

THERMO-VALORISATION DES DÉCHETS : PILIER DE L'ÉCONOMIE CIRCULAIRE ET DE LA GESTION DURABLE DES RESSOURCES

*WASTE-TO-ENERGY : A SUSTAINABLE PILLAR OF CIRCULAR ECONOMY
& RESOURCE MANAGEMENT*



EUROPEAN FORUM FOR CIRCULAR ECONOMY (EFCE)
VIRTUEL – 13 & 14 Octobre 2020

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Vice Chair WGER ISWA(Working Group Energy Recovery)



SYCTOM PARIS XVII, FRANCE

CIRCULAR ECONOMY MECHANICAL WASTE TREATMENT FOR SORTING & MATERIAL RECYCLING

ENIM

Courtesy: Ateliers Monique Labbé

RECYCLING (MATERIAL-FROM-WASTE) IMPACT IN FRANCE WITH RECYCLED MATERIAL SHARE



66%

Paper
Industry



50%

Steel
industry



58%

Glass
industry



6%

Plastic
industry

«CIRCULAR ECONOMY PACKAGE »

SOURCE : LIDIA LOMBARDI , UNIV. ROME - MATER 2019 & D-WASTE

- ▲ DIRECTIVE (EU) 2018/851 OF THE EUROPEAN PARLIAMENT amending Directive 2008/98/EC on waste

/ “Improving the efficiency of resource use and ensuring that waste is valued as a resource can contribute to reducing the Union's dependence on the import of raw materials and facilitate the transition to more sustainable material management and to a circular economy model.”

- ▲ What are the critical RAW MATERIALS?
- ▲ What is the size of the CIRCLE?
- ▲ Where is the ECONOMY?
- ▲ Where is the POLLUTION?



« CIRCULAR ECONOMY » ORIGINS

... A « CHINESE INVENTION »



- ▲ Model formally adopted in 2002 in National Congress for “Eco-Industrial Development”
- ▲ China’s basic national policy according to 11th five-year plan 2006
- ▲ 2008 - China “Law for the Promotion of the Circular Economy”
 - / “Art 1...for the purposes of facilitating circular economy, raising resources utilization rate, protecting and improving environment and realizing sustainable development.
 - / Art 2 ...“C.E”. is a generic term describing the activities of decrement, recycling and resource recovery in production, circulation and consumption...”
 - / Art15 ...recycle those waste articles if possible, or make harmless treatment if those waste articles cannot be reused due to economic or technical restrictions.
- ▲ The « CIRCLE » size is « CHINA »!
- ▲ Chinese ban for our « Low quality recycled materials »/ our Waste!

RESOURCES FOR SUSTAINABLE DEVELOPMENT



SOURCE : CHARDONNENS
- BAFU 2020



Fossil fuel



Metals



Minerals

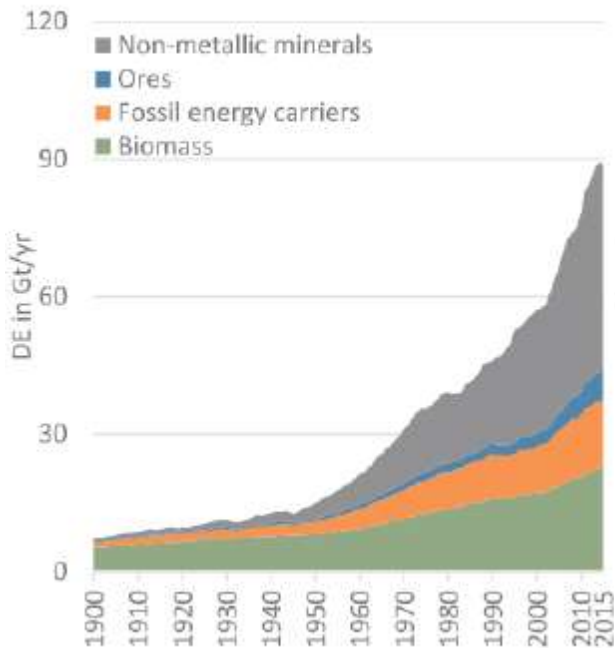


Biomass

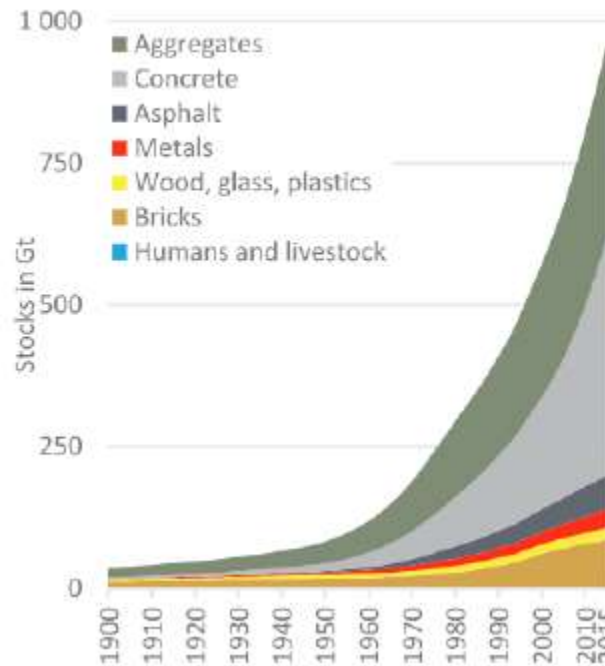
EXTRACTION OF RAW MATERIALS & USE IN THE WORLD

SOURCE : F.KRAUSMANN & AL. (2018) SOCIOECONOMIC METABOLISM OF GLOBAL ECONOMY

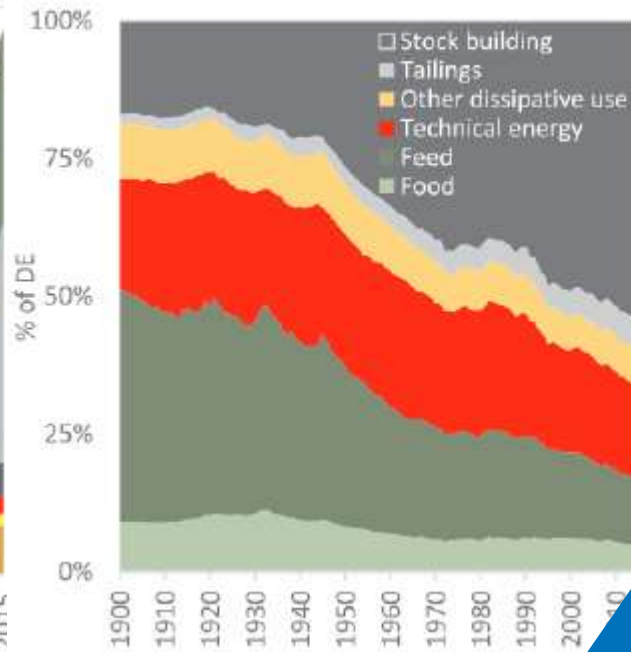
Extraction (DE)



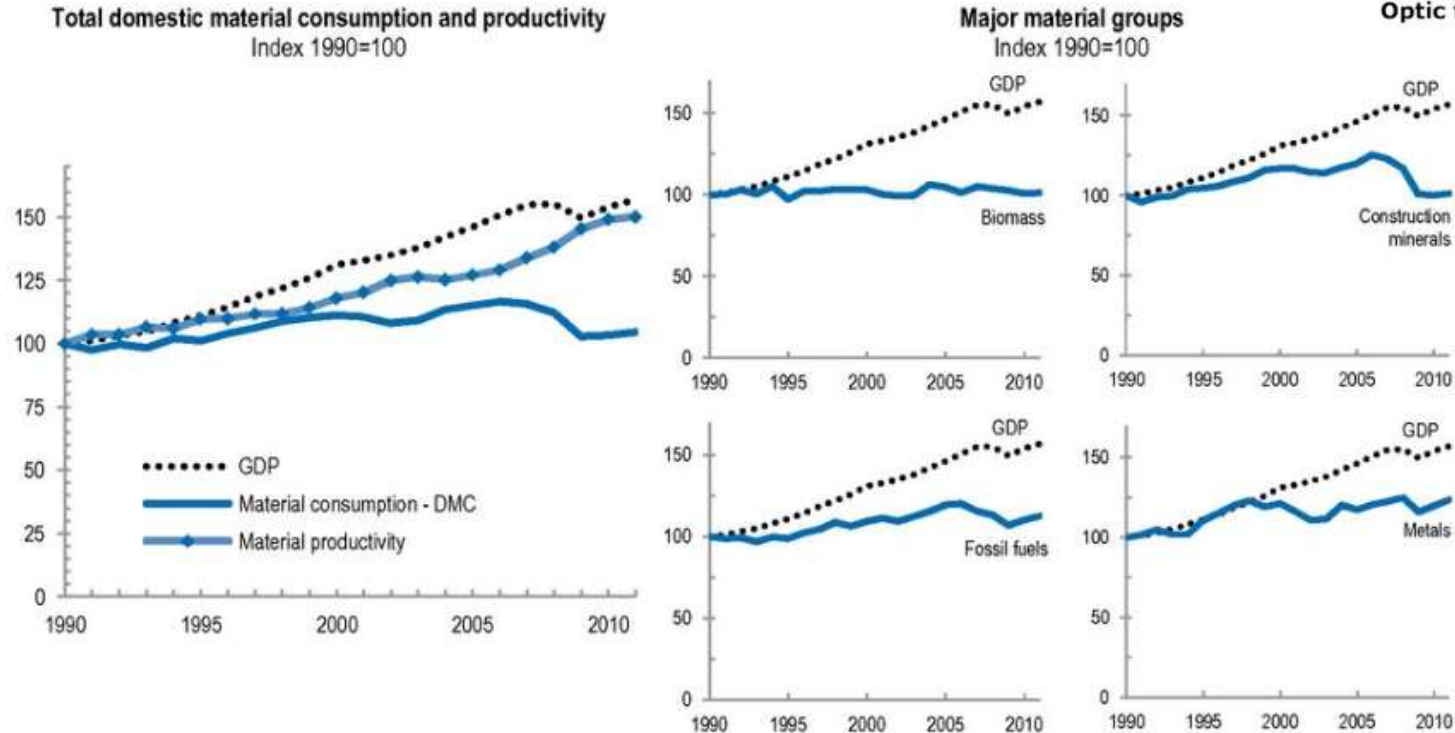
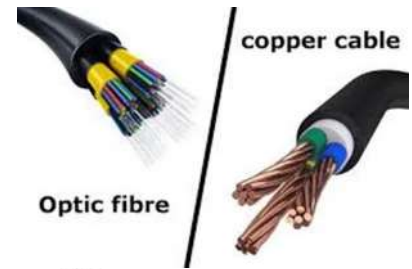
D Stocks



B Material use

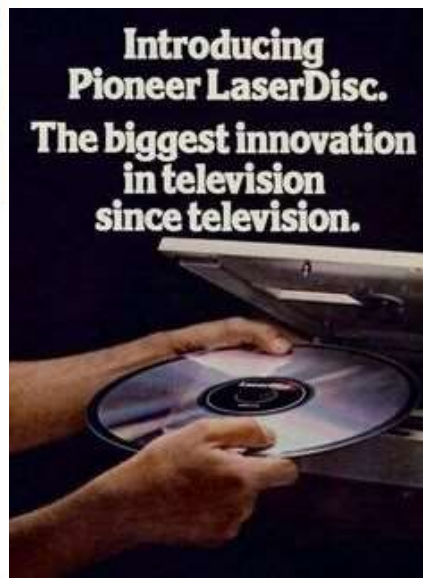
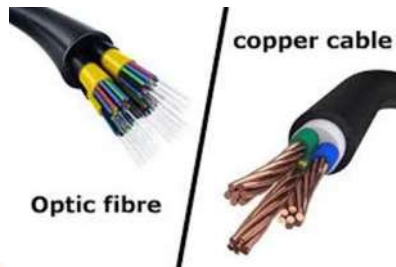


REAL DECOUPLING TRENDS IN OECD: DOMESTIC MATERIAL CONSUMPTION VS GDP

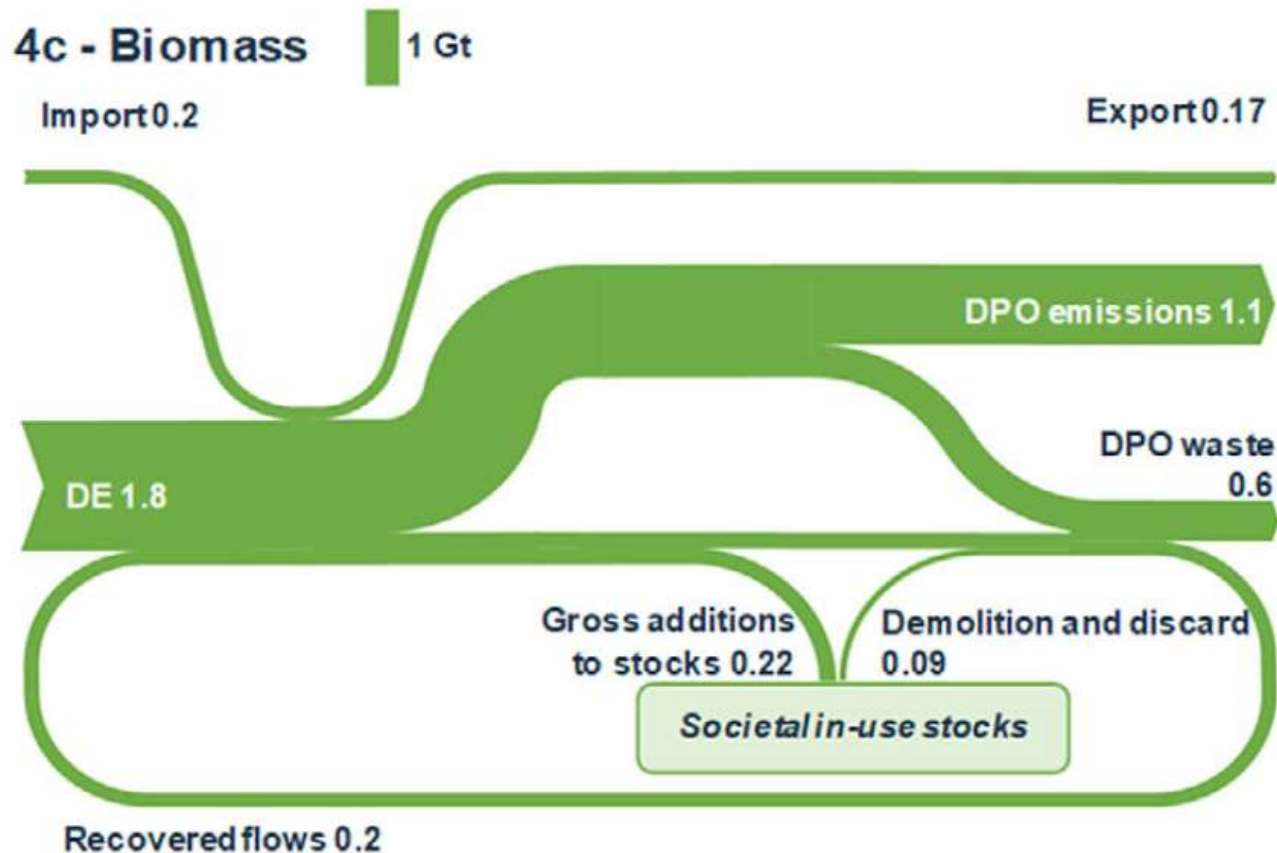


Source: OECD (2013), "Material resources", OECD Environment Statistics (database).

REMEMBER A GENERATION AGO!

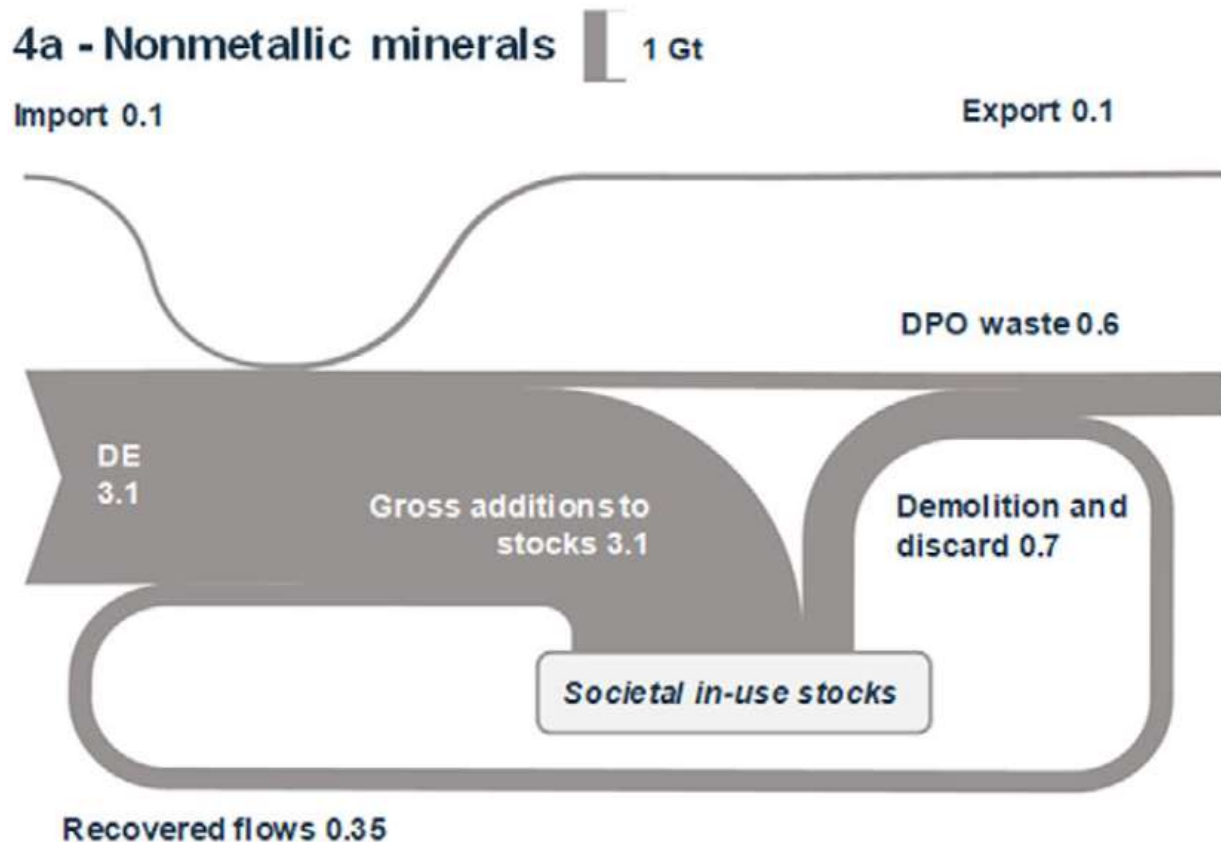


BIOMASS FLOWS THROUGH THE EU28 ECONOMY



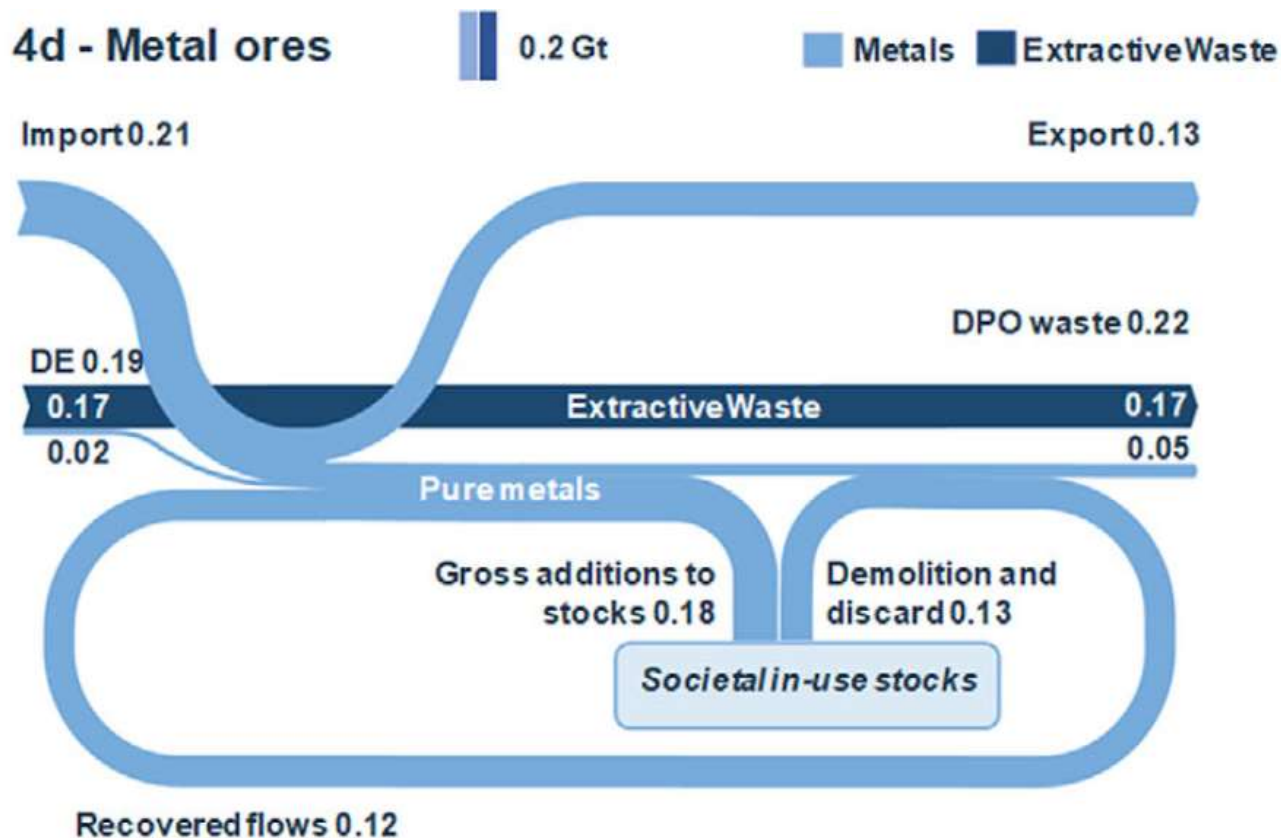
SOURCE : MAYER &... (2019). MEASURING PROGRESS TOWARDS A CIRCULAR ECONOMY (JIEC.12809)

MINERALS FLOWS THROUGH THE EU28 ECONOMY (2014)



SOURCE : MAYER &... (2019). MEASURING PROGRESS TOWARDS A CIRCULAR ECONOMY (JIEC.12809)

METALS FLOWS THROUGH THE EU28 ECONOMY (2014)



SOURCE : MAYER &... (2019). MEASURING PROGRESS TOWARDS A CIRCULAR ECONOMY (JIEC.12809)

THE WASTE-TO-ENERGY PLANT OF THE FUTURE



SOURCE : ESWET

ENIM PLANTS RECOVER MATERIAL AND ENERGY FROM MUNICIPAL SOLID WASTE OF **110 MILLION** PEOPLE AROUND THE WORLD



TORINO EfW 421,000tMSW/a, ITALY – ARCHITECT



ENIM



TYPICAL CNIM ENERGY-FROM-WASTE PROCESS

MATERIAL RECOVERY WITH WTE



SOURCE : CEWEP 2019 WTE ROADMAP TOWARDS 2035

METALS RECOVERY WITHOUT WTE



SOURCE : ARIANE STÄUBLI UMTEC 2020

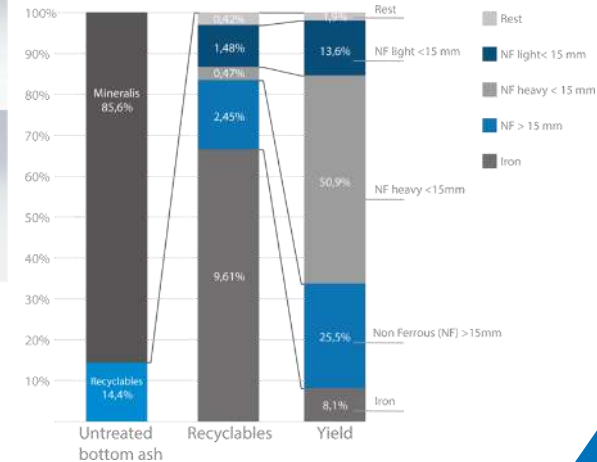
URBAN MINING FOR MATERIAL RECOVERY IN WTE

Ferrous & non-ferrous metals recovery in WtE bottom ashes

NE-Metall-Produkte fein



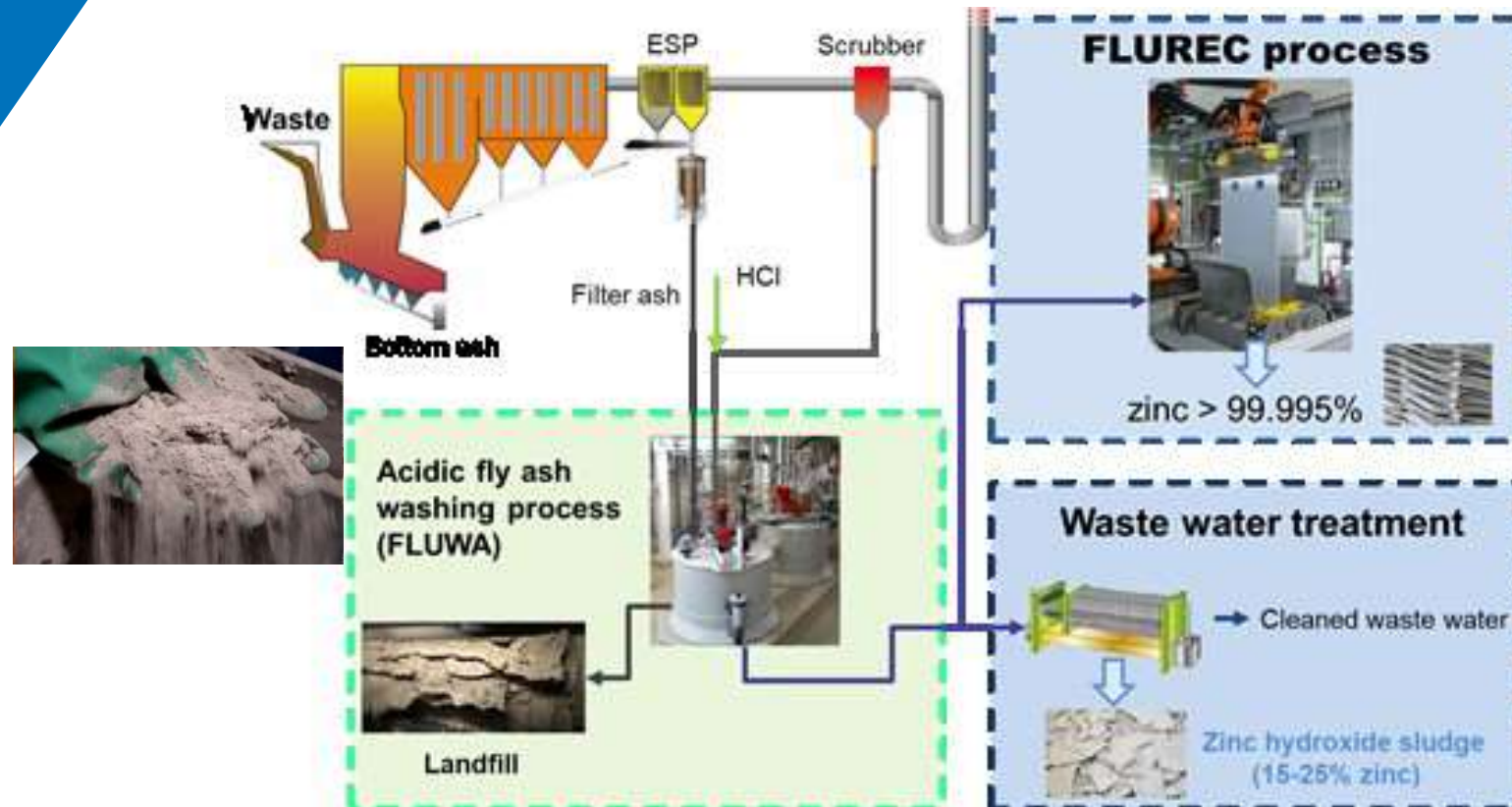
NE-Metall-Produkte grob



« Thermo-recycling »

SOURCE : 2020/01 BÖNI - ZAR

URBAN MINING FOR MATERIAL RECOVERY IN WTE



Metals recovery in WtE fly ashes in Switzerland (« Zn mining »)

METALS RECOVERY IN BOTTOM ASHES IN MONO-LANDFILL (« LANDFILL MINING »)

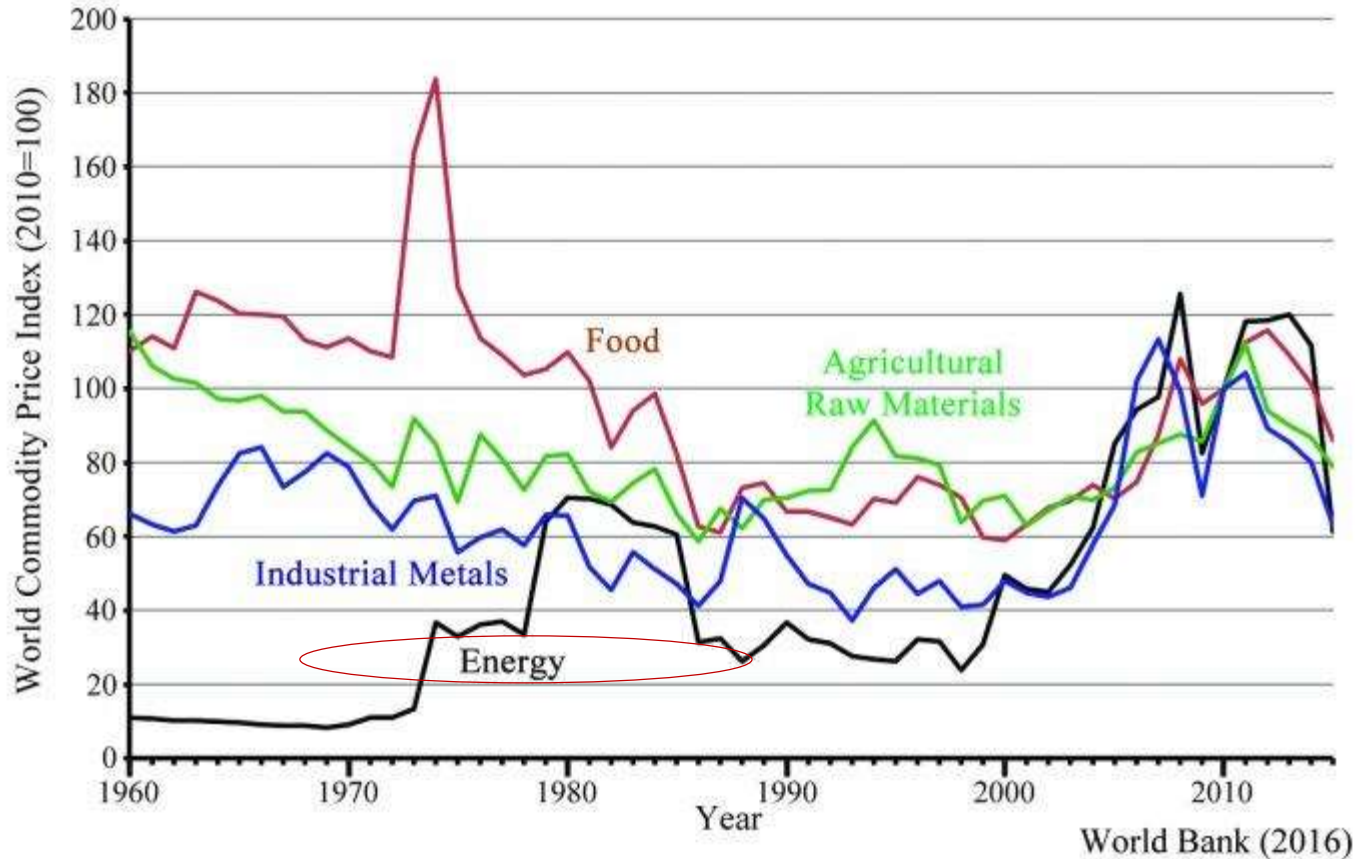
ROOSEVELT USA (180KTPY)



LAB ROOSEVELT (USA)

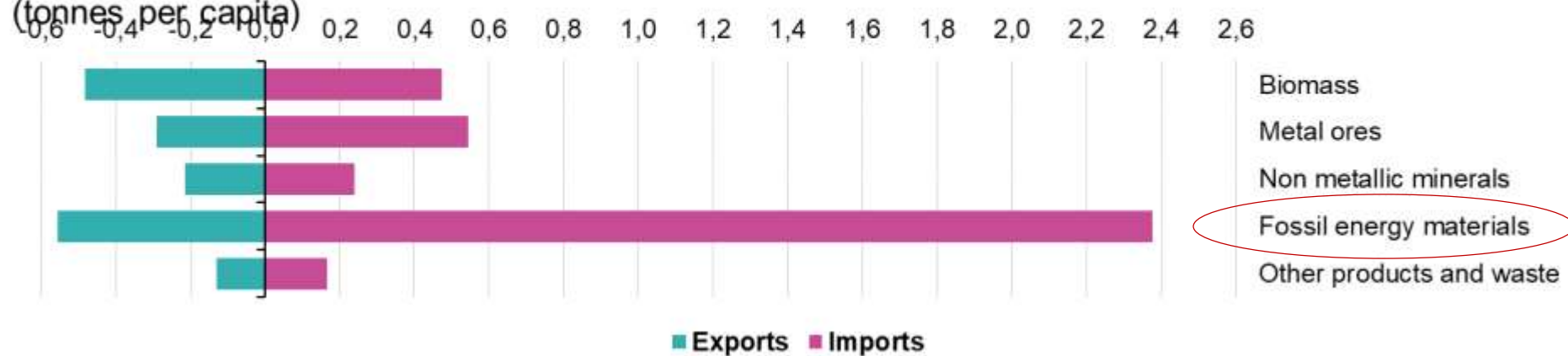
ENIM

RESOURCE SCARCITY? WORLD COMMODITY PRICES EVOLUTION



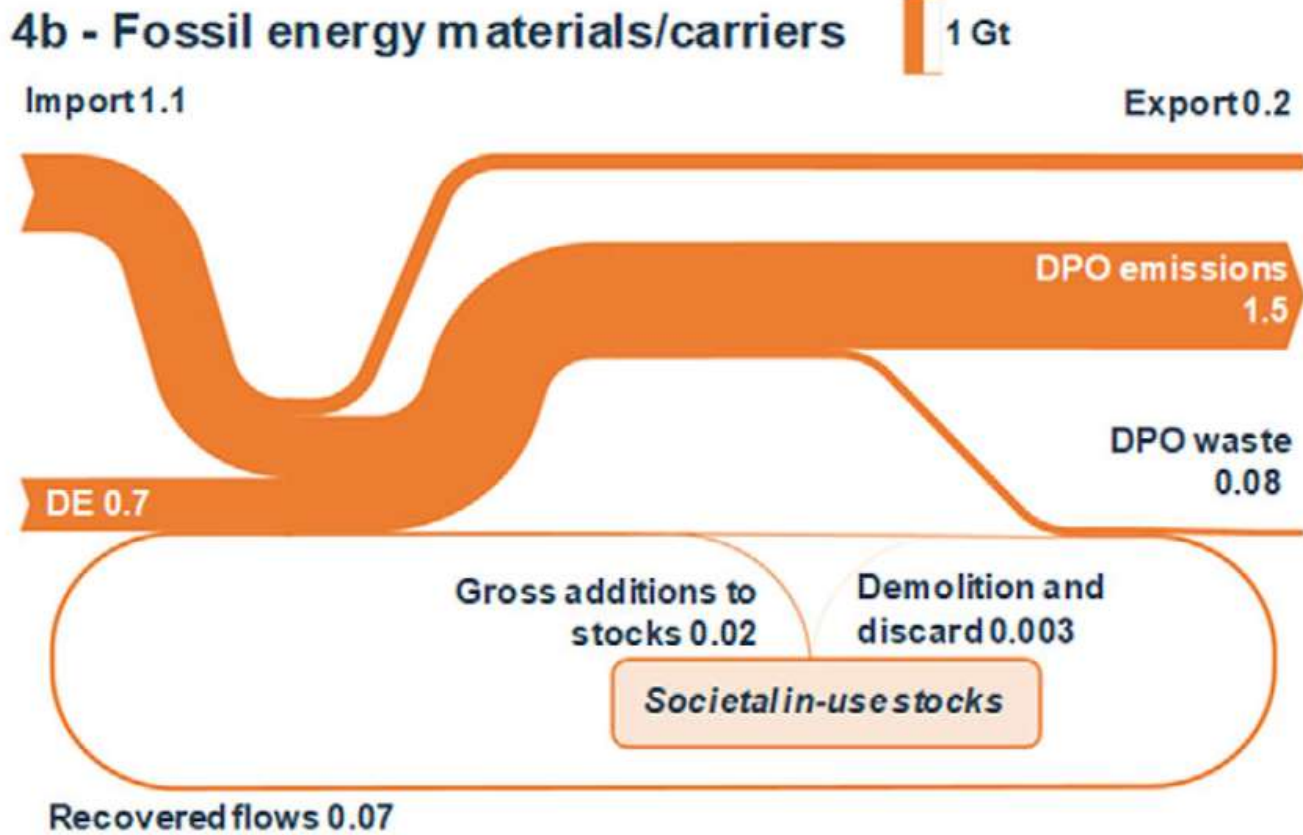
Physical imports and exports by main material category, EU-27, 2019

(tonnes per capita)



SOURCE : EUROSTAT [HTTPS://EC.EUROPA.EU/EUROSTAT/STATISTICS-EXPLAINED/INDEX.PHP/PHYSICAL_IMPORTS_AND_EXPORTS#IMPORT_DEPENDENCY](https://ec.europa.eu/eurostat/statistics-explained/index.php/Physical_imports_and_exports#Import_dependency)

FOSSIL CARRIERS FLOWS THROUGH THE EU28 ECONOMY

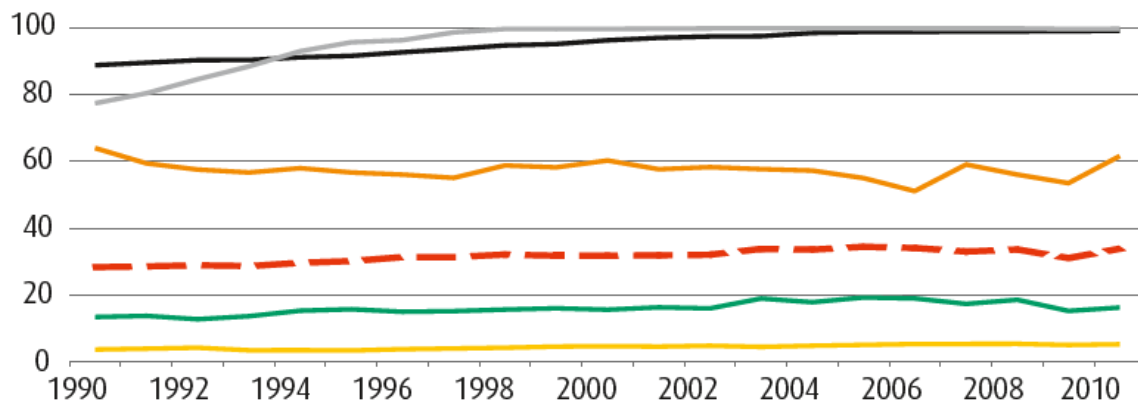


SOURCE : MAYER &... (2019). MEASURING PROGRESS TOWARDS A CIRCULAR ECONOMY (JIEC.12809)

IMPORT DEPENDENCY IN FRANCE PER MATERIAL TYPE

Dépendance aux importations par catégorie de matières
(Importations/besoin en matières de l'économie)

En %



- Combustibles fossiles
- Minerais métalliques et produits à base dominante de métal
- Minéraux industriels et produits à dominante non métallique

- - - Total
- Biomasse (agricole, poissons, bois)
- Minéraux utilisés principalement dans la construction

SOURCE : CGDD 2013 -
MATIÈRES DANS L'ÉCO

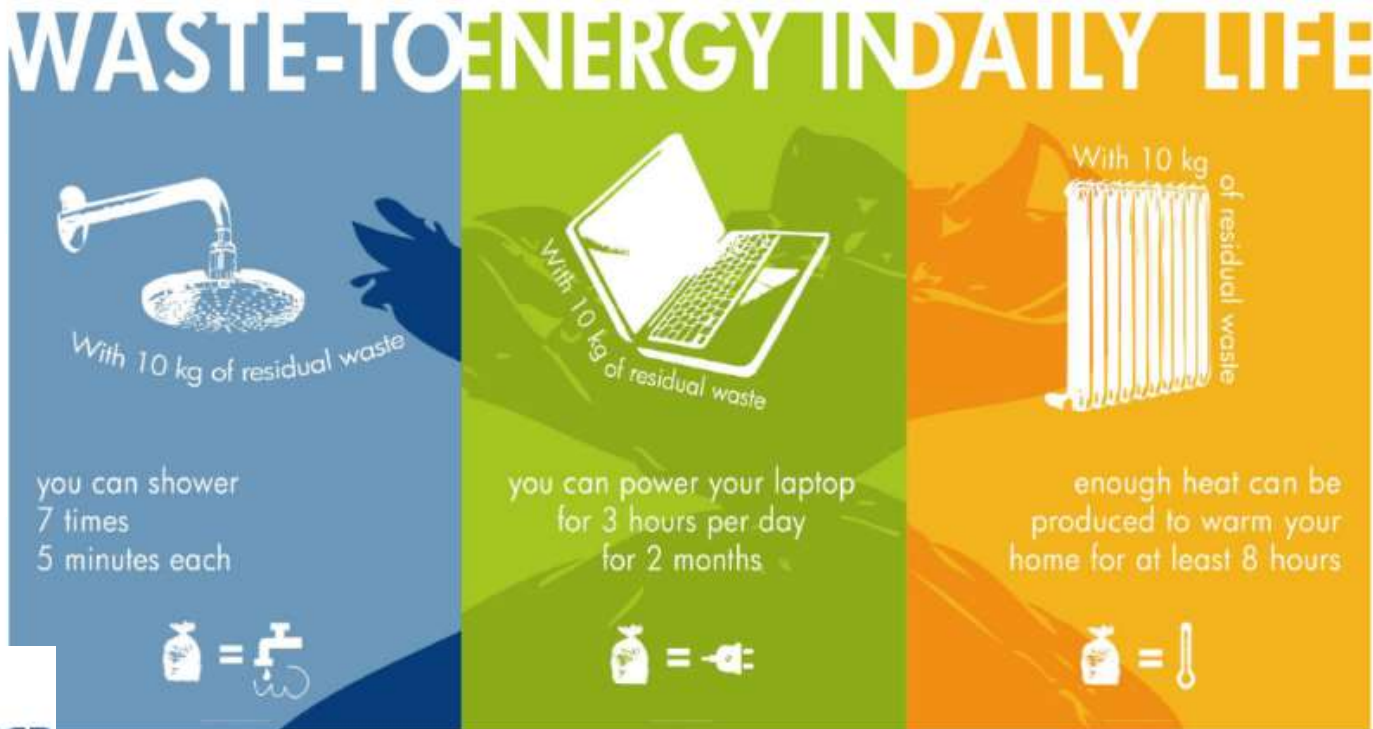
RESOURCE RECOVERY IN WTE



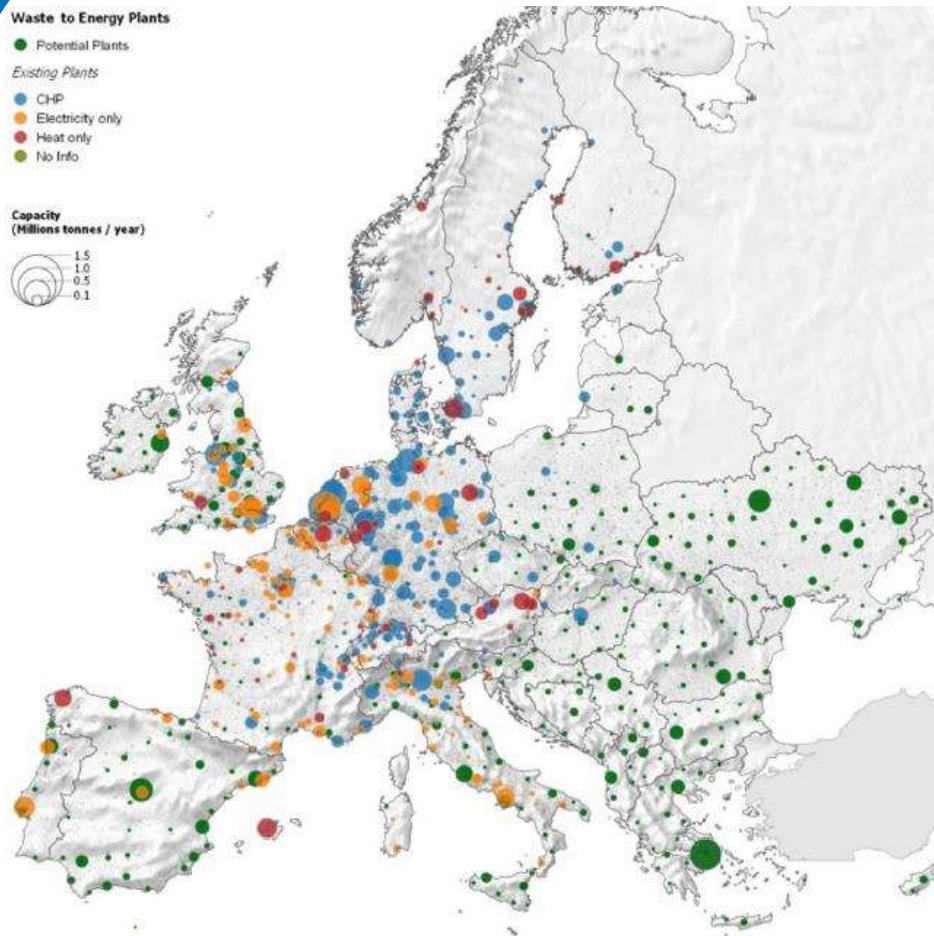
SOURCE : CEWEP 2019 WTE
ROADMAP TOWARDS 2035

WASTE-TO-ENERGY IN DAILY LIFE

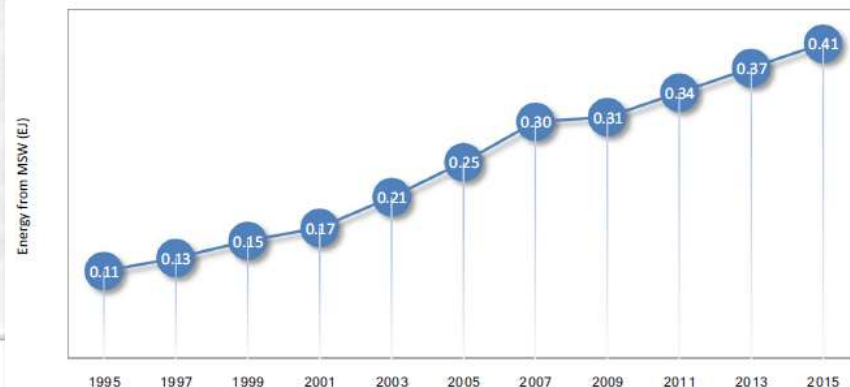
AN AVERAGE FAMILY PRODUCES ABOUT 10KG OF RESIDUAL WASTE PER WEEK ,
AFTER THE RECYCLABLE WASTE HAS BEEN SEPARATED



POTENTIAL SUITABLE WTE PLANT LOCATION

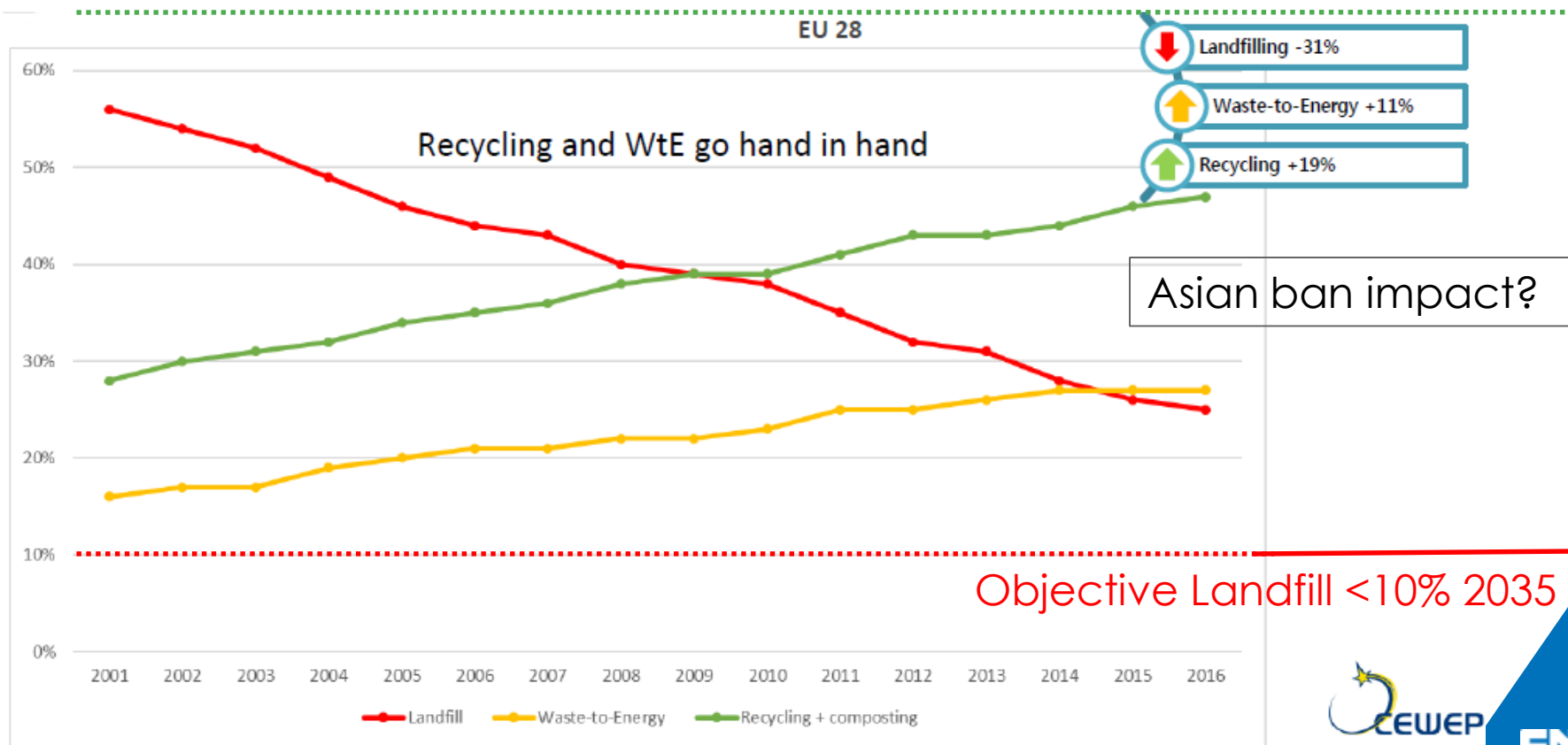


EVOLUTION OF ENERGY RECOVERY FROM MSW

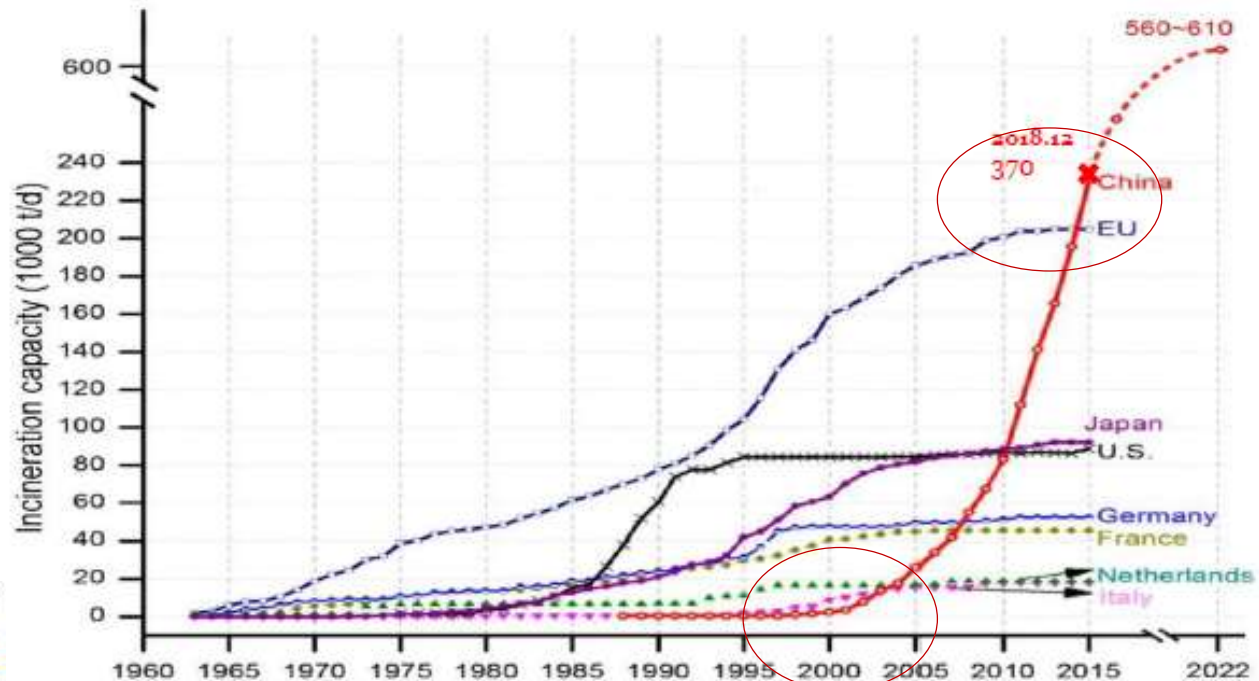


SOURCE : NICOLAE SCARLAT 2019 - STATUS AND OPPORTUNITIES FOR ENERGY RECOVERY FROM MUNICIPAL SOLID WASTE IN EUROPE

MUNICIPAL WASTE TREATMENT TRENDS 2001-2016 IN EU28



WASTE-TO-ENERGY CAPACITY OF MAJOR COUNTRIES



Data source: South China Institute of Environmental Sciences;
huanbao.bjx.com.cn

SOURCE:



中信产业基金
CITICPE



康恒环境
SUS ENVIRONMENT

COPENHAGEN (DK) BY 2025: 1ST CO₂-NEUTRAL CAPITAL & 100% RENEWABLE AND RECOVERY HEAT IN DISTRICT HEATING (98% OF CITY'S DEMAND)



by BIG Architects



Copenhill

250MWth Waste to Energy
with LAB flue gas condensation
& absorption heat pumps



BIO4 "Plant power"

500 MWth Wood Boiler
with LAB flue gas condensation

Highest energy efficiency with :

- flue gas condensation
- heat pumps
- combustion air humidification

200 MILLION PEOPLE WASTE COMBUSTION FLUE GASES CLEANED BY **Lab**



Credit: BIG

arc

EFW AMAGERFORBRÆNDING, COPENHAGEN, DENMARK

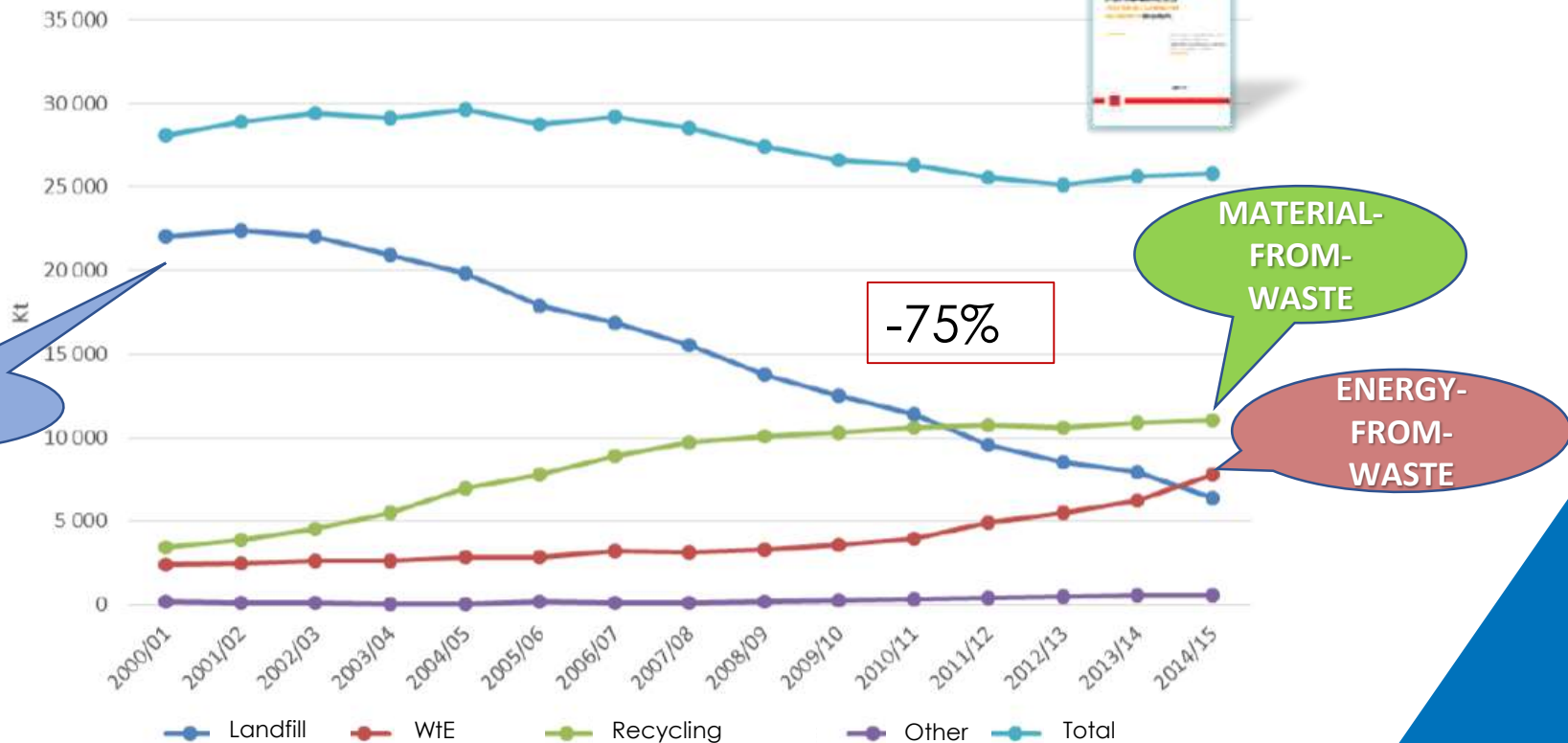
GoPro: Jesper Ijeder - CopenHill | Skiing On Top a Building



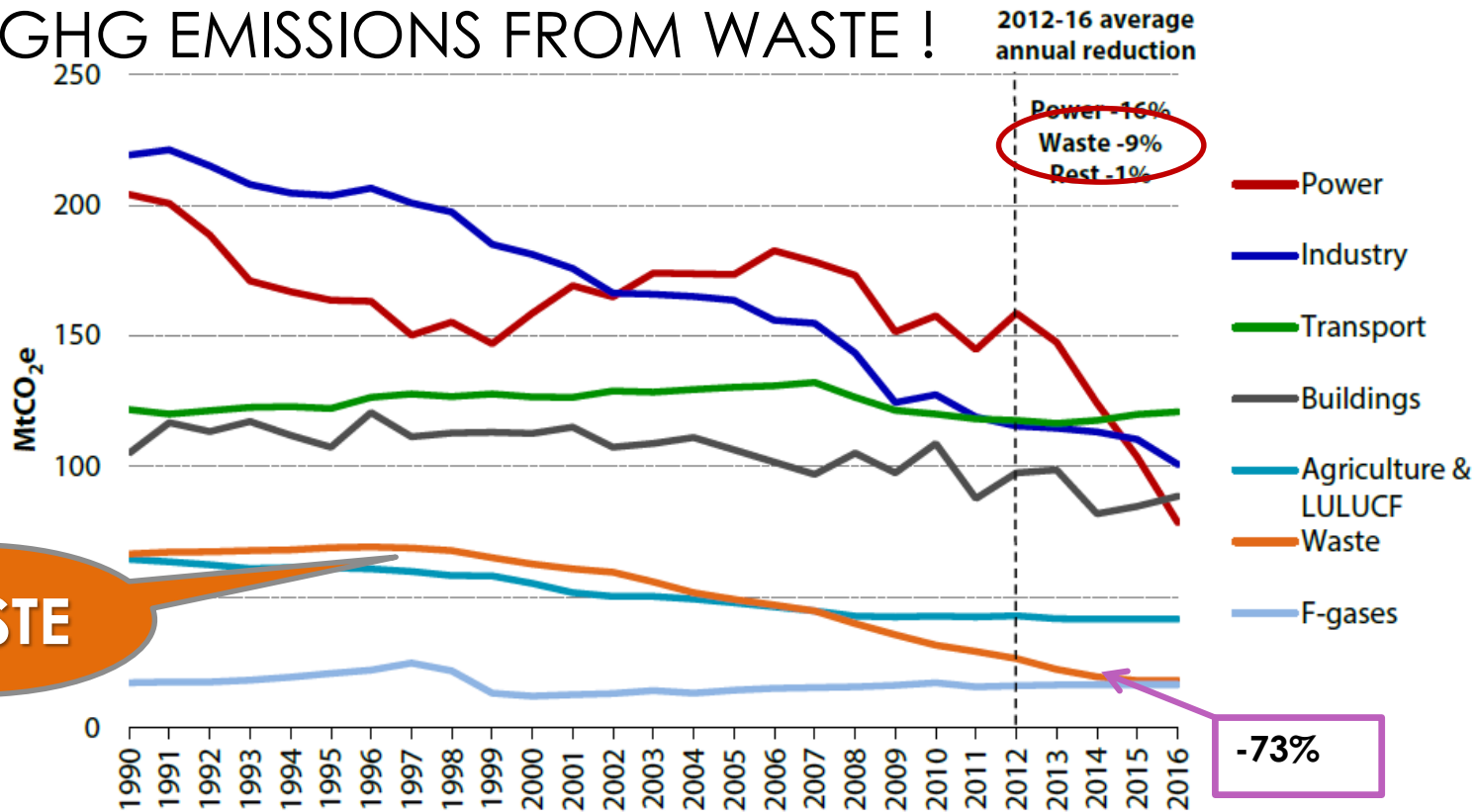
<https://www.youtube.com/watch?v=Zdw28p0u0u>

ENIM

UNITED KINGDOM GREAT SUCCESS: MUNICIPAL WASTE TREATMENT!



UNITED KINGDOM GREAT SUCCESS: ...& GHG EMISSIONS FROM WASTE !



Source: BEIS (2017) Provisional GHG statistics for 2016; BEIS (2017) Final GHG statistics for 1990-2015; CCC calculations.

**KEEPING IT CLEAN:
HOW TO PROTECT THE
CIRCULAR ECONOMY
FROM HAZARDOUS
SUBSTANCES**

EUROPEAN
ENVIRONMENTAL
BUREAU



An aerial photograph of Monaco, showing the densely packed city built into the hillsides overlooking the Mediterranean Sea. The harbor is filled with numerous yachts and boats. The Prince's Palace is visible on the left, perched on a cliff. The text is overlaid on a semi-transparent dark blue rectangle in the upper half of the image.

ENERGY-FROM-WASTE IS NOT THE PROBLEM.
IT IS A PART OF THE SOLUTION AS
A SUSTAINABLE PILLAR OF RESOURCE MANAGEMENT, CIRCULAR
ECONOMY & GREENHOUSE GAS REDUCTION

EfW NEIGHBOUR WITH MONACO PRINCE'S PALACE

ENIM