

# ELIMINATING POLLUTANTS FROM SOIL AND WATER: A DRIVER FOR TERRITORIAL REGENERATION AND DECARBONIZATION

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**SOIL IS A “NON-RENEWABLE” RESOURCE  
AND MANY DEGRADATION PROCESSES ARE ACCELERATING DUE  
TO HUMAN PRESSURE.**

**20% OF EUROPE'S LAND SURFACE IS SUBJECT TO EROSION RATES ABOVE 10 T/HA/YR,  
WHILE SOIL SEALING LEADS TO THE LOSS OF MORE THAN 1000 KM2 OF PRODUCTIVE LAND EACH YEAR.\***



agricultural production



growth of vegetation



retention, filtration and moderation of the flow of water towards the water tables and rivers



removal of contaminants and reduction of the frequency and risk of floods



regulation of energy flows to and from the atmosphere



mitigation of climate and the impact of drought





# CARBON STOCK IN SOIL IN THE PLANET TOPSOIL

ECOSYSTEM RESPIRATION WILL INCREASE WITH TEMPERATURE REDUCING SOIL CARBON STORAGE.

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## THE GOALS OF THE "4 PER 1000" INITIATIVE

**Increase organic carbon sequestration in soils, with a view to:**

- adapting agriculture to climate change
- mitigating climate change (1.5°C target): carbon sink
- Fertility increase: improving food security

b2

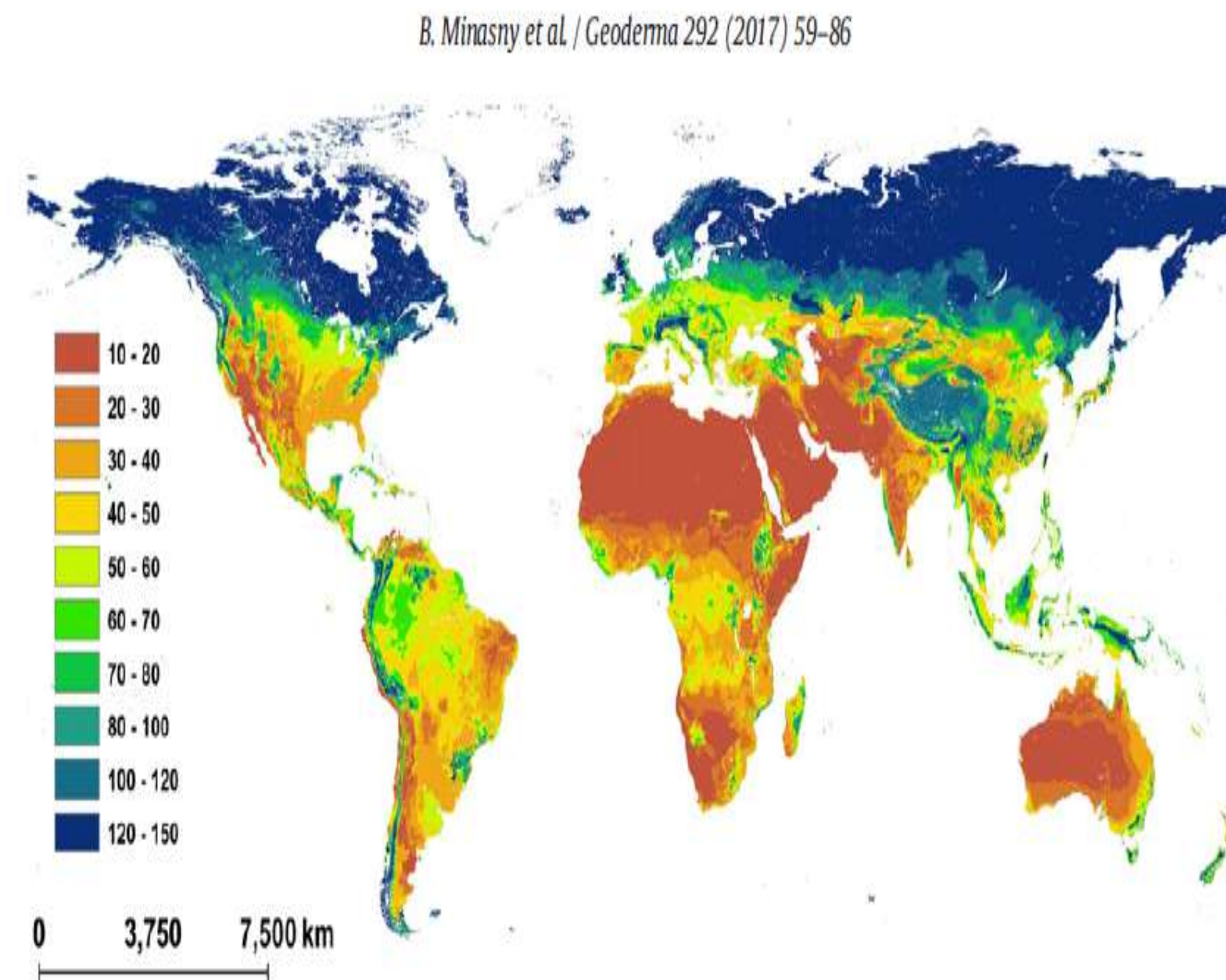
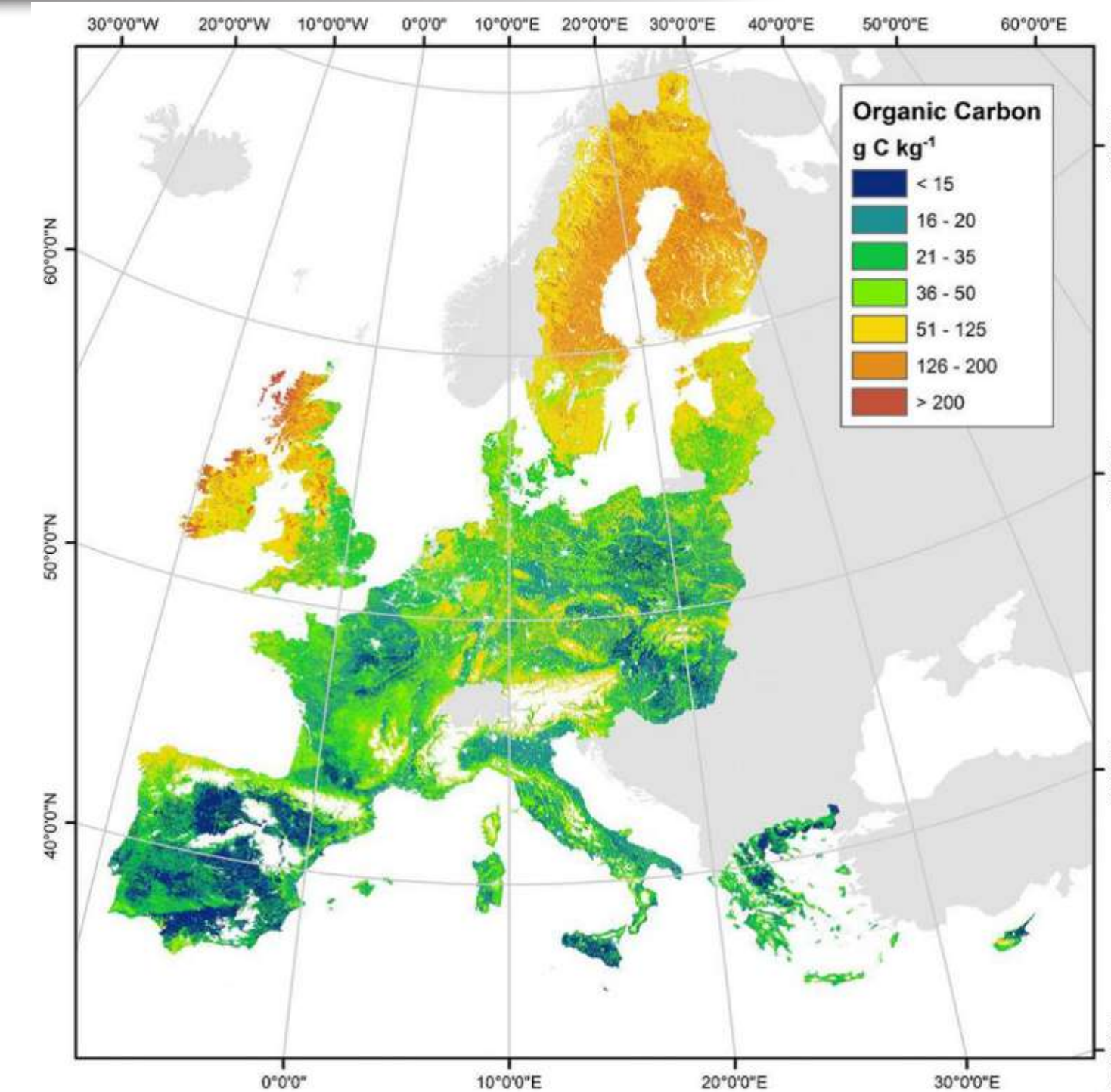


Fig. 2. Soil C stocks of the world's topsoil (0–0.3 m) in tonne C per hectare. The map was generated based on global datasets of C stock from the study of Stockmann et al. (2015).



Source: JRC, European map of topsoil organic carbon ©EU, 2014



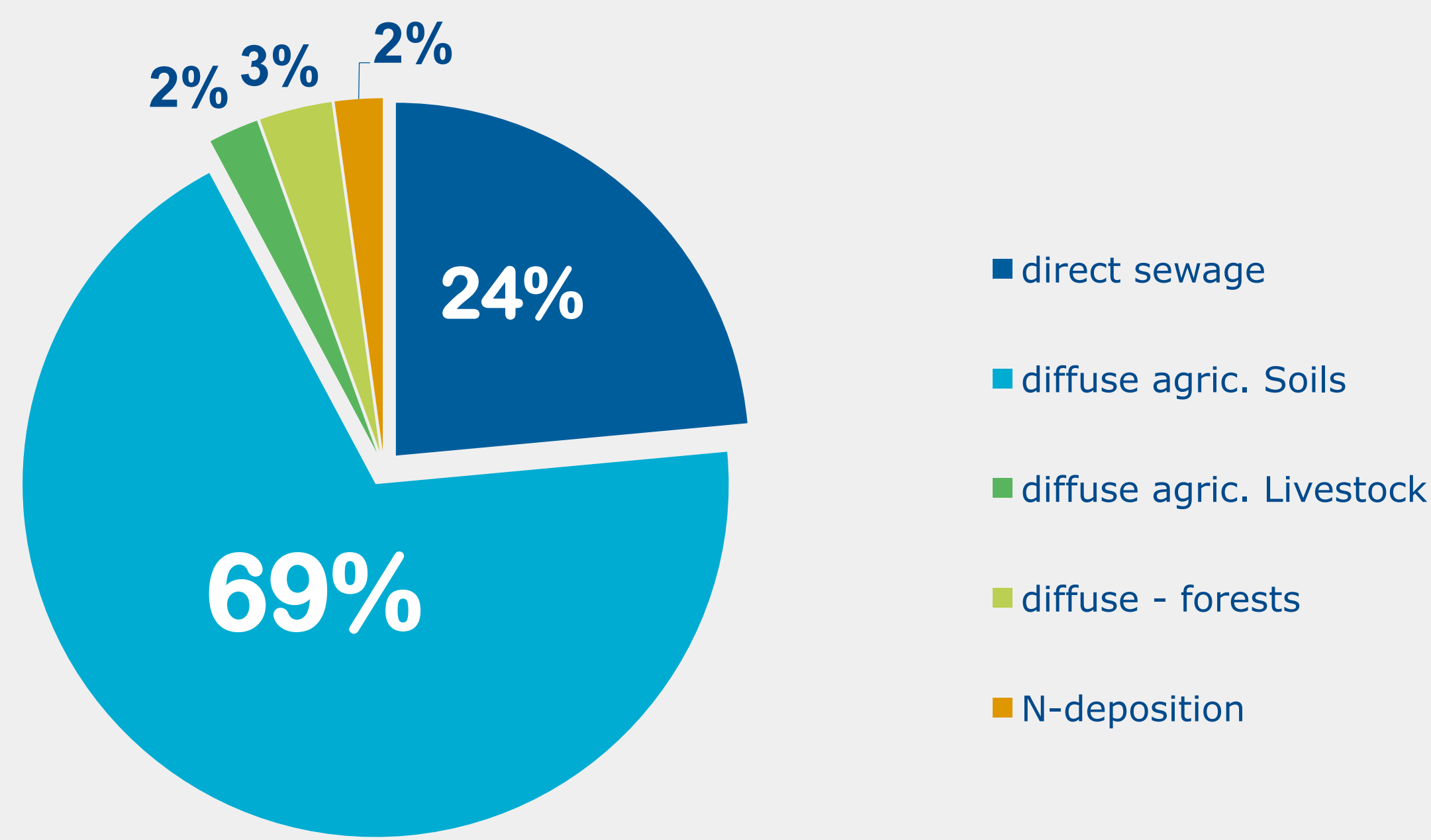


# REDUCING DENITRIFICATION

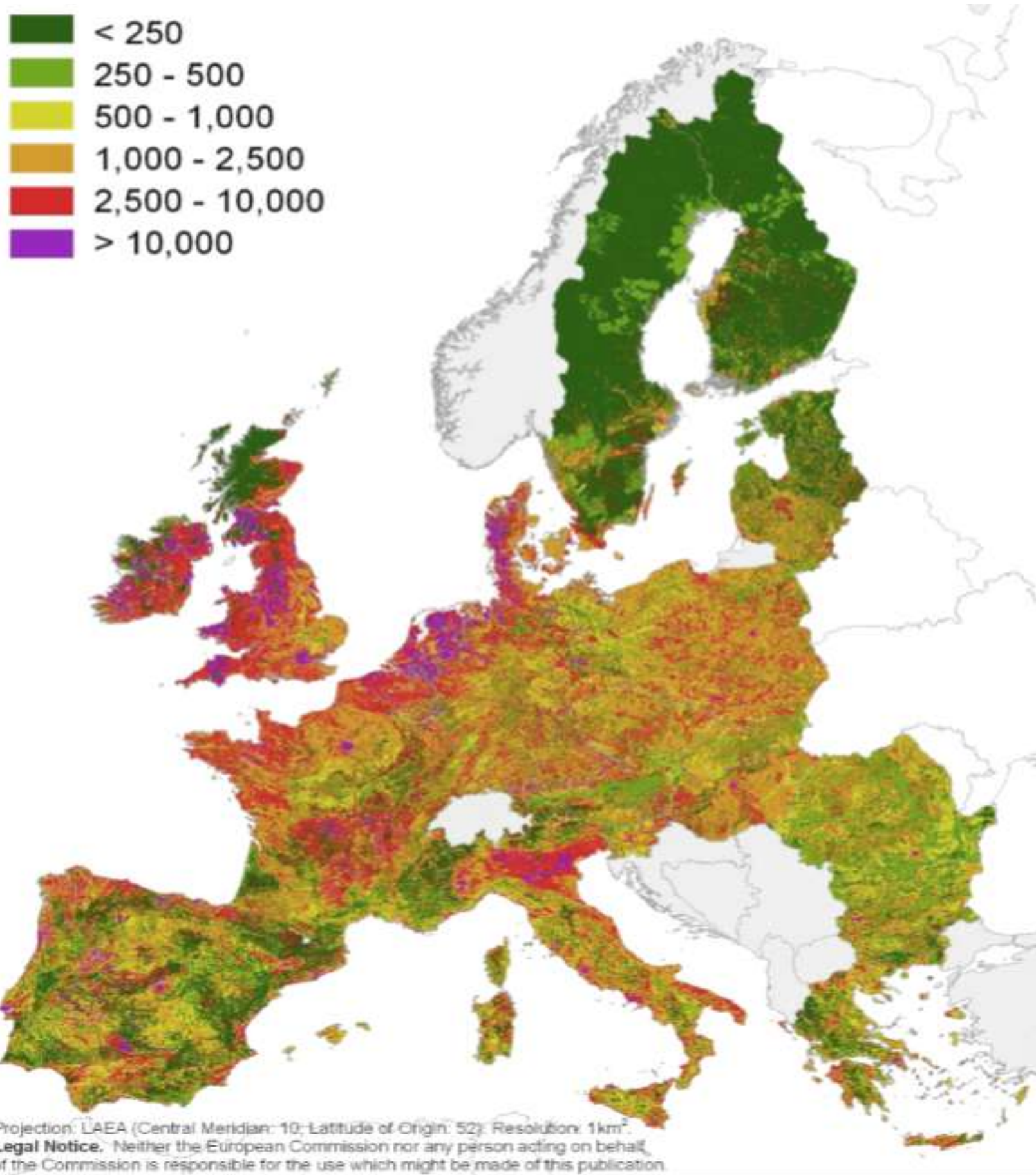
IT IS VITAL TO INCREASE NUE (NITROGEN USE EFFICIENCY)

THE SECTOR THAT MOST INFLUENCES THE INTRODUCTION OF N INTO AQUATIC SYSTEMS IS AGRICULTURE

SPLIT OF N-INPUT TO ACQUATIC SYSTEM FOR eu27 [Gg N year<sup>-1</sup>]



N-INPUT TO ACQUATIC SYSTEMS [kg N km<sup>-2</sup> yr<sup>-1</sup>]



“HALVE NITROGEN WASTE” BY 2050?

SHOULD THE UN TACKLE THE CHALLENGE?



# THE ANTHROPOGENIC PHOSPHOROUS CYCLE

WE CONTINUE TO SIMPLY THROW AWAY A NON-RENEWABLE RESOURCE WHICH IS ESSENTIAL FOR LIFE

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Phosphates from sewage or from animal manures can be industrially recycled into either fertilisers or into industrial phosphate applications (flame retardants, detergents, Electronics etc).

substitution of minded phosphates

P RECOVERY AND RECYCLING

10%

detergents,  
industrial  
uses

crops

fertilisers  
and animal  
food additives

90%

farm  
animals

Fosfati  
estratti dalle rocce

225 MILIONI T  
P (settore  
minerario globale  
2013, USGS 2015)

SEWAGE WORKS

SLUDGE  
INCINERATION

ANIMAL  
WASTE

LANDFILL

leaching or  
release

SURFACE WATER

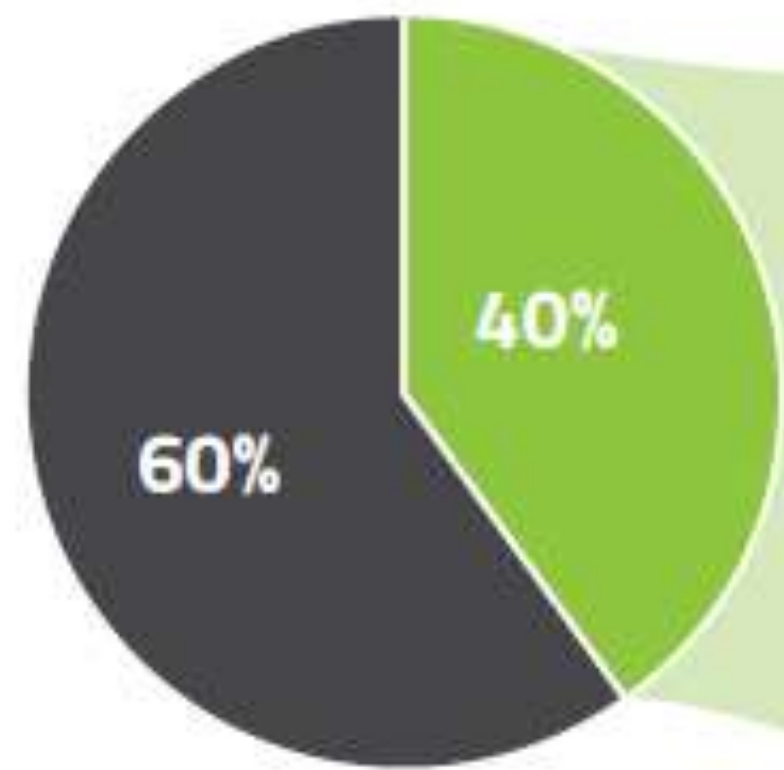
disposal in  
ground or in  
building  
materials

losses from  
intensive  
farming

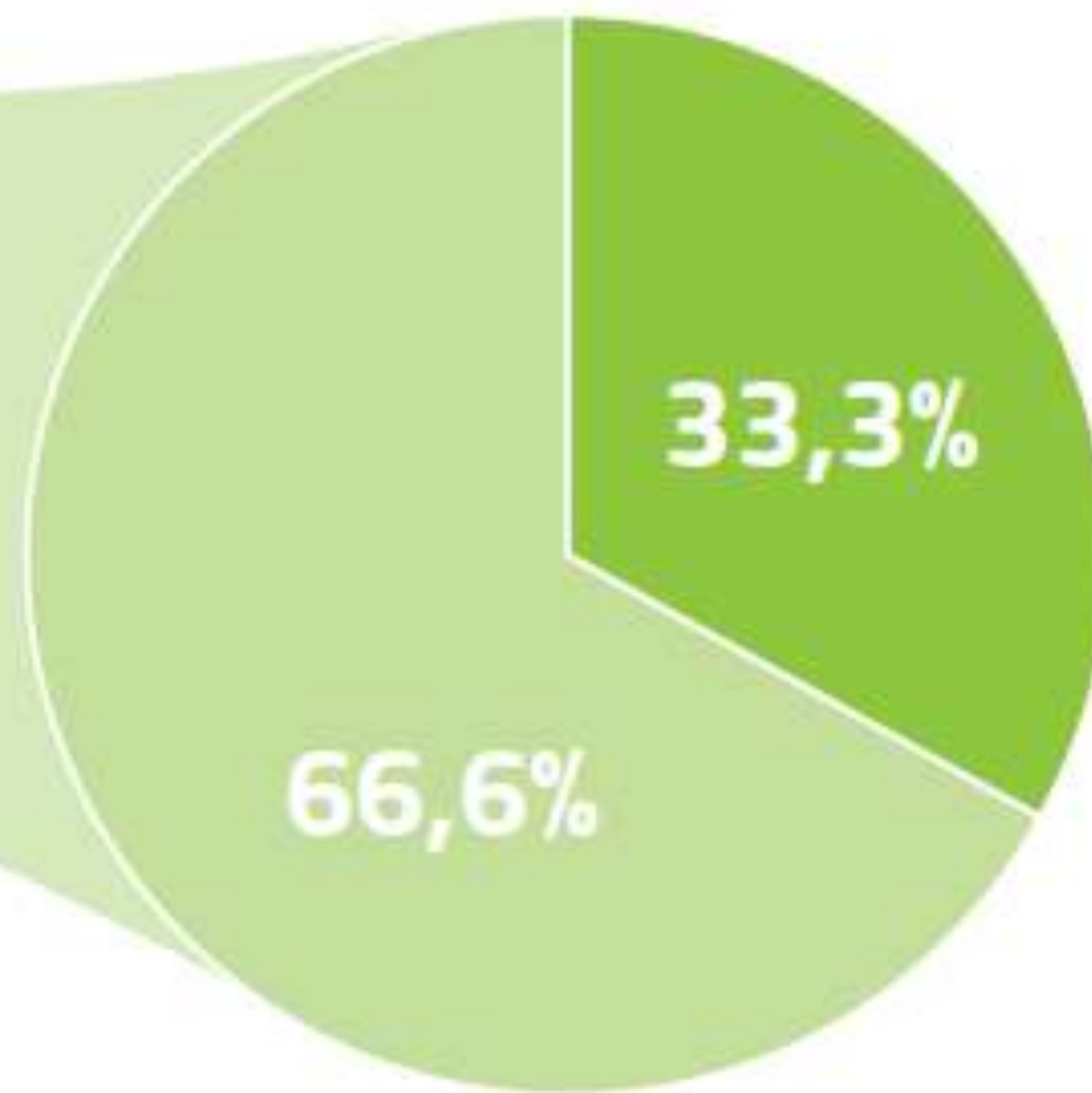




### TOTAL WASTE



### TOTAL BIOWASTE



### POTENTIAL DIRECT JOBS IN THE BIOWASTE SECTOR



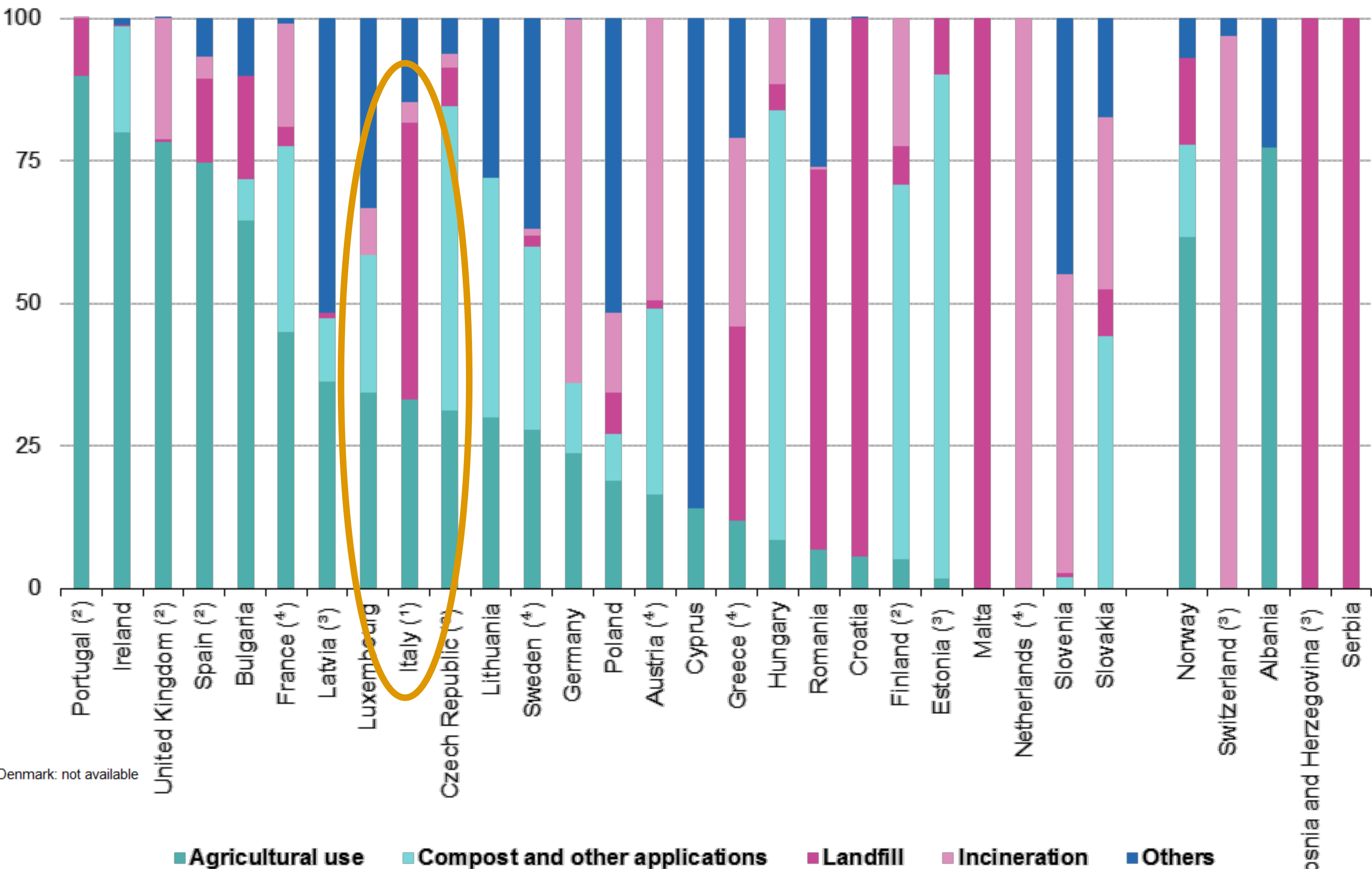


# ANOTHER LOST OPPORTUNITY FOR SOILS

## SEWAGE SLUDGE

- Italy is the sixth country in Europe for sludge landfilling, with an incredible waste of resources
- Sludge disposal in **Italy** –(86,5% of total product)
  - landfill: **48,46%**
- Netherlands, Germany, Slovenia and Austria (as well as Switzerland) reported **incineration** as their principal form of treatment for disposal
- discharge into landfills is the principal type of treatment in Malta Croatia, Romania and Italy, as well as Serbia and Bosnia and Herzegovina.

SEWAGE SLUDGE DISPOSAL FROM URBAN WASTEWATER TREATMENT, BY TYPE OF TREATMENT IN 2015 IN EUROPE (% OF TOTAL MASS).



Note: Belgium, Denmark: not available  
(1) 2010 data  
(2) 2012 data  
(3) 2013 data  
(4) 2014 data

■ Agricultural use ■ Compost and other applications ■ Landfill ■ Incineration ■ Others







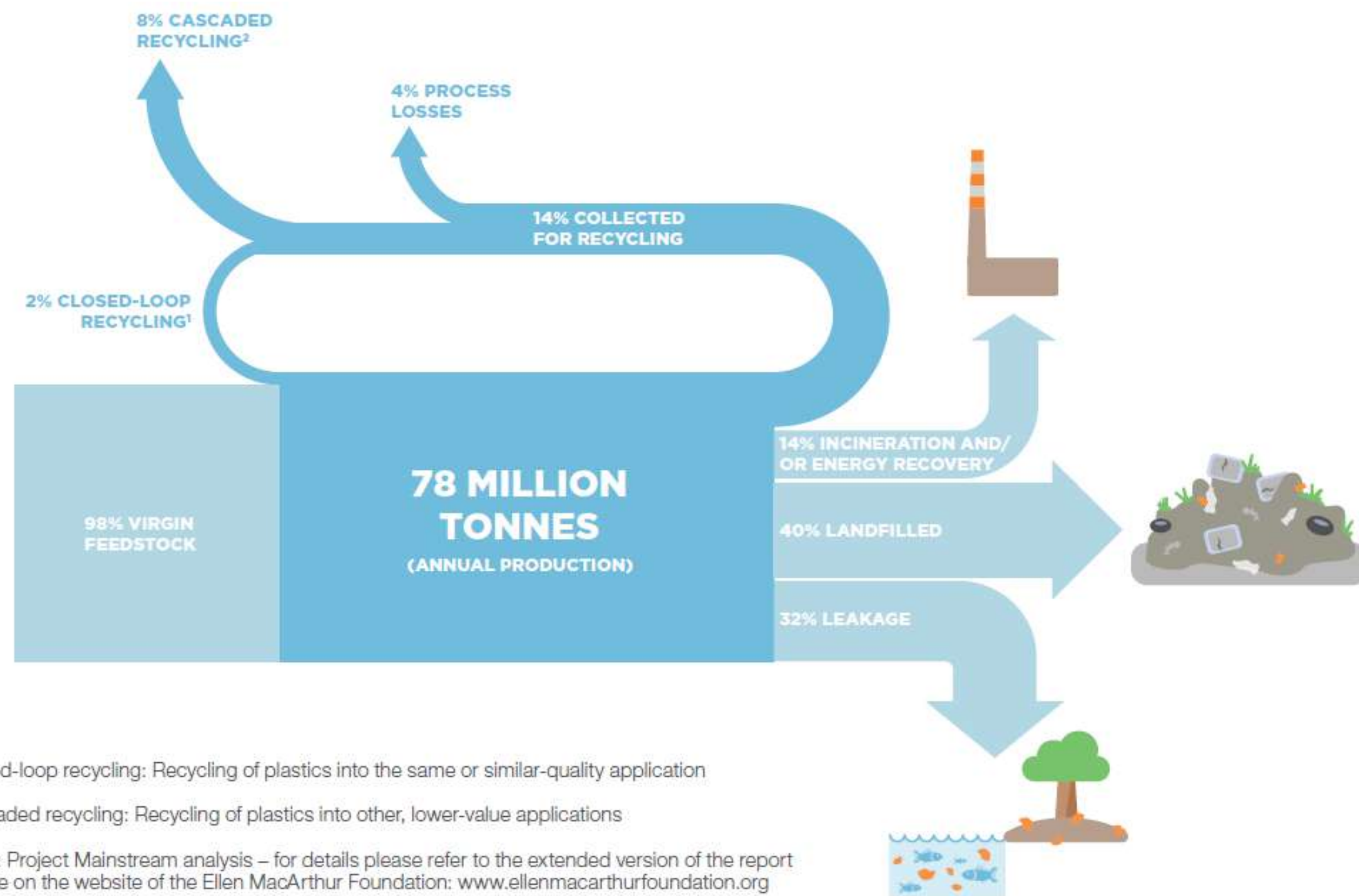
# PLASTICS: IT'S NOT ABOUT TECHNOLOGY, IT'S ABOUT HOW WE USE IT

PLASTICS GIVE EVERY DAY A BIG IMPROVEMENT TO OUR QUALITY OF LIFE

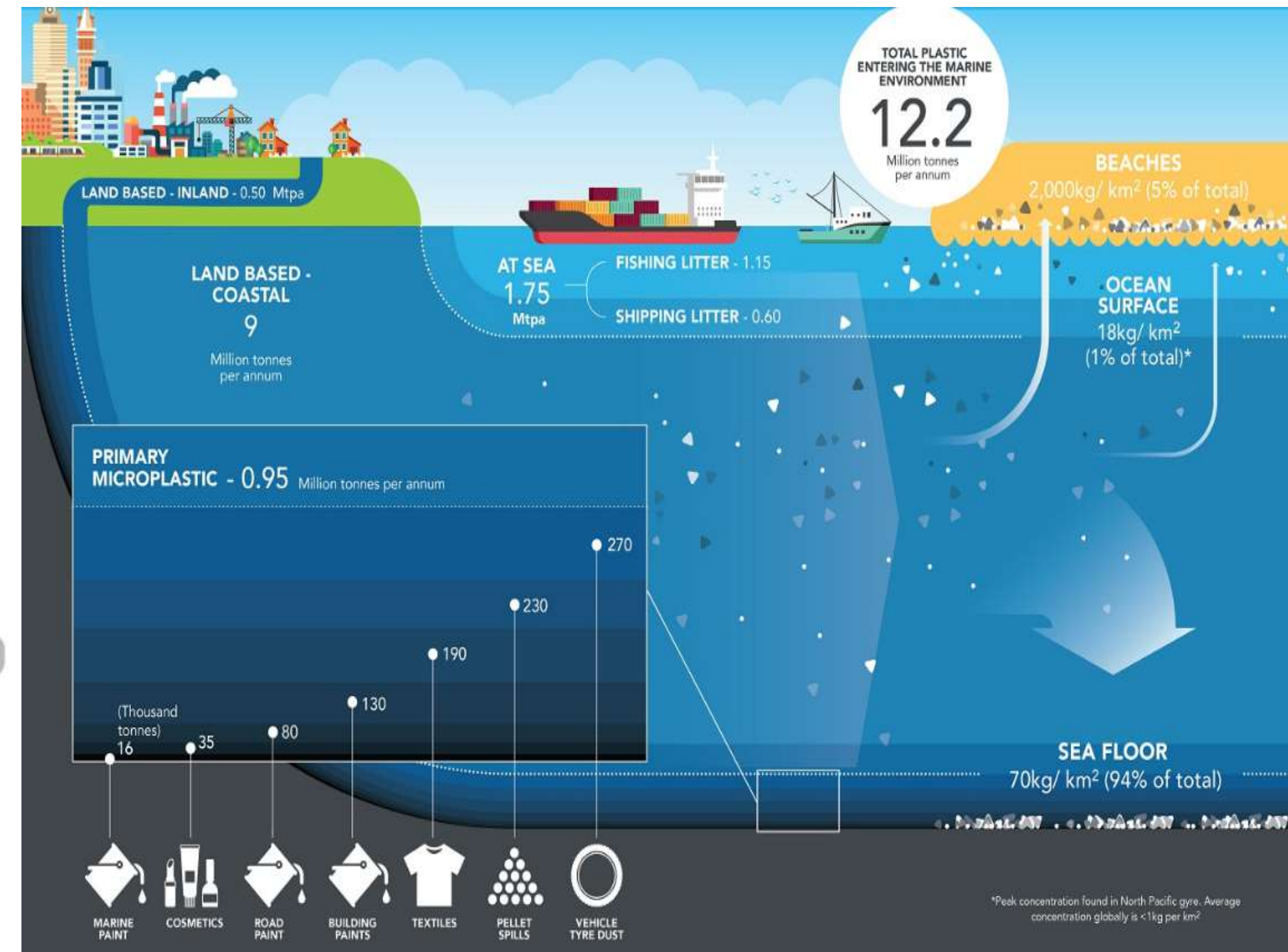
GLOBAL PLASTIC PRODUCTION HAS CROSSED 300 MILLION TONS PER YEAR AND IS SCHEDULED TO HIT ONE BILLION TONS PER YEAR IN THE NEXT 25 YEARS:



## GLOBAL FLOWS OF PLASTIC PACKAGING MATERIALS **EMF DATA**



## PLASTICS IN THE MARINE ENVIRONMENT WHERE DO THEY COME FROM? WHERE DO THEY GO?



Source: Eunomia, <http://www.eunomia.co.uk/reports-tools/plastics-in-the-marine-environment/>





# END OF LIFE OF AGRICULTURAL PLASTICS

## ENVIRONMENTAL IMPACTS

- Agriculture plastic waste: **5 % of total** plastic waste\*
- Thin mulch films are not easy to recycle and the raw materials obtained are not high in quality
- **White pollution** phenomena:
  - Plastic wastes in soil have a negative impact on crops growth and development, **reducing their yield up to 15%\*\***
- mulch film market in Europe 80,000 tonnes
- 95% of which are fossil-based and non-biodegradable. \*\*\*
- It is estimated that of these 76,000 tonnes, more than 30% remain on the field and in the soil. \*\*\*
- Every year 15 000 tons of micro plastics are released in European soils\*\*\*







# OTHER SECTORS CONTRIBUTING TO GHG EMISSIONS AND POLLUTION OF SOIL AND WATER

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## LUBRICANTS

about 50% of worldwide lubricants is left in the environment through total loss applications, evaporation, leakage and accidental losses, estimated values reaches 70-80% for hydraulic fluids\*

## HERBICIDES AND PESTICIDES

- In Italy glyphosate was found in 39.7% of the ISPRA monitoring points of surface water
- in 25% is responsible for exceeding environmental quality standards.
- In the groundwater it was present in 4.3% of the points checked
- ISPRA also reported the contamination due to AMPA (aminomethylphosphonic acid), a metabolite that is formed in the environment by degradation of glyphosate, present in 70.9% of the surface water monitoring points, in the 52.2% with values above the limits.\*

## COSMETICS/ DETERGENCY

Every day, tonnes of plastic 'dust' resulting from the use of personal care and detergent products are poured into seas







PRINCIPLE

1

Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows  
ReSOLVE levers: regenerate, virtualise, exchange

PRINCIPLE

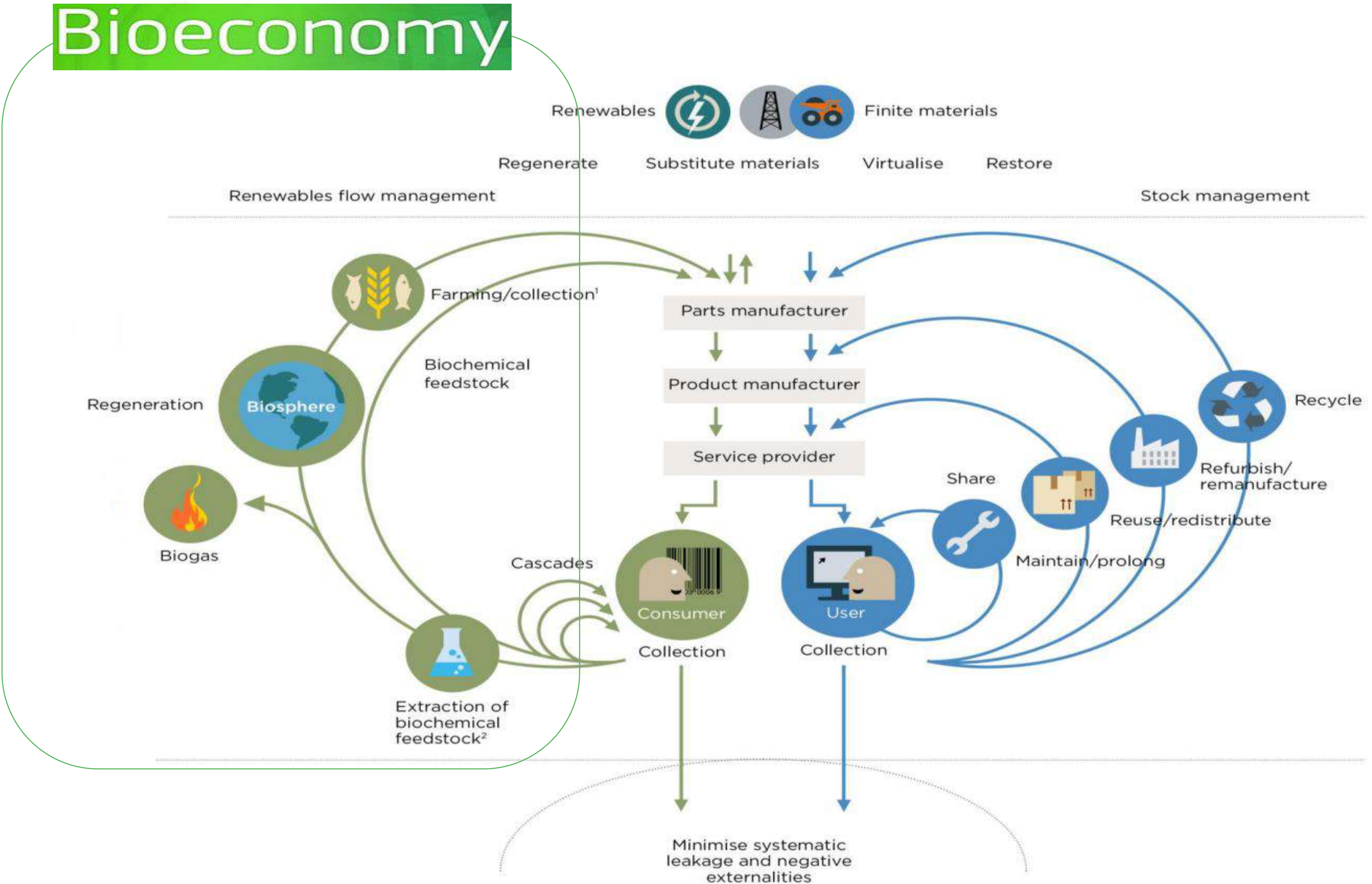
2

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles  
ReSOLVE levers: regenerate, share, optimise, loop

PRINCIPLE

3

Foster system effectiveness by revealing and designing out negative externalities  
All ReSOLVE levers

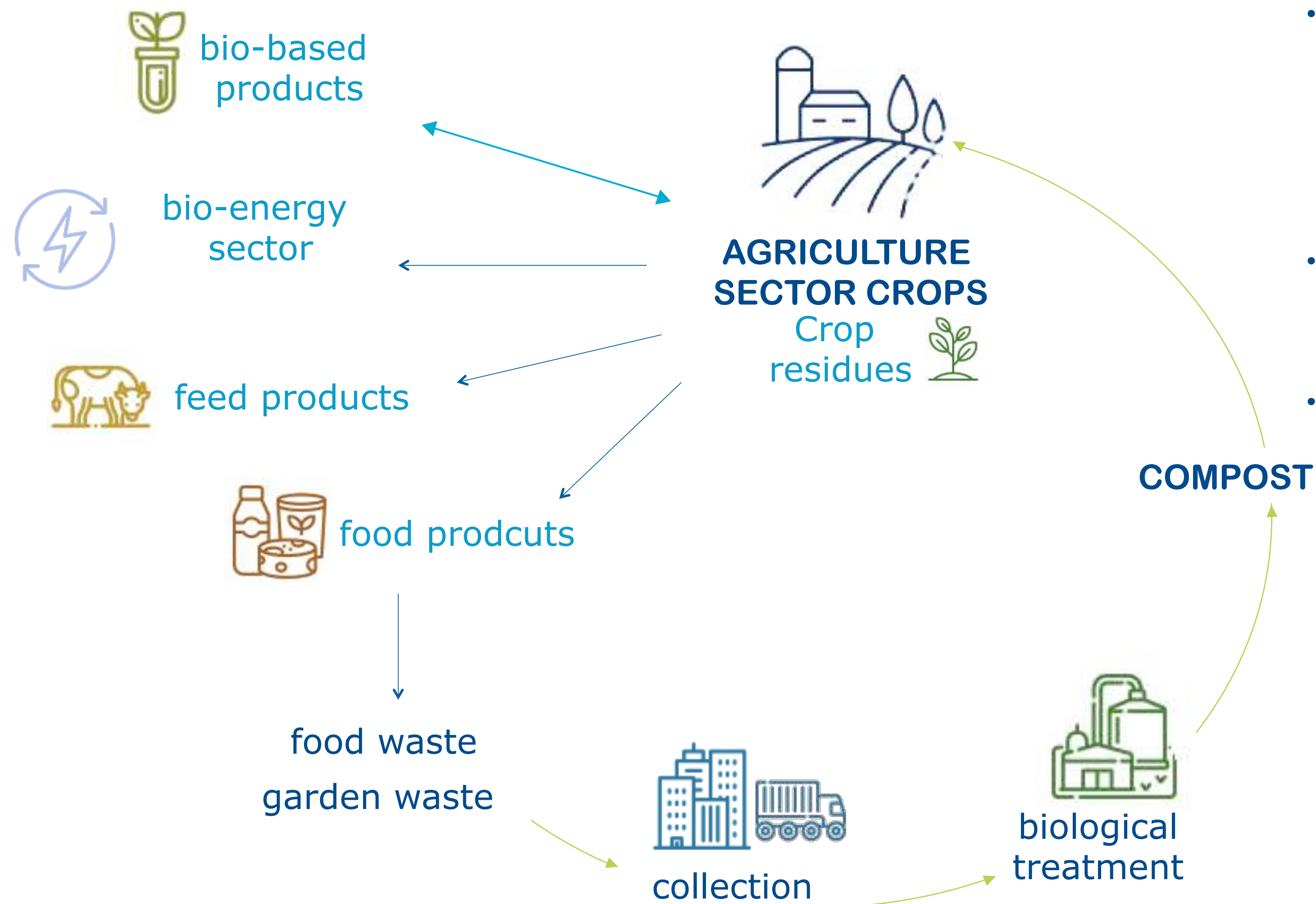


1. Hunting and fishing  
2. Can take both post-harvest and post-consumer waste as an input  
Source: Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment; Drawing from Braungart & McDonough, Cradle to Cradle (C2C).





BIOECONOMY  
BIOWASTE



- Promote a **sustainable agriculture** has a huge relevance since agricultural sector represents the **ground of bioeconomy**.
- **Need to shift towards regenerative as well as socially inclusive practices**, while (mainly urban) consumption centres will need to transition to healthier diets, minimize food waste and (re) build biological nutrient loops.
- Biowaste “generates” organic matter (compost)
- Compost use in agricultural sector increases SOM and tends to neutralize GHG caused by cultivation







# BIOECONOMY AS TERRITORIAL REGENERATION

THE PILLARS OF STRATEGY AIMED AT RECONNECTING ECONOMY, ENVIRONMENT AND SOCIETY

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## REGENERATION OF DEINDUSTRIALISED SITES

- TRANSFORMING WORLD-FIRST TECHNOLOGIES INTO FLAGSHIPS.
- BIOREFINERIES INTENDED AS BIOECONOMY INFRASTRUCTURES, INTERCONNECTED AMONG THEM AND CONNECTED WITH THE LOCAL AREAS.



## LOW-IMPACT AND DEDICATED AGRICULTURAL VALUE CHAINS

- THROUGH THE VALORISATION OF MARGINAL LAND AND NOT IN COMPETITION WITH FOOD PRODUCTION
- INTEGRATED IN THE LOCAL AREAS AND CONNECTED WITH THE BIOECONOMY INFRASTRUCTURES.



## PRODUCTS CONCEIVED AS SOLUTIONS

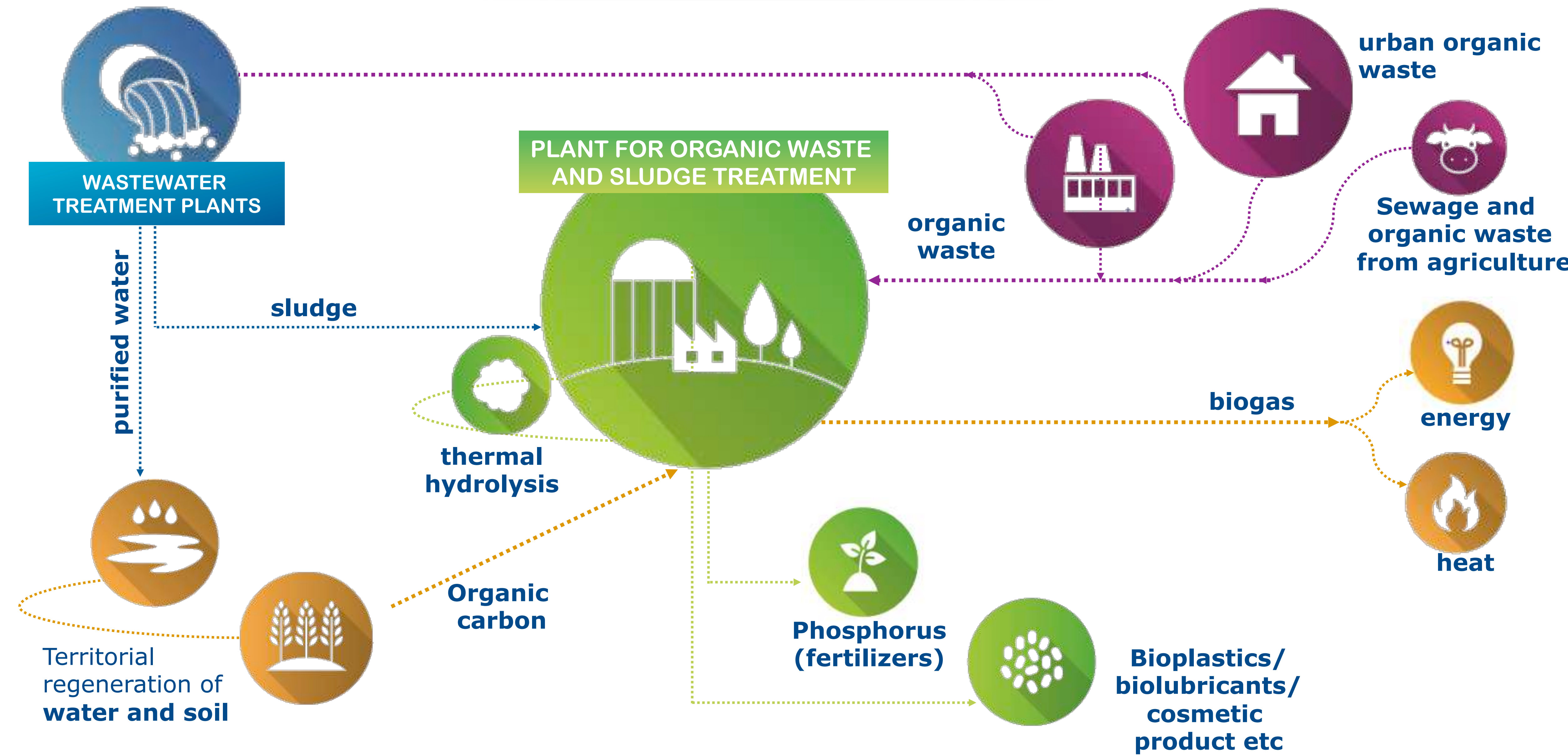
- DESIGNED TO TACKLE REAL SOCIETAL CHALLENGES PROVIDING CONCRETE SOLUTIONS TO PROBLEMS GOING FAR BEYOND THE PRODUCT ITSELF.
- **CLEAN LIQUID AND SOLID ORGANIC WASTES STREAMS FOR SOIL REGENERATION.**
- **PRODUCTS WITH RISK OF DISPERSION IN THE ENVIRONMENT THAT DO NOT ACCUMULATE**

Multiplication of integrated projects in the local areas and their monitoring



# TERRITORIAL REGENERATION: ORGANIC SOLID AND LIQUID STREAMS

THE INTERCONNECTIONS ACROSS THE SECTORS

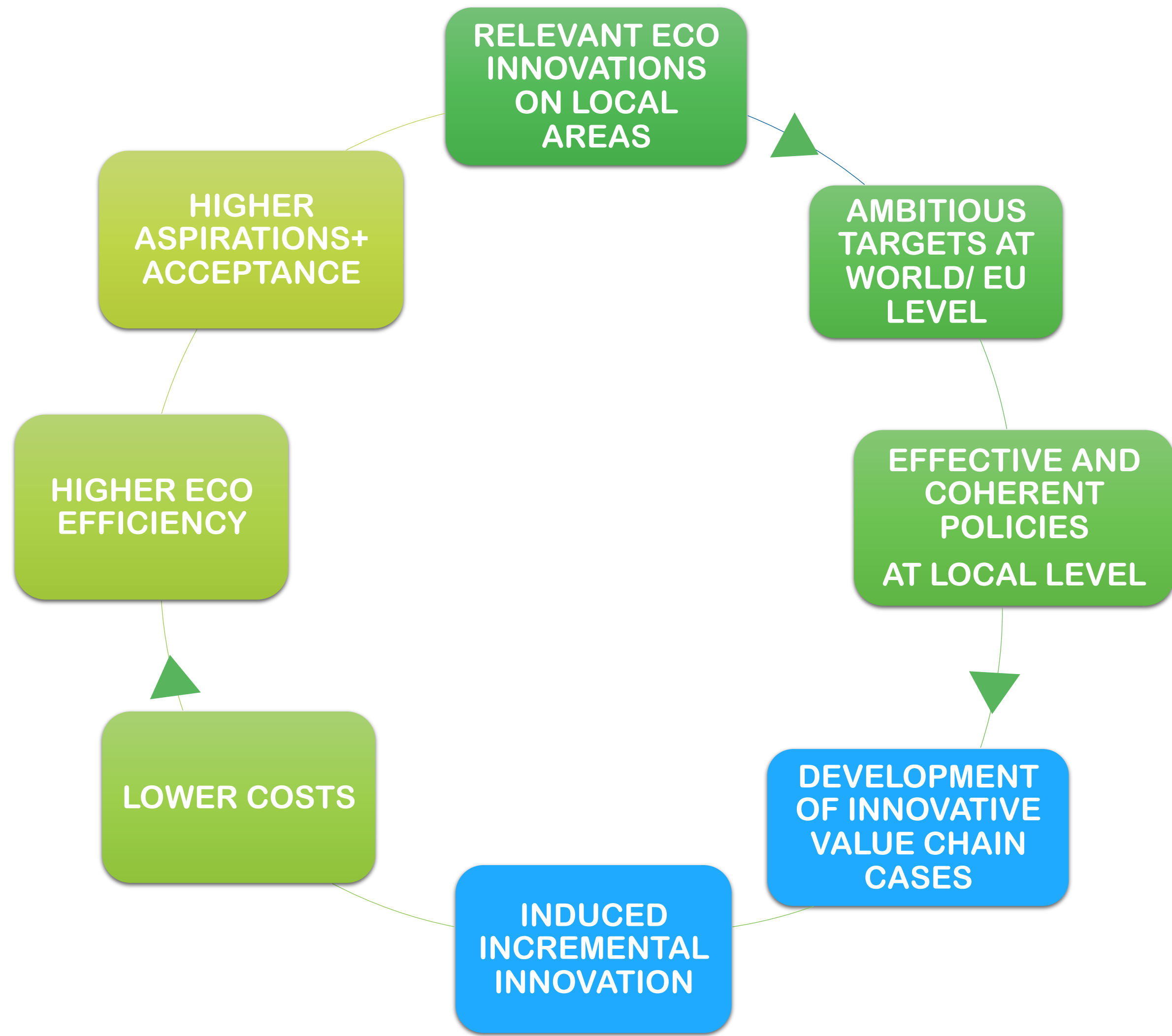






# CONNECTING AND MULTIPLYING THE EXISTENT CASE STUDIES: THE ACCELERATION FACTOR

THE MULTIPLICATION OF INTEGRATED INCLUSIVE VALUE CHAIN PROJECTS AT LOCAL LEVEL  
STIMULATE SECONDARY SYSTEMIC INNOVATION  
REDUCING COSTS AND MAKING SOCIETY MORE RESILIENT

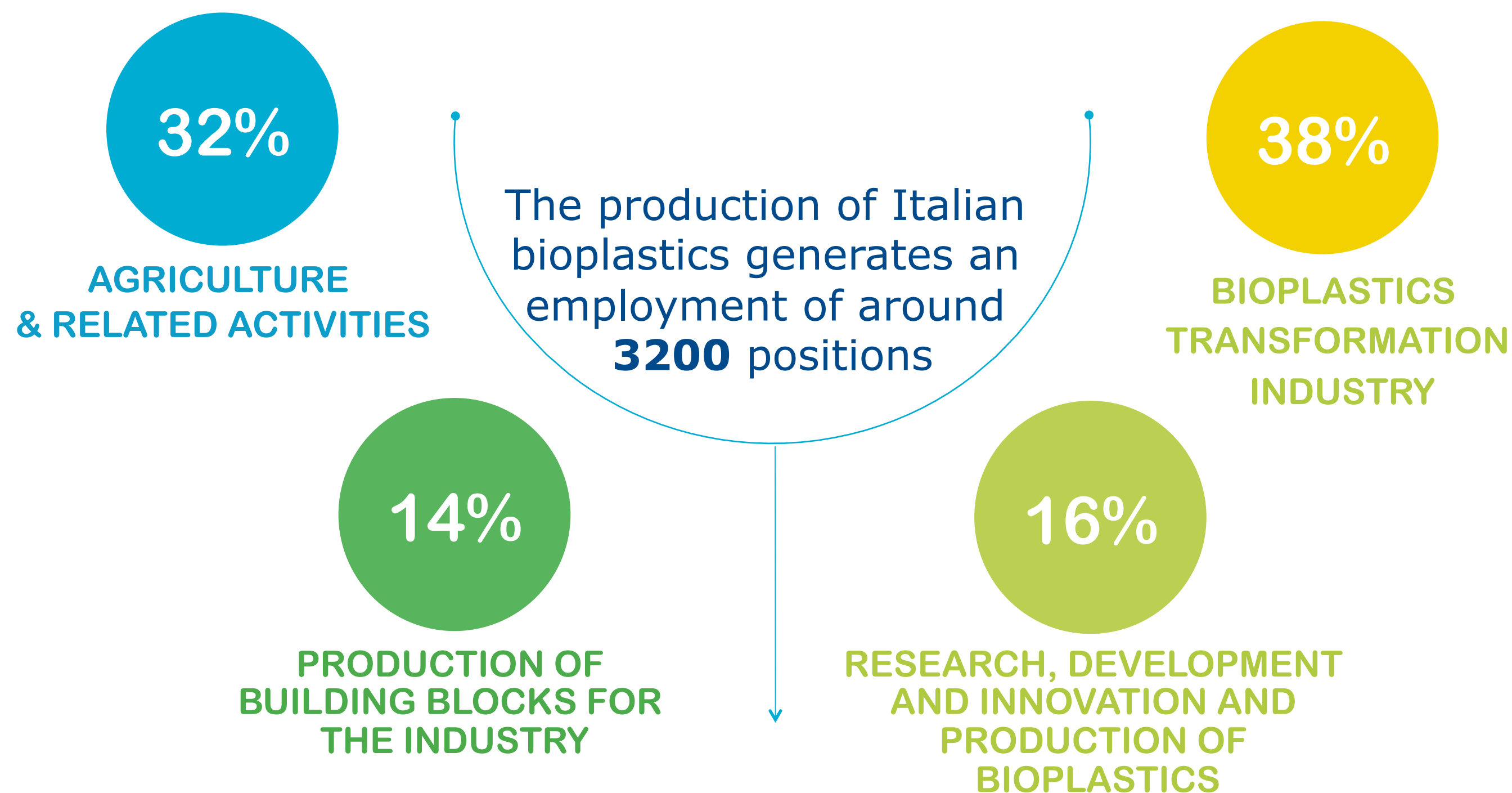


# A CIRCULAR APPROACH TO BIOECONOMY AN OPPORTUNITY TO DECARBONISE THE ECONOMY AND RECONNECT IT WITH SOCIETY

*There is a much more at stake than industry and agriculture in this reconnection: there is the antidote against the increasing poverty and inequalities*

*The social fabric is not something separate from the industrial world: industry, agriculture and the environment, academy and school institutions, the world of consumption and labor must work together for a common project of development where virtuous cooperation – at a time so highly critical on many fronts – could take the place of sterile position battles.*



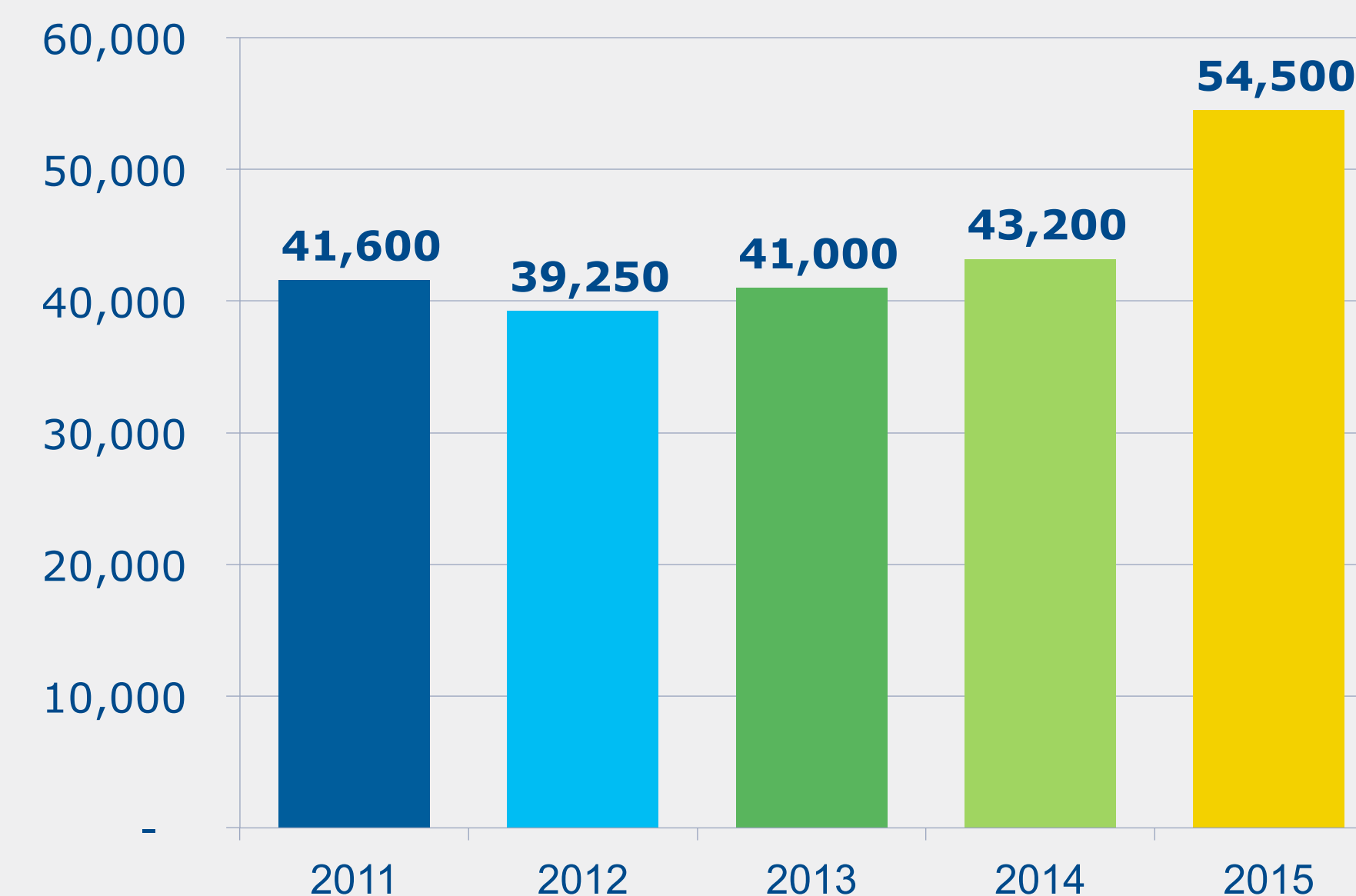


Including in this computation the around 9000 jobs <sup>[1]</sup> directly or indirectly related to organic waste recycling, from collection to management, it can be assessed that the employment related to the whole supply chain, for the production and management of Italian bioplastics is around **12.000 positions**, representing **~100 jobs every 1000 tons of bioplastic produced**.

### THE ITALIAN VALUE CHAIN OF COMPOSTABLE POLYMERS

- 210 operators
- 2,000 dedicated employees
- 475 million euros

### EVOLUTION OF THE NATIONAL PRODUCTION OF COMPOSTABLE MANUFACTURES (TON / A) \*



\* Fonte: Plastic Consult 2016





# THE REGENERATION CONTINUES

MATER-BIOPOLYMER: A VIRTUOUS EXAMPLE OF INDUSTRIAL DEVELOPMENT IN TERMS OF REGENERATION

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NEW PRODUCTS FROM  
WASTE RECOVERY:  
WORLD-FIRST BIOGENIC  
THF

-90%  
of WASTE  
PRODUCED

from 250,000 t/y of PET  
to **100,000 t/y**  
of BIOPOLYMERS

**246,000**

metric tons CO<sub>2</sub> eq.  
EMISSIONS AVOIDED  
PER YEAR