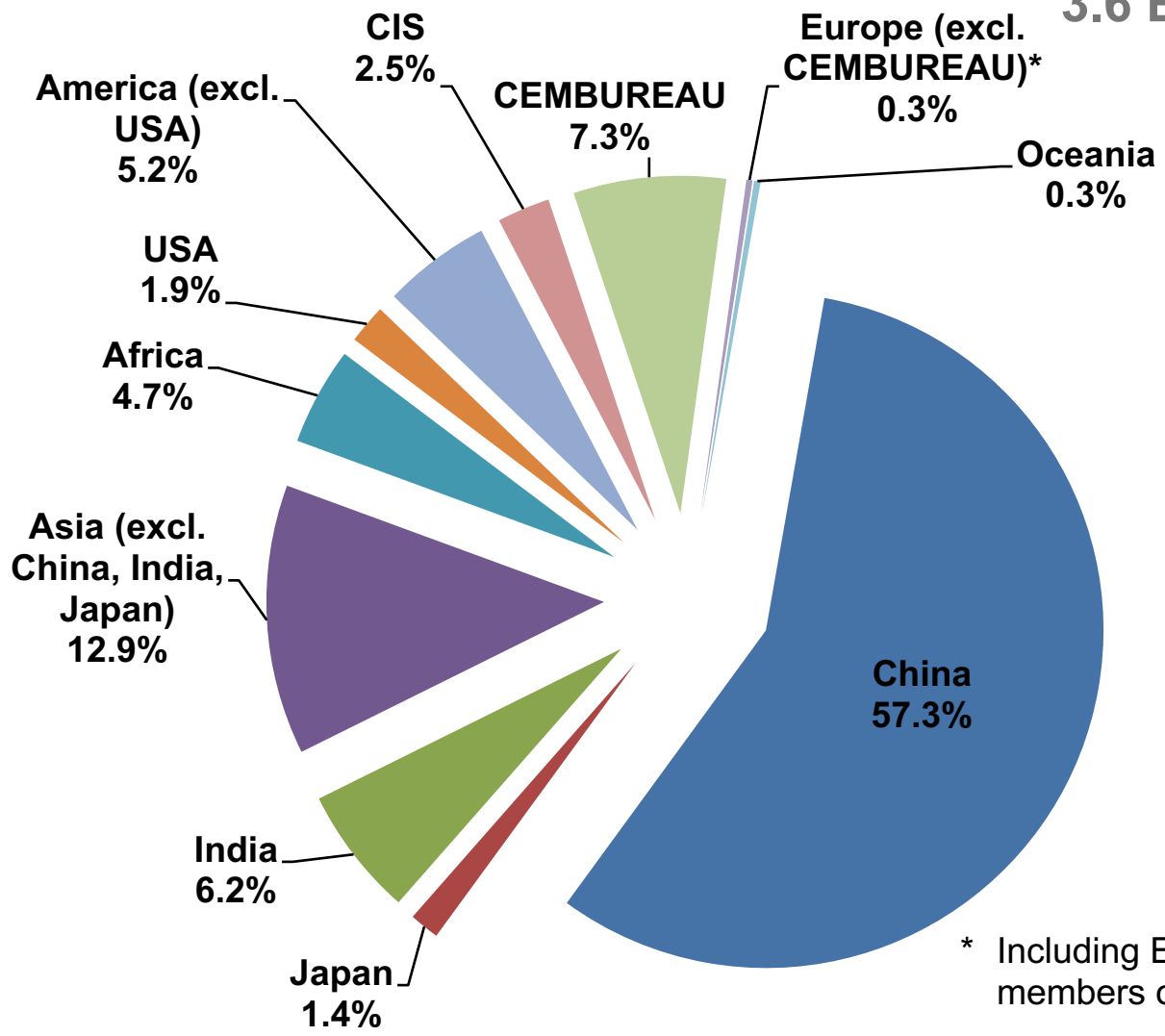


CEMBUREAU

WORLD CEMENT PRODUCTION - 2011

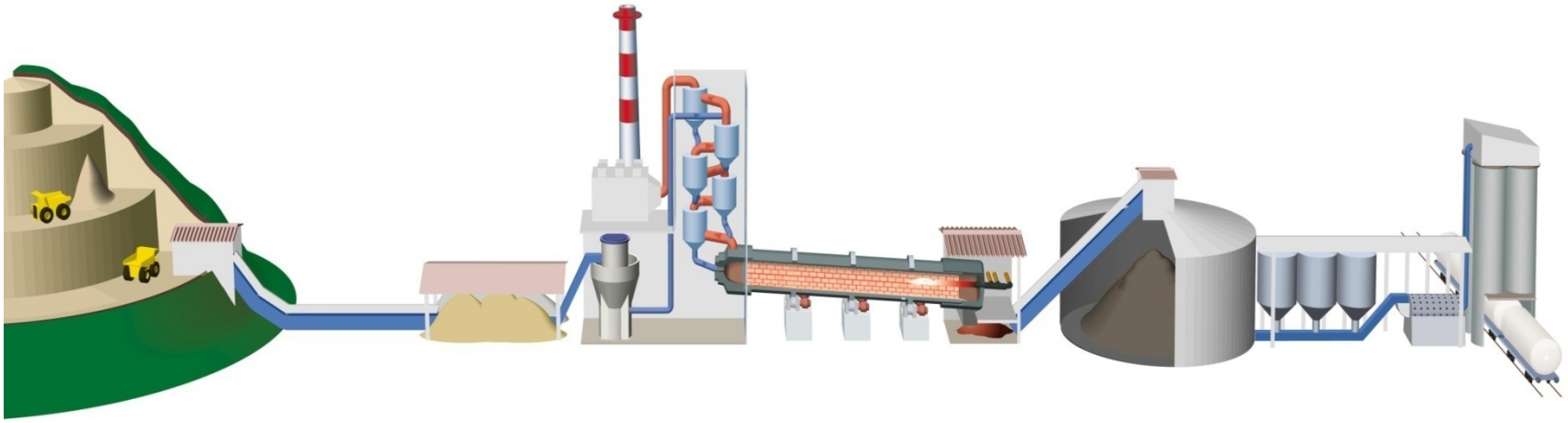
3.6 Billion tonnes

by region and main countries



* Including EU27 countries not members of CEMBUREAU

CEMENT MANUFACTURING – MAIN PHASES



1) Preparation of raw materials into raw meal (Extraction – Crushing – Pre-homogenisation - Dosing – Grinding – Homogenisation)
2) Clinker production – pyro-processing of raw materials (calcination of the raw meal into the rotary kiln – energy supplied by burning fuels)
3) Cement production - grinding of clinker and mineral components to obtain cement

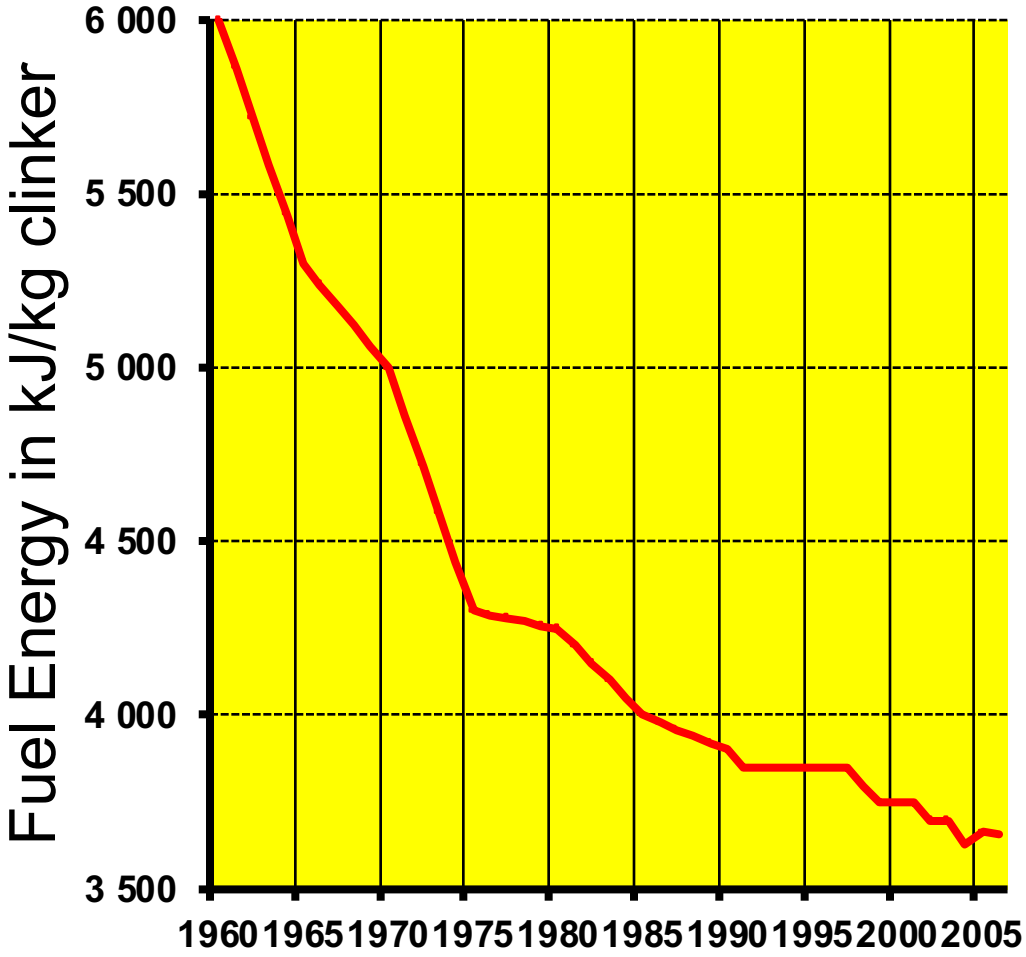
AN ENERGY INTENSIVE INDUSTRY

One metric tonne of cement

- 60 - 130 Kg of fuel oil (or equivalent fuelling amount)
- The world has only limited amount of fossil based fuels
- Sustainable development: “To meet the needs of the present without compromising the ability of the future generation to meet their own needs”
- Take measures in order to save “some” resources for the future generation

REDUCTION OF SPECIFIC ENERGY

Development of the specific fuel energy consumption in CEMBUREAU countries since 1960



Source: CEMBUREAU EL December 07

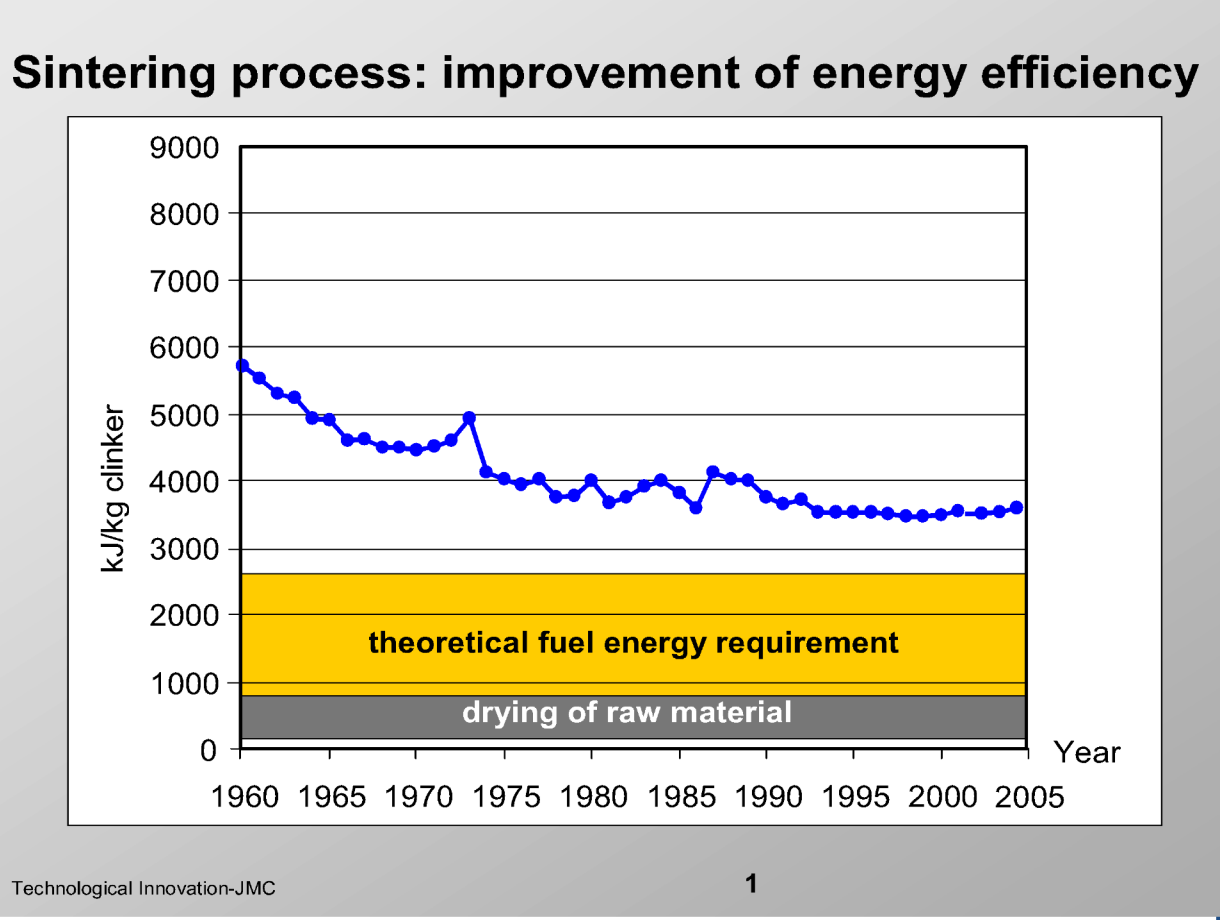
REDUCTION OF SPECIFIC ENERGY

Remaining potential for specific energy consumption reduction through technological innovation and process improvement

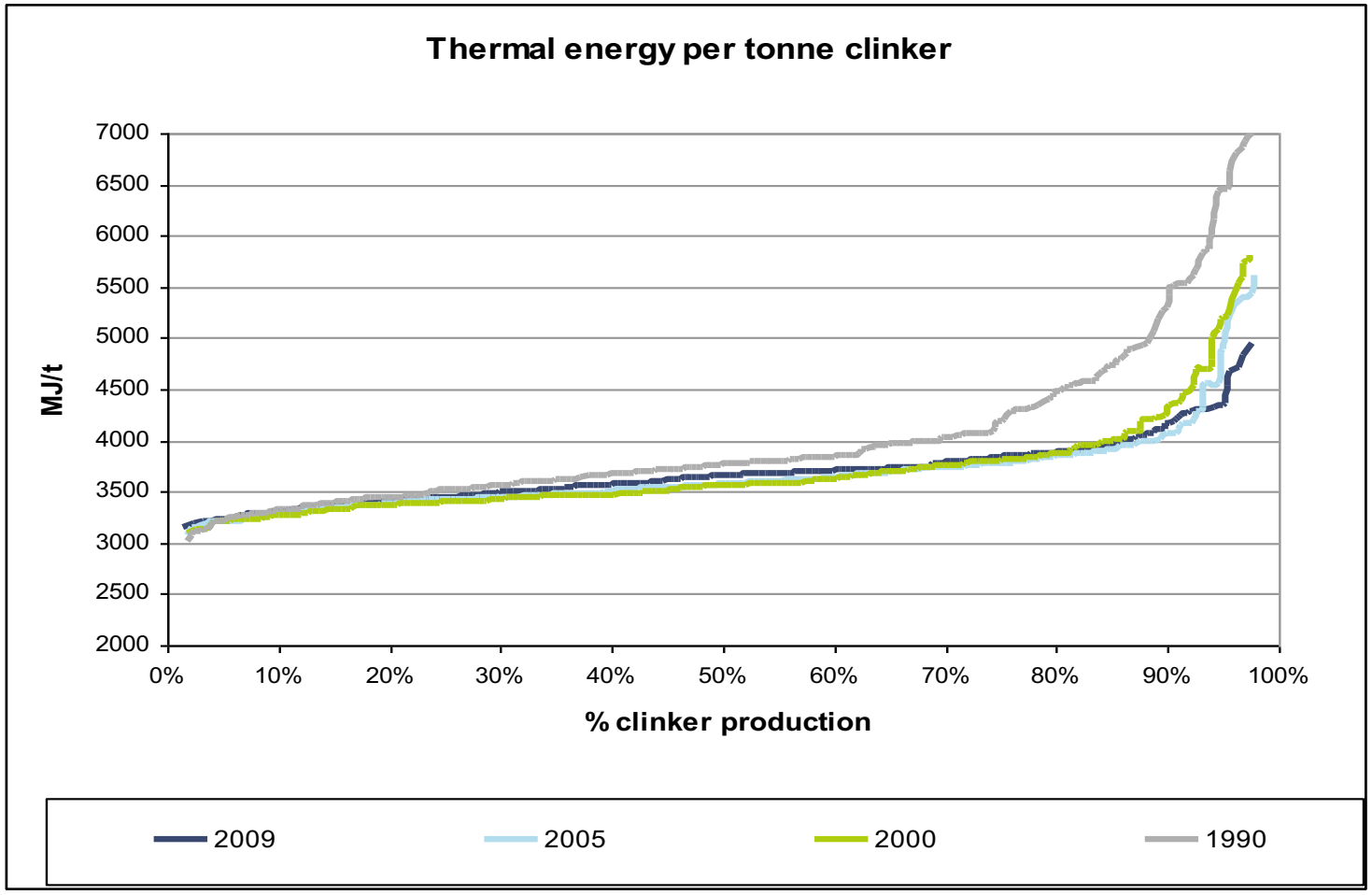
⇓

LESS THAN 2%!

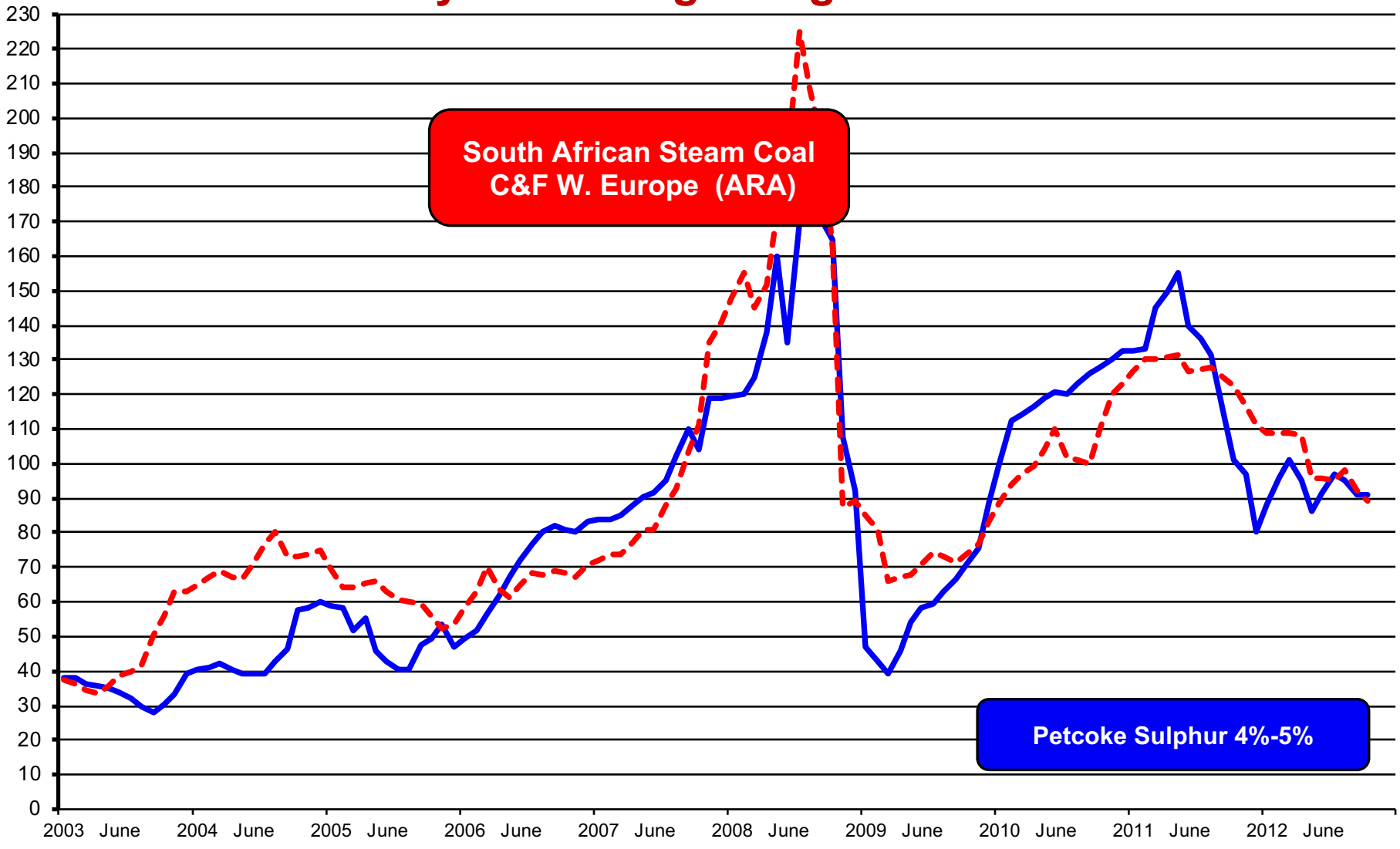
⇒Alternative fuels!⇐



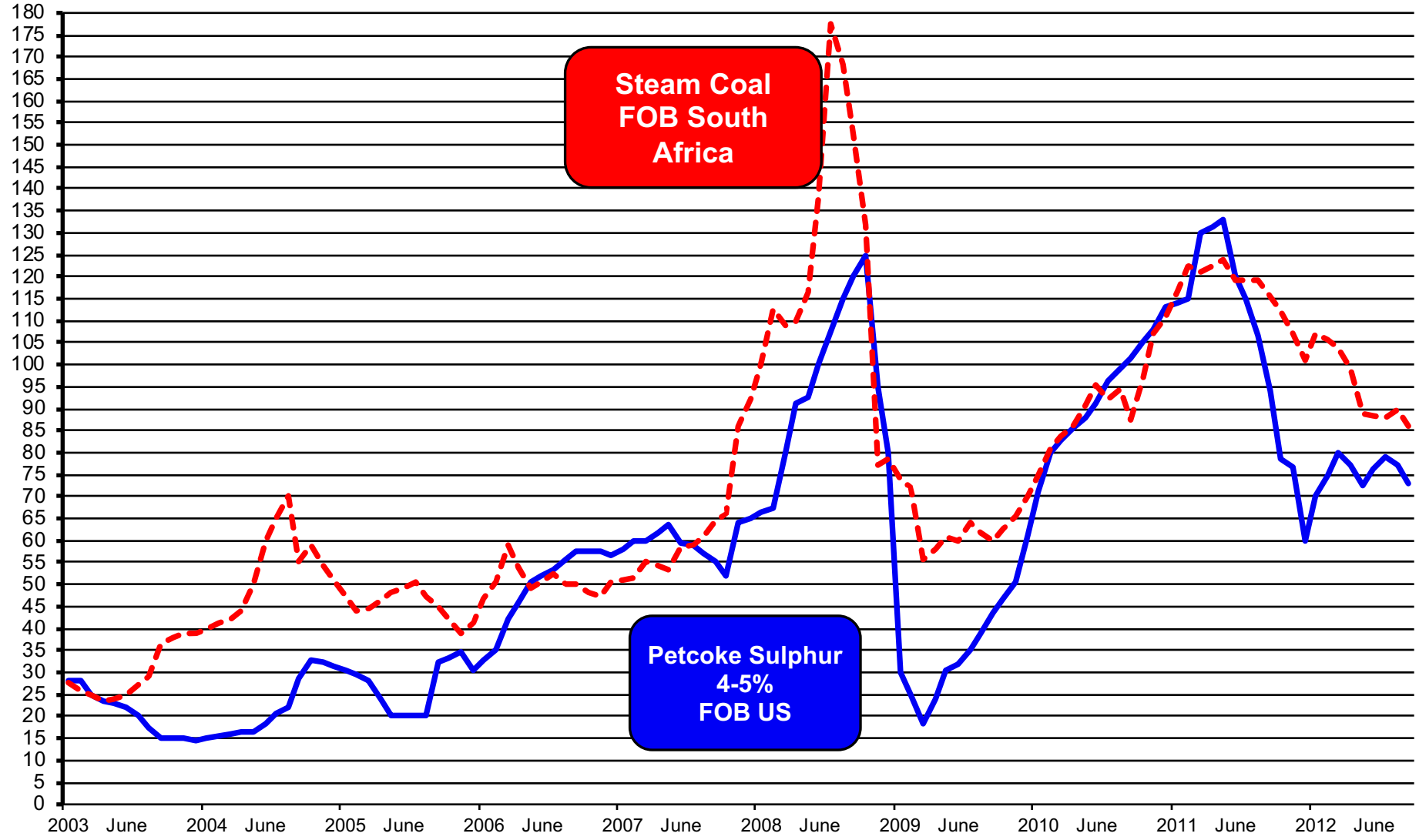
Year: 2009
Region: EU 27
Company: All GNR participants



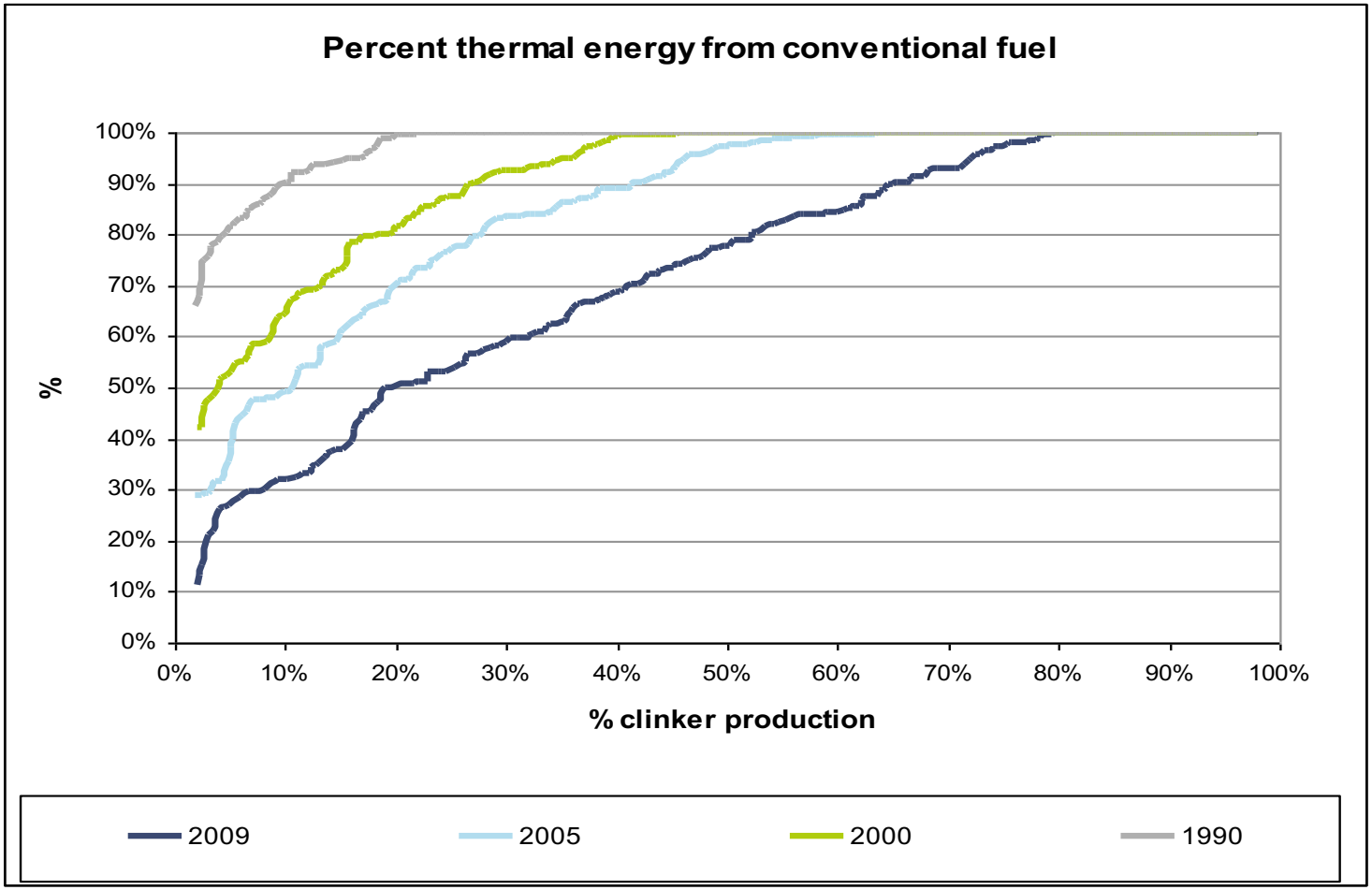
STEAM COAL & PETCOKE PRICES – C&F
January 2003 - Beginning October 2012



STEAM COAL & PETCOKE PRICES – FOB
January 2003 - Beginning October 2012

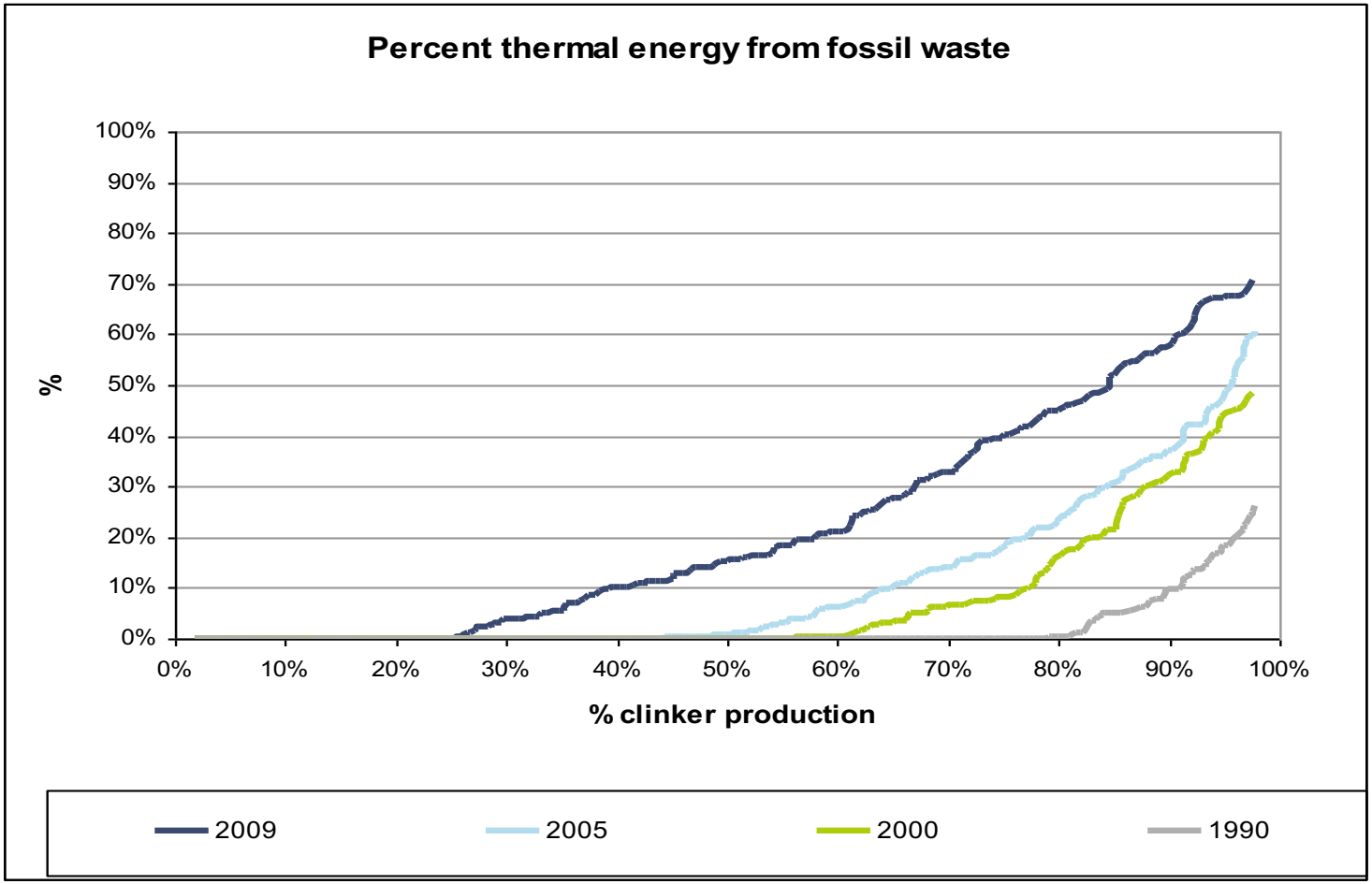


Year: 2009
Region: EU 27
Company: All GNR participants

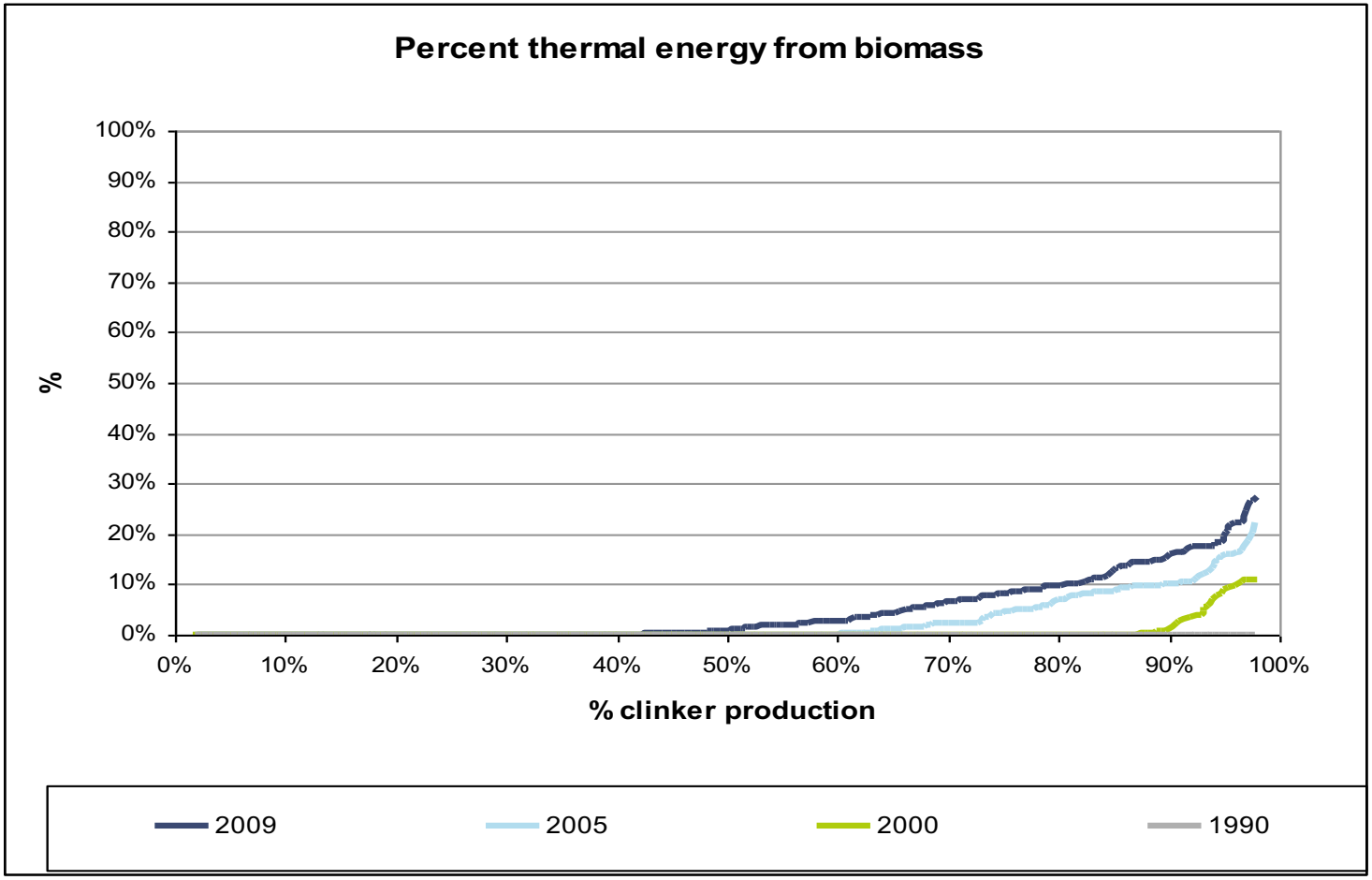


CEMBUREAU - *"Getting the Numbers Right"*

Year: 2009
Region: EU 27
Company: All GNR participants



Year: 2009
Region: EU 27
Company: All GNR participants



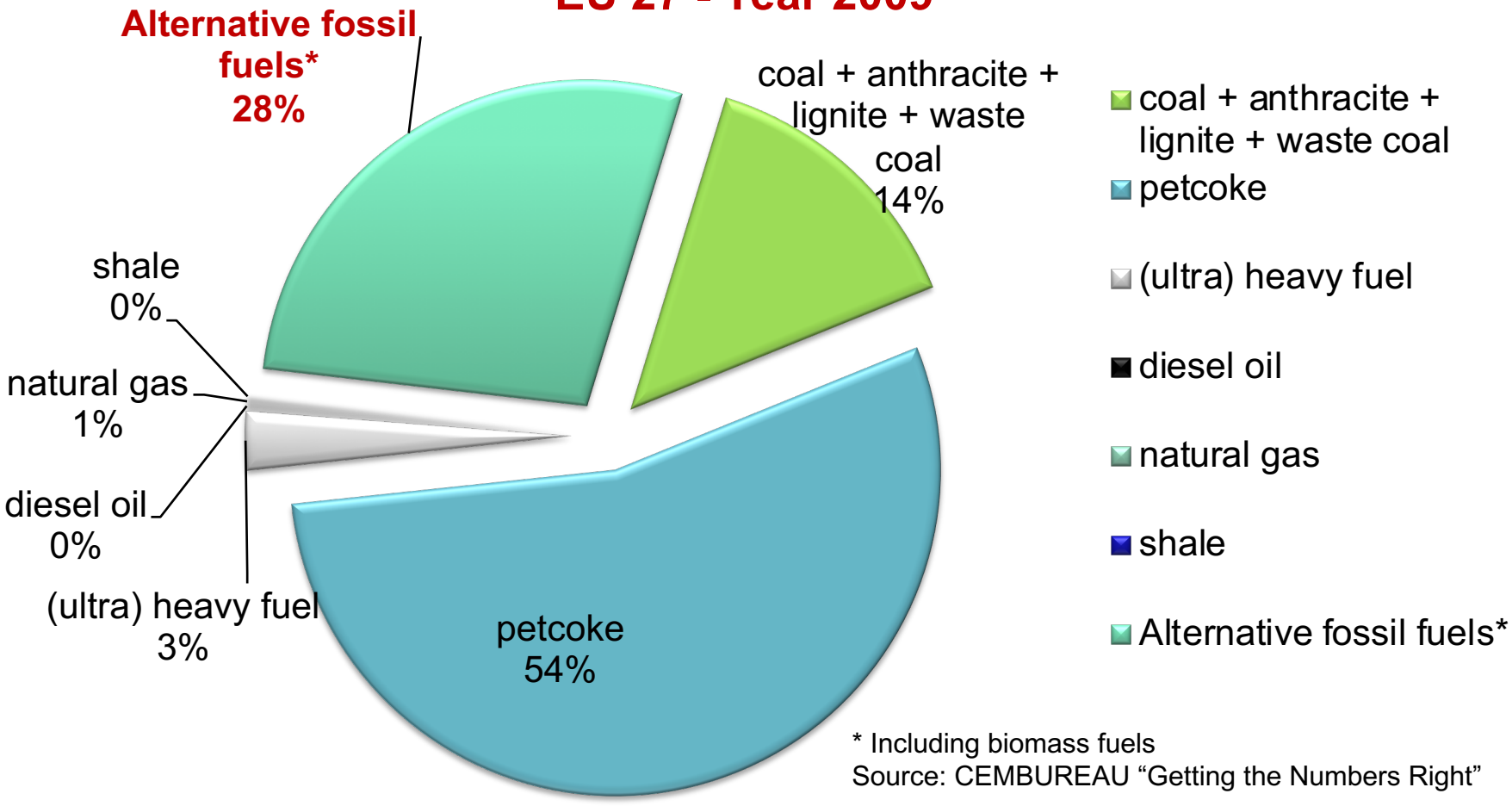
COULD WASTE BE THE SOLUTION ?

Homogeneous waste can be effectively recovered energetically and/or materially by co-processing in the cement - making process

- as alternative fuels (co-processing of waste)
- as alternative raw materials
- as mineral components

ALTERNATIVE FUELS

Thermal energy consumption
EU 27 - Year 2009

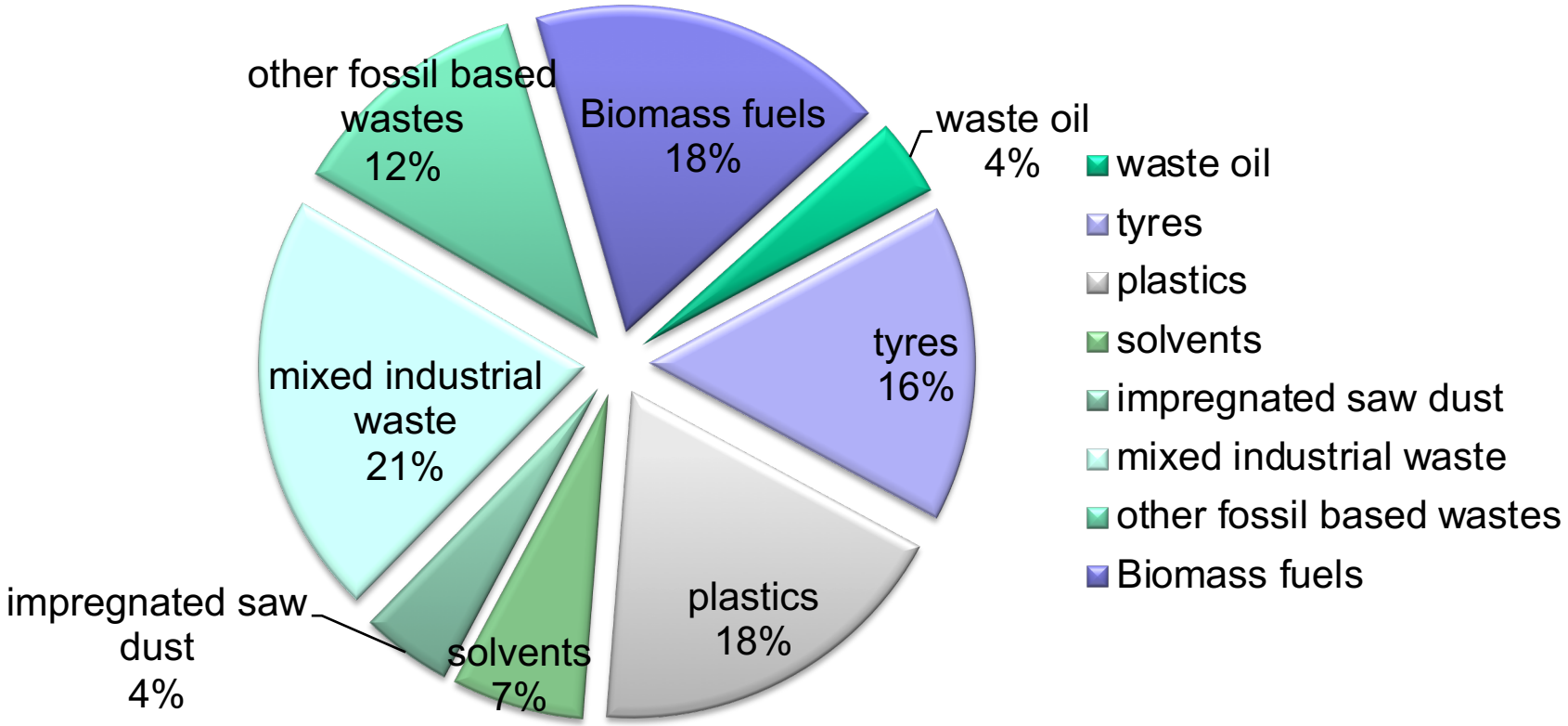


* Including biomass fuels

Source: CEMBUREAU "Getting the Numbers Right"

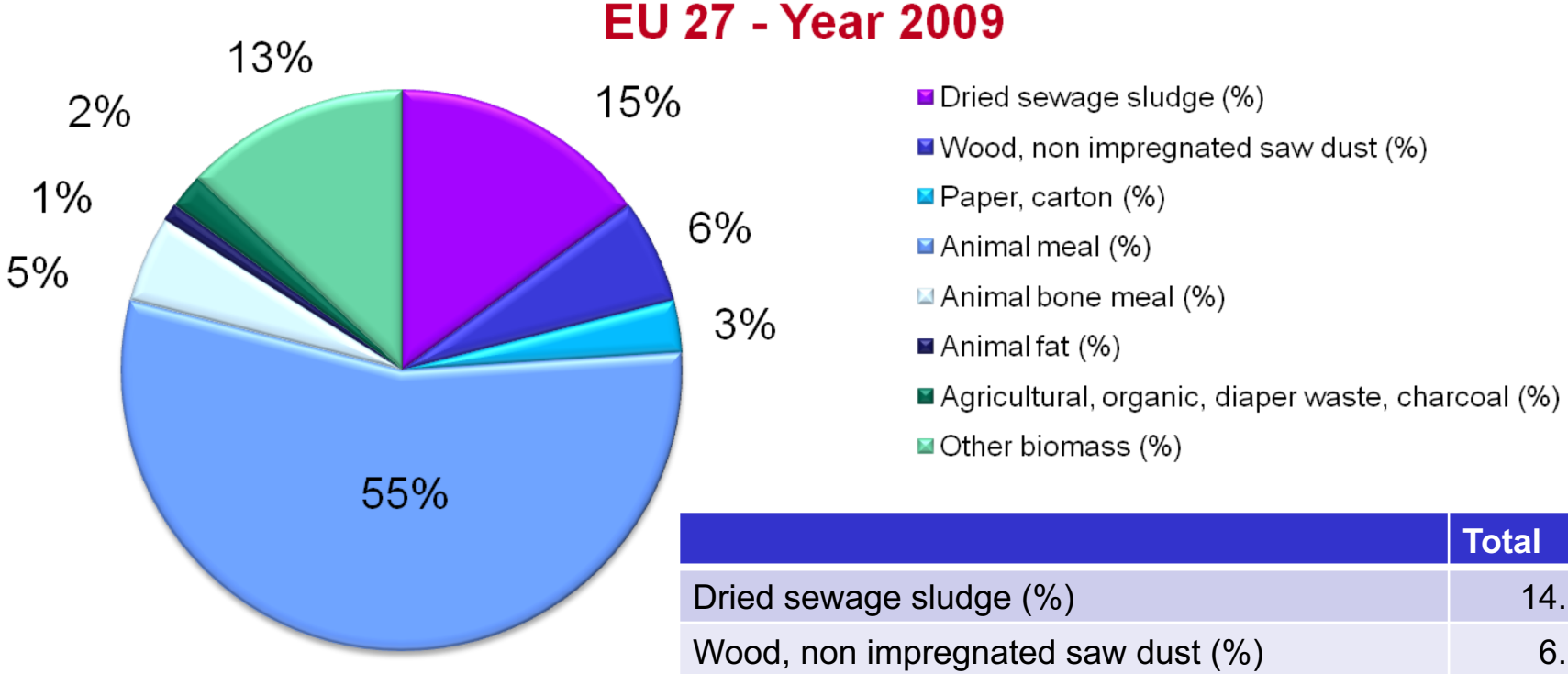
ALTERNATIVE FUELS

Consumption of alternative fuels
EU27 - Year 2009



Source: CEMBUREAU “Getting the Numbers Right”

BIOMASS FUELS



	Total
Dried sewage sludge (%)	14.80%
Wood, non impregnated saw dust (%)	6.30%
Paper, carton (%)	3.50%
Animal meal (%)	54.60%
Animal bone meal (%)	5.30%
Animal fat (%)	0.70%
Agricultural, organic, diaper waste, charcoal (%)	1.90%
Other biomass (%)	13.00%

EXAMPLES OF WASTE CO-PROCESSED IN CEMENT PLANTS

Alternative Fuels

- waste oil, waste wood
- sewage sludge
- waste tyres
- plastics
- animal meal
- solvents
- impregnated saw dust

Alternative Raw materials

- foundry sands
- contaminated soil
- waste from road cleaning
- iron-, aluminium-, silica- containing wastes

Clinker Substitute
(Mineral Components)

- fly ash (power generation)
- artificial gypsum (flue gas cleaning)
- ground slag (steel industry)

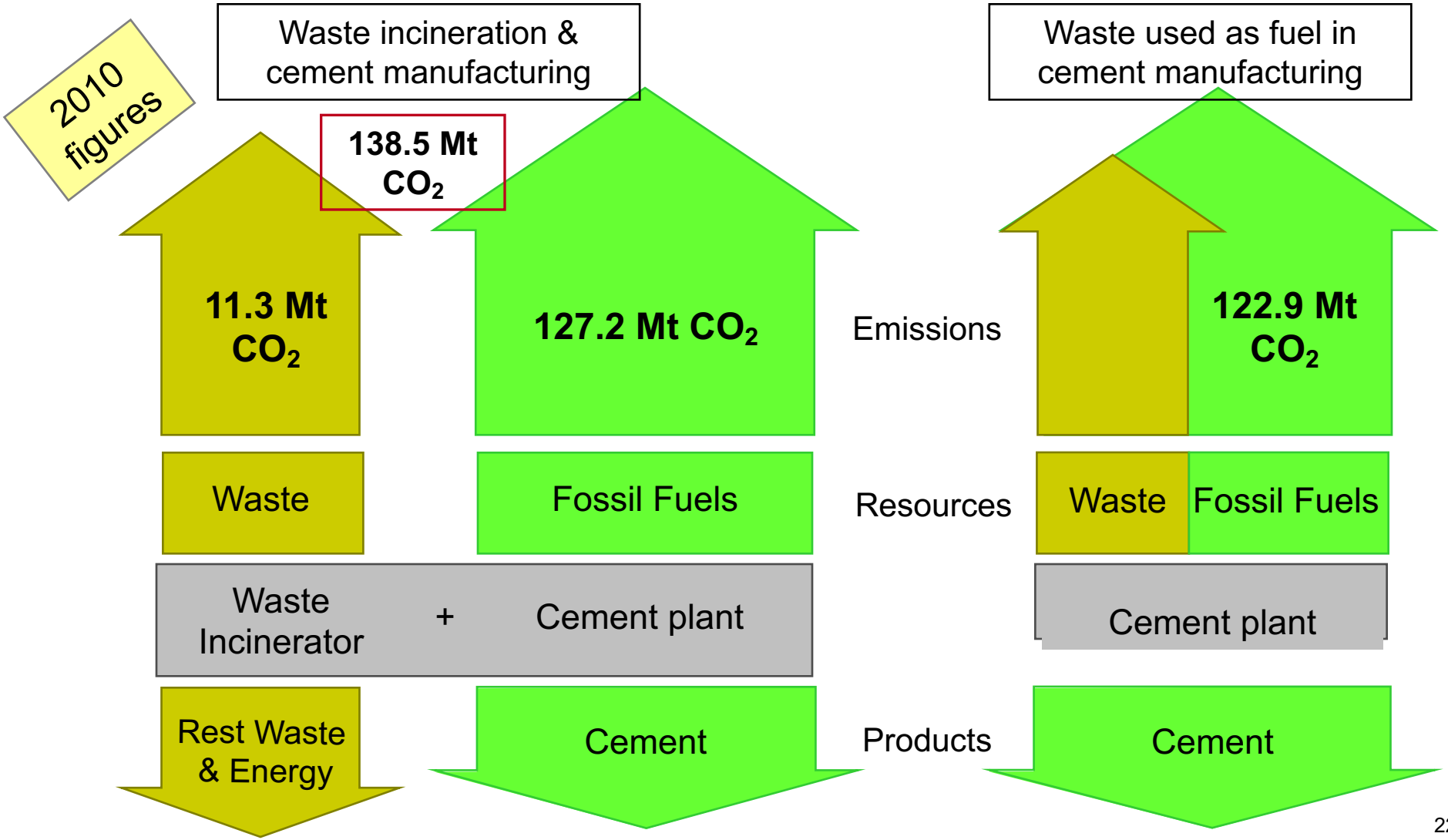
Auxiliary Materials

- water containing ammonium (for de-NO_x)
- water containing solvents
- water from photo chemical process

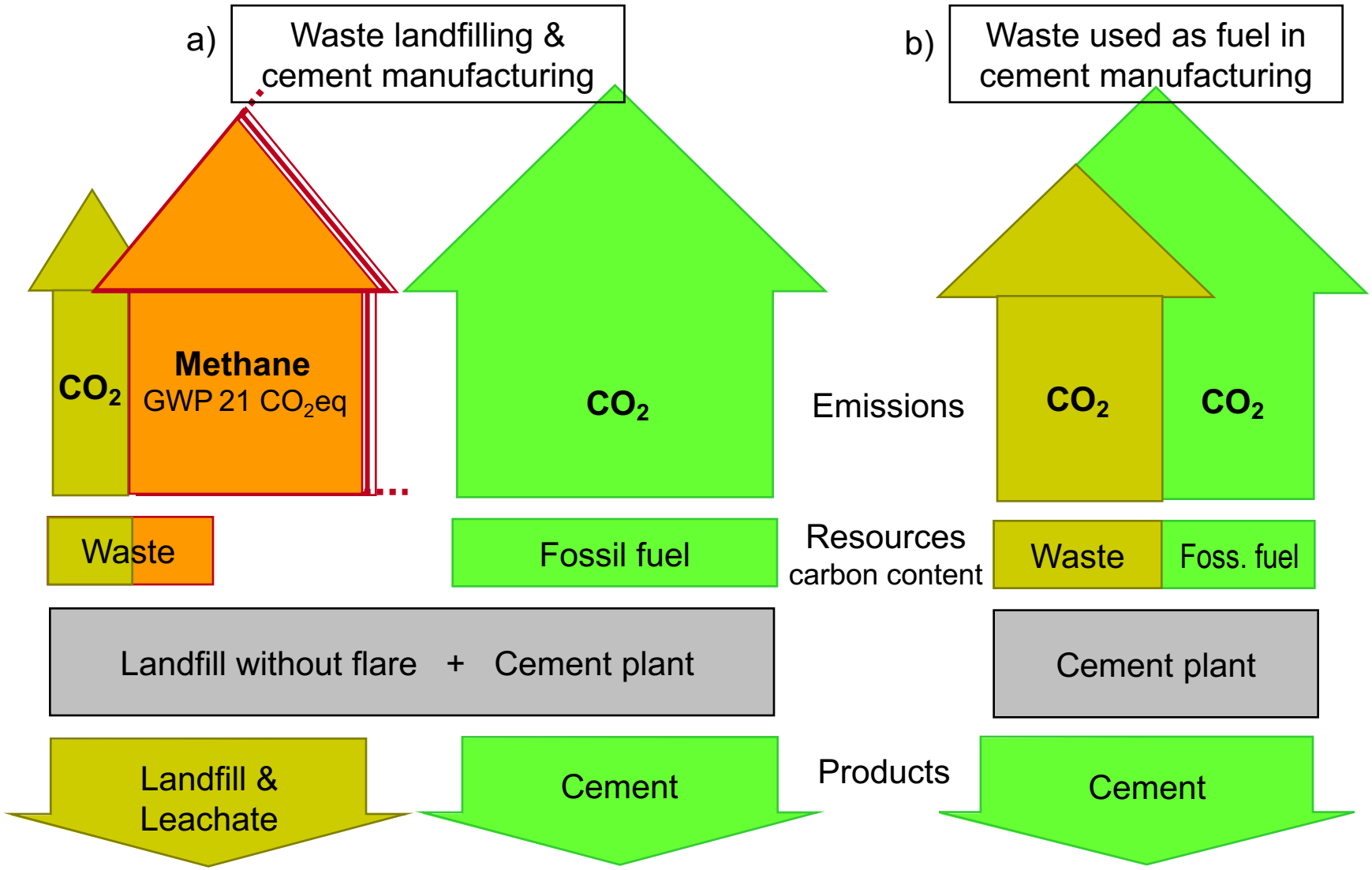
BENEFIT TO THE ENVIRONMENT

- 4 million tonnes of coal saved every year
- Lower global CO_2 emissions

THE USE OF WASTE & BIOMASS INSTEAD OF FOSSIL FUEL IN THE CEMENT INDUSTRY REDUCED EUROPEAN ABSOLUTE EMISSIONS BY 15.6 MT/YEAR

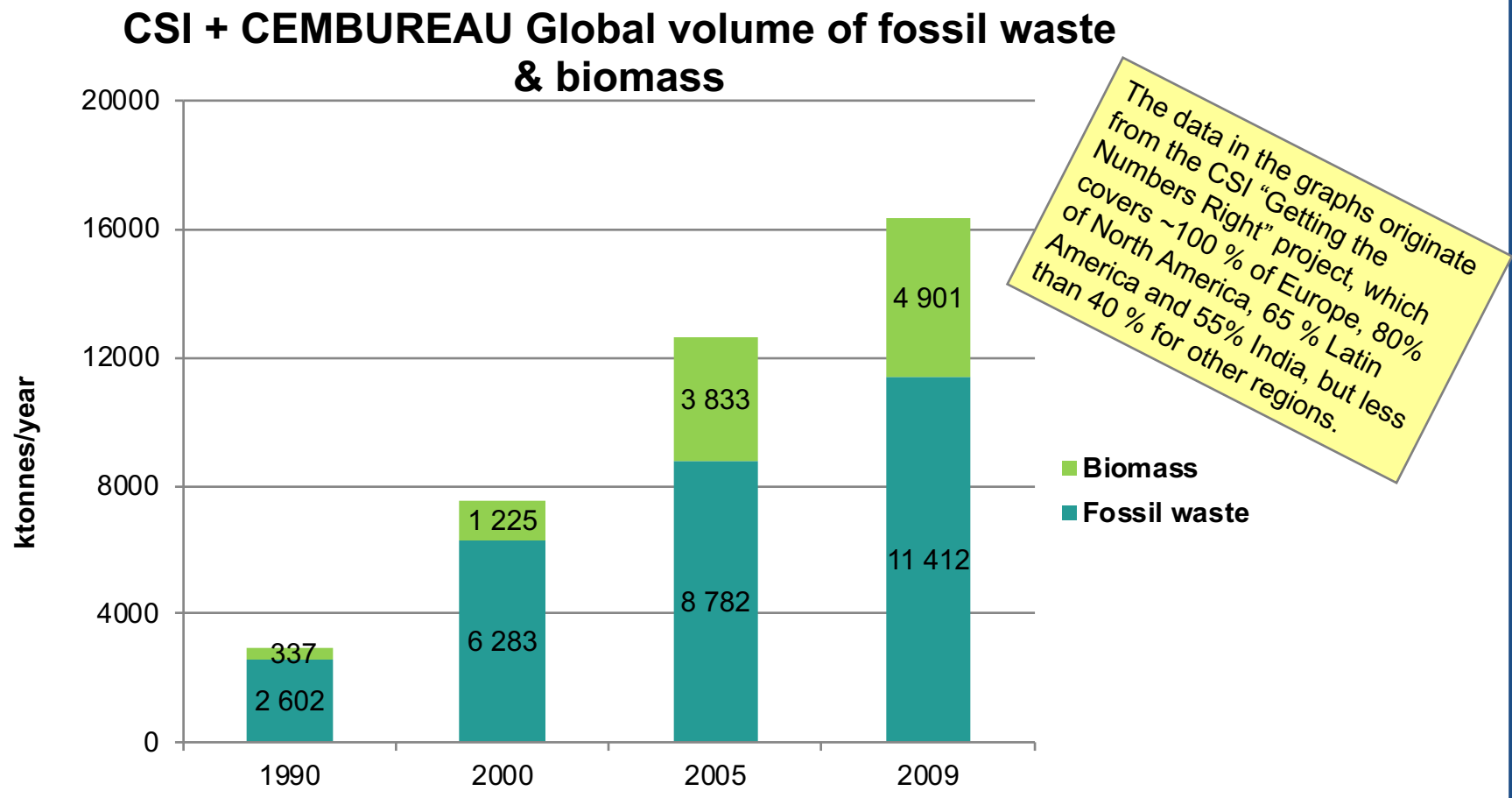


THE USE OF SOLID WASTE IN A CEMENT PLANT (B) PREVENTS METHANE EMISSIONS IN A LANDFILL (A), GWP=21 CO_2EQ.



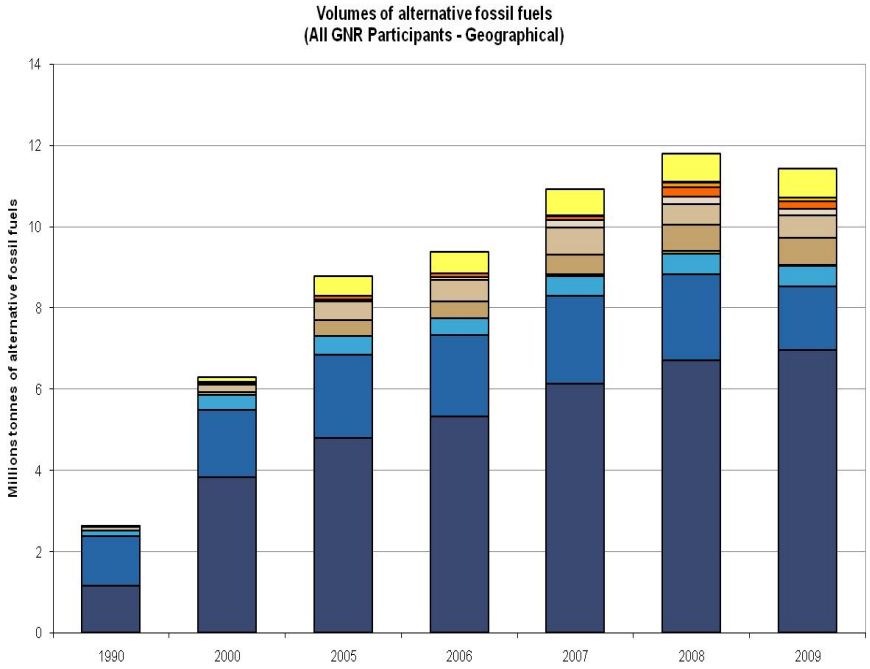
VOLUMES OF FOSSIL WASTE AND BIOMASS USED BY THE GLOBAL CEMENT INDUSTRY (CSI + CEMBUREAU) GREW MORE THAN 5 TIMES IN 19 YEARS TIME

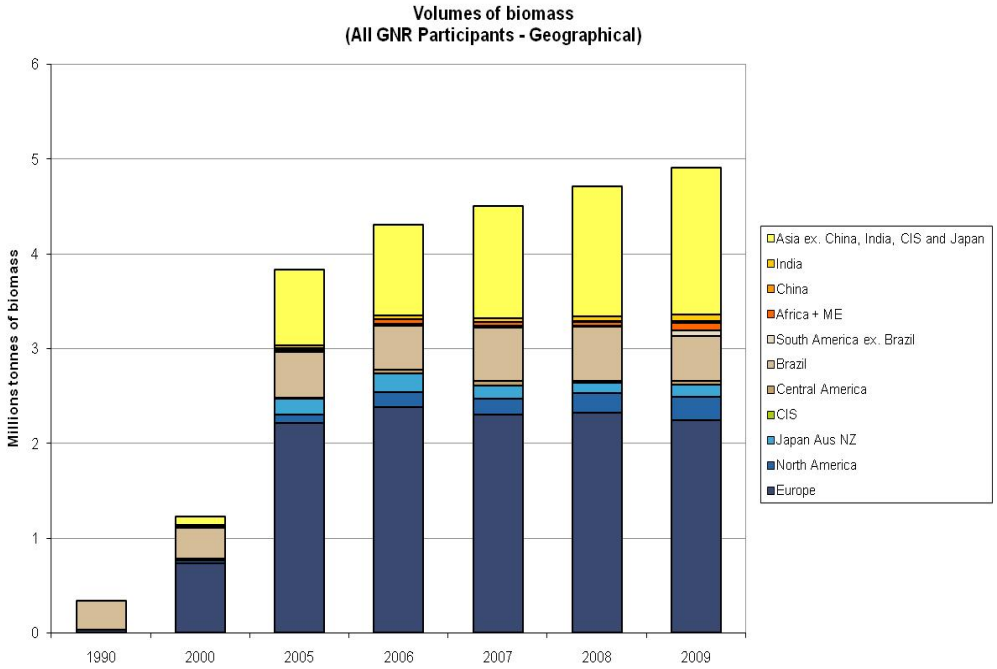
Data from the CSI "Getting the Numbers Right" system



- In 2009 the cement industry recovered 16.3 million tonnes of waste
- The use of fossil waste grew fast between 1990 and 2000, whereas biomass grew fast since 2000

THE EUROPEAN CEMENT INDUSTRY RECOVERS THE LARGEST VOLUMES OF WASTE AND BIOMASS





- Europe accounts for 61 % of fossil waste and 46 % biomass recovered in the global cement industry (however, GNR covers 100 % of Europe, 80 % of NA and < 50 % non-Annex 1)
- Very important growth of biomass use in Europe from 2000 to 2005, is probably animal meal and – fat, which is a temporary source

ALTERNATIVE FUELS: CO_2 EMISSIONS AVOIDED

YEAR	SUBSTITUTION RATE	CO_2 EMISSIONS AVOIDED BY FOSSIL FUELS
1990	3%	1.6 Mt
2005	15%	9.3Mt
2010	**31%**	**15.6 Mt**

BENEFITS TO LOCAL COMMUNITIES

- No capital cost
- Lower operating costs
- A safe -strictly regulated- solution

BENEFIT TO THE CEMENT INDUSTRY

- Long term viability – in an era with fewer and fewer fossil natural resources
- From “Polluter image” to “Supplier of safe waste solution”

STRICT REGULATION AT EU LEVEL

- Formerly Incineration of Waste Directive (2000/76/EC)

  transposed into national laws by 28 December 2002

- IPPC & IWD now recast together in Industrial Emissions Directive (2010/75/EC)

INDUSTRIAL EMISSIONS DIRECTIVE

The Directive covers:

- Cement plants burning waste
- Hazardous waste and non-hazardous waste
- Waste oil, but the specific requirements for hazardous waste do not apply to waste oil (up for revision)

INDUSTRIAL EMISSIONS DIRECTIVE

The Directive prescribes obligations on:

- Application and permits
  - *Types and amounts of waste*
- Delivery and reception of waste
  - *Control*
- Operating conditions
  - *Gas temperature > 850 °C/1100 °C, 2 sec*
- Access to information
  - *Applications for permits, annual reports*

EMISSION LIMIT VALUES

The following emission limit values are provided for cement plants burning non-hazardous waste or less than 40% hazardous waste:

Total dust	**30**
Hydrogen Chloride (HCl)	**10**
Hydrogen Fluoride (HF)	**1**
NOx for existing plants	**800**
NOx for new plants	**500**
Cadmium (Cd) & Thallium (Tl)	**0.05**
Mercury (Hg)	**0.05**
Antimony (Sb), arsenic (As), lead (Pb),	**0.5**
Chromium (Cr), cobalt (Co), copper (Cu),	
manganese (Mn), nickel (Ni), vanadium (V)	
Dioxins and furans	**0.1**
Sulphur dioxide (SO_2)	**50**
Total Organic Carbon (TOC)	**10**

Exceptions may be authorised by the competent authority in case where TOC and SO_2 do not result from the incineration of waste

Limit values expressed as a daily average, 10% O_2, dry, mg/m^3 (dioxins ng/m^3)

WASTE FOR RECOVERY V. DISPOSAL

EU case law E.C.J

Waste Framework Directive (2008/98/EC)

→ co-processing of waste in cement plants
= recovery (≠ disposal)

because

- The combustible parts of the waste replace fossils fuels;
- The non-combustible parts of the waste replace raw materials;
- The energy efficiency in cement kilns is high;
- The environmental impact is low:
  - emission to air (strictly regulated)
    - kiln - preheater system - “neutraliser” of the acid gases
    - high temperatures assures complete combustion
  - there are no releases to soil (no ash and slag) or to water

REMAINING BARRIERS

- **At national level: EU Member States should take waste management seriously**
  - No incentives for collection and sorting of waste
  - No implementation of Waste Action Plans
  - No action versus illegal landfilling
  - No reduction of landfilling
- **Transport cost**

The key problem is a supply problem

NEW BARRIERS AT EU LEVEL

- EU Biomass Action Plan (Dec. 2006):
  Biomass ⇒ electricity and transport

- EU target 20% of renewables by 2020 (8-9 March 2007)
  ⇒ use of biomass fundamentally redirected

- EC Communication "*Innovating for Sustainable Growth: A Bioeconomy for Europe*" – 13 February 2012
  boost for bioeconomy – use of renewable biological resources as fuels and raw materials

END OF WASTE

- Lifting the Waste Status possible under EU Waste Framework Directive (2008/98/EC)
- Benefits:
  - EOW reduces the total volumes of waste in Member States
  - Creates a market for ex waste products
- Risks:
  - By passing strict waste legislation
  - Products more expensive than waste
- CEMBUREAU recognises that ***lifting the waste status*** could help some specific material recovery operations and ***may be justified for a limited selection of waste streams*** but insists that this is to be achieved only under ***strict conditions***

EOW: CEMBUREAU CONDITIONS

- Only non-hazardous, specifically defined waste streams should be considered for lifting of the waste status;
- The waste status must not be lifted for mixed waste;
- After treatment, the product must be free of contaminants, must not possess any environmental hazard and must fulfil all relevant limits to ensure an environmental sound further utilisation;
- The lifting of the waste status must only be considered once all recovery operations have been completed;
- The recovery operation to prepare for end-of-waste must take place in an installation having all necessary permits, especially a waste permit;
- The no-longer waste material should comply with all REACH applicable requirements, e.g. registration; and
- When the no-longer waste is processed outside the scope of waste legislation, it should be ensured that there are no adverse impacts for human health or the environment due to the absence of constraints as e.g. the emission limits from the IPPC Directive (Industrial Emissions Directive)

THE OBVIOUS CONCLUSION:

WASTE CO-PROCESSING IN CEMENT KILNS IS A SOUND WASTE MANAGEMENT POLICY

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