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# A CIRCULAR APPROACH TO BIOECONOMY: THE ITALIAN BIOPLASTICS AND BIOCHEMICALS VALUE CHAIN

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# “GHG CONCENTRATIONS SURGE TO NEW RECORD”

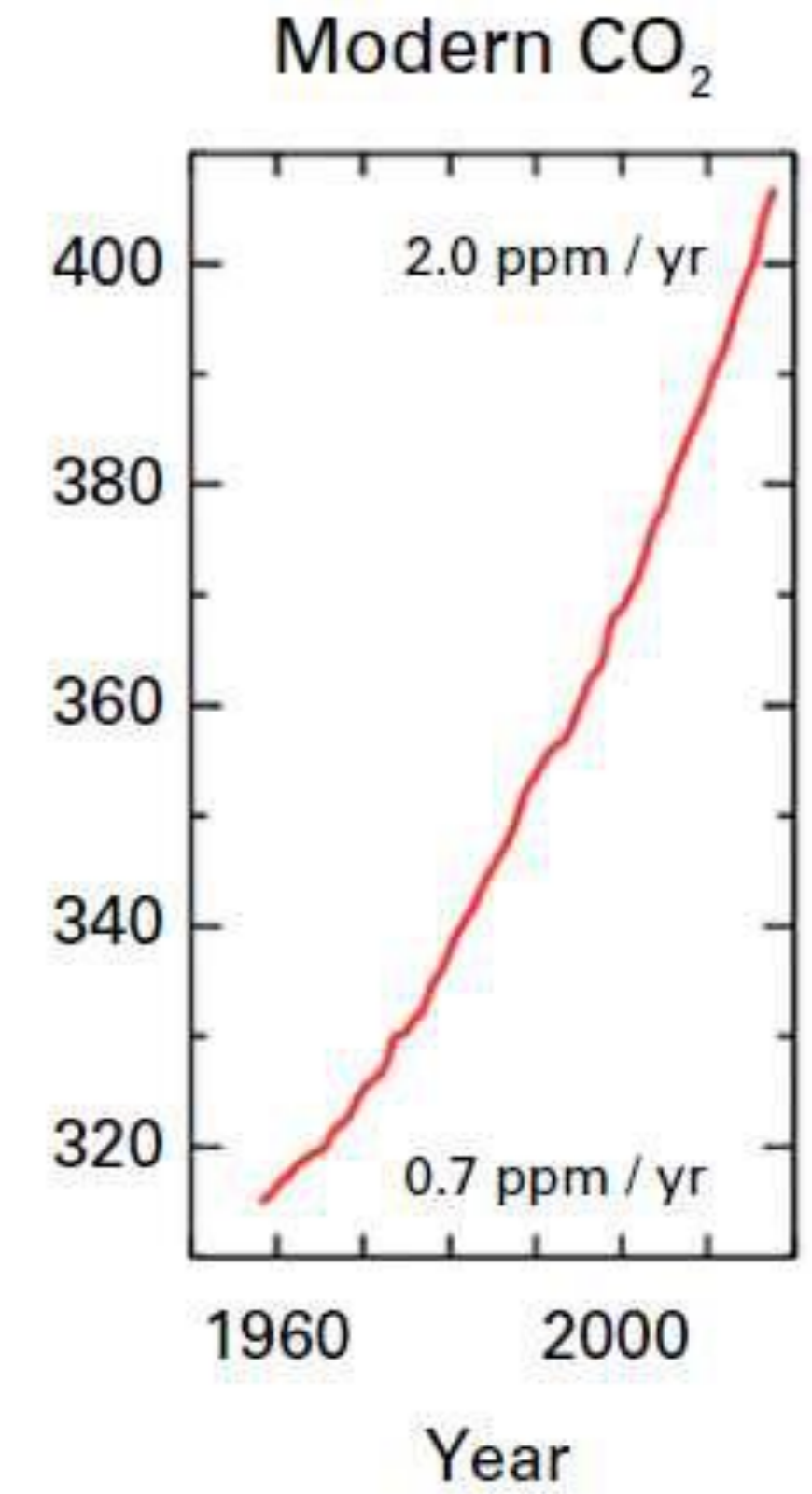
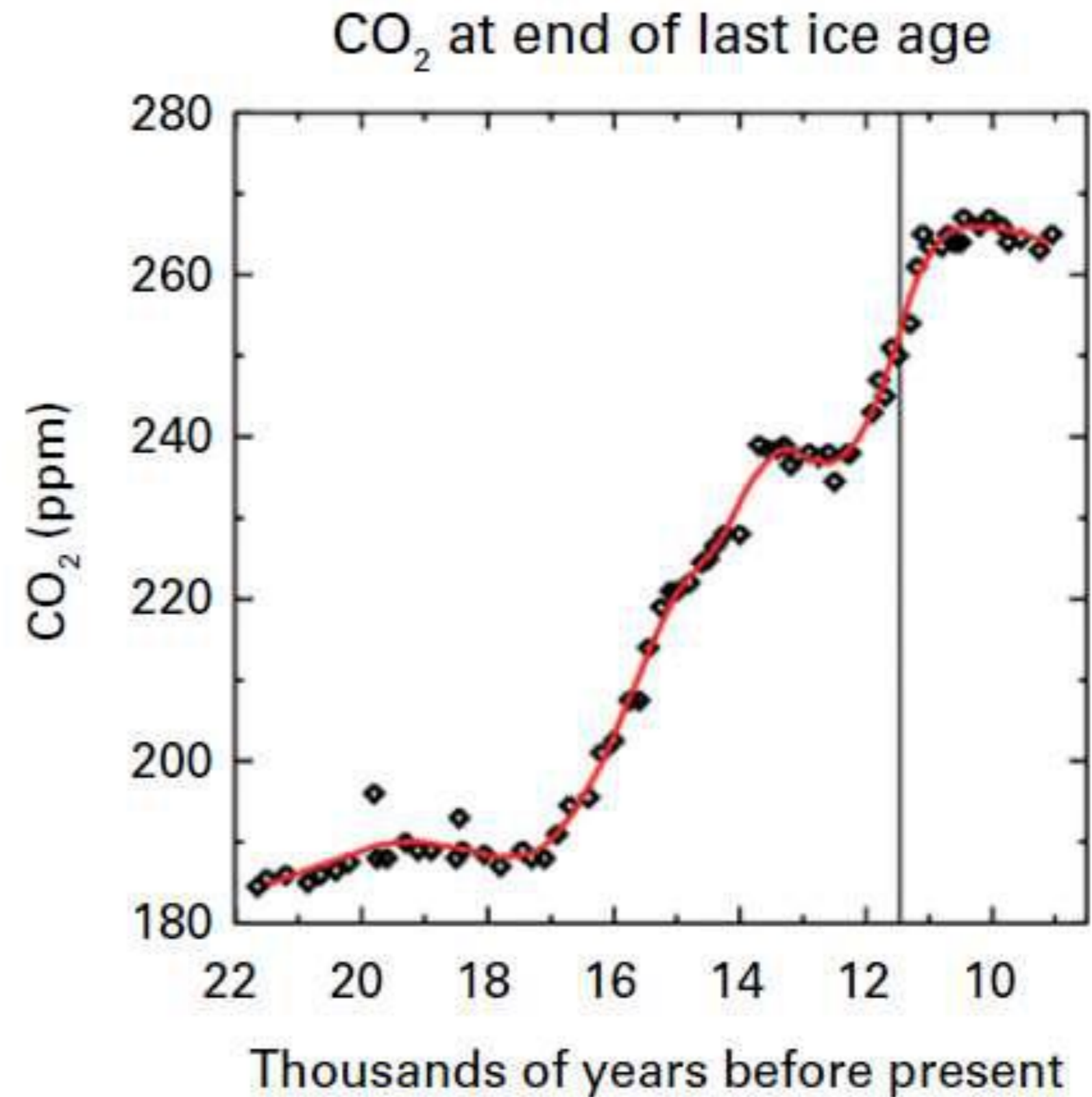
30TH OCTOBER 2017

Concentrations of carbon dioxide in the atmosphere surged at a record-breaking speed in 2016 to the highest level in 800 000 years.

Globally averaged concentrations of CO<sub>2</sub> reached 403.3 parts per million in 2016, up from 400.00 ppm in 2015 because of a combination of human activities and a strong El Niño event.

Concentrations of CO<sub>2</sub> are now 145% of pre-industrial (before 1750) levels.

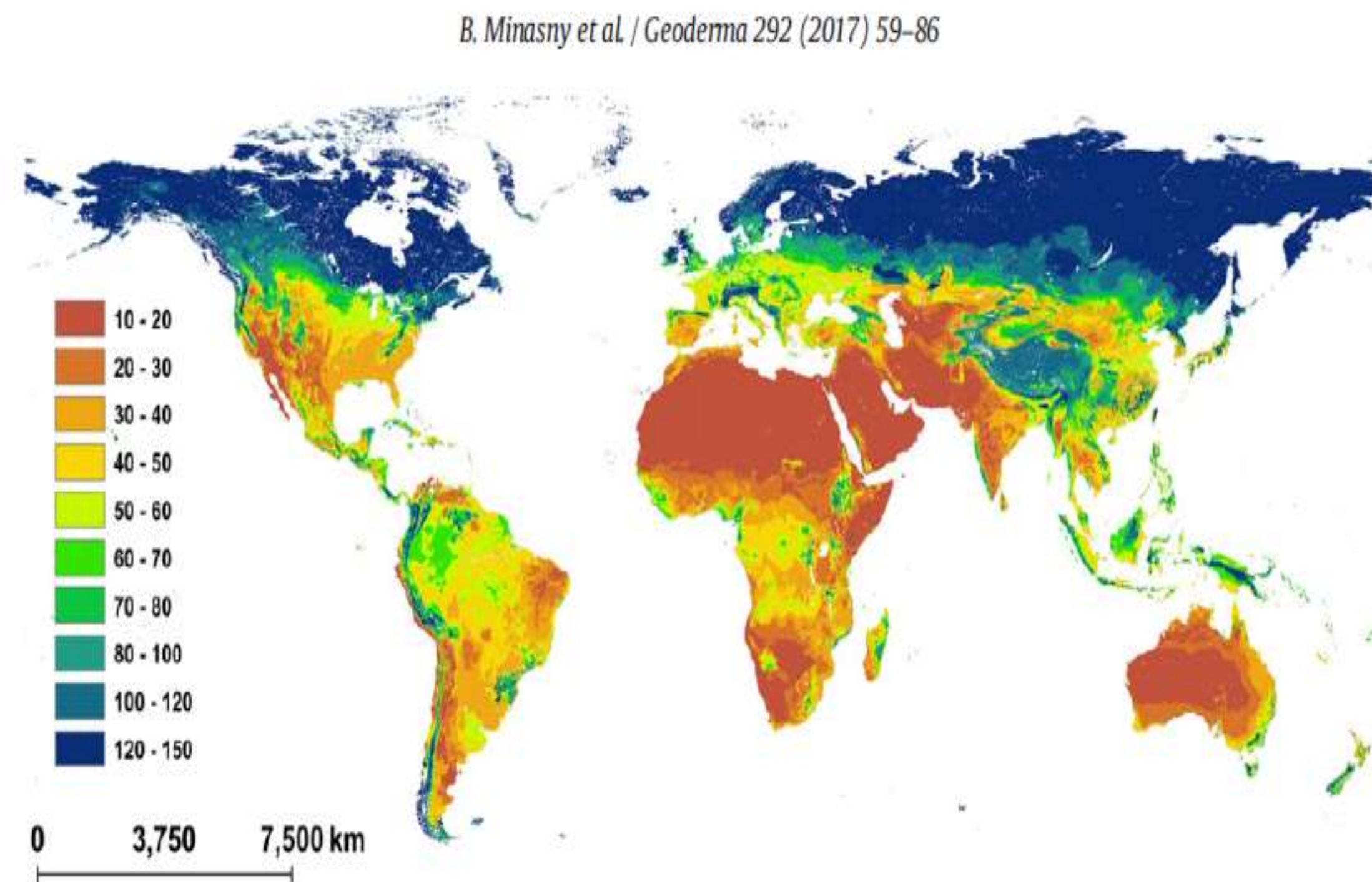
*World Meteorological Organization's Greenhouse Gas Bulletin, 30<sup>th</sup> October 2017*





# CARBON STOCK IN SOIL IN THE PLANET TOPSOIL

SOIL ORGANIC MATTER (SOM) PIVOTAL TO MANY SDGS (LAND, WATER, HEALTHY SOILS, CLIMATE AND GLOBAL WARMING)



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).

**24 %** of global soils are degraded at various levels, including 50 % of agricultural soils [source: Bai et al., 2013]

**1 500** billion tonnes of carbon are stocked in soil organic matter, which is twice more carbon than atmospheric CO<sub>2</sub> [source : IPCC, 2013]

**1,2** billion tonnes of carbon could be stocked every year in agricultural soils which represents an annual rate of 4‰ compared to the surface soil horizon [source : IPCC, 2014]

Every years crop production in Africa, Asia and South America could increase by **24/40** millions, by increasing soil organic matter by 1 tonne/ha [Lal , 2006]

**1,2** billion USD is the economic loss in crop production due to soil degradation [FAO, 2006]

BUDIMAN MINASNY ET AL. (2017)

«THE 4 PER MILLE SOILS FOR FOOD SECURITY AND CLIMATE» INITIATIVE WAS LAUNCHED AT THE COP21 WITH AN ASPIRATION TO INCREASE GLOBAL SOIL ORGANIC MATTER STOCKS BY «4 PER 1000» (OR 4‰ ) PER YEAR AS A COMPENSATION FOR THE GLOBAL EMISSIONS OF GREENHOUSE GASES BY ANTROPHOGENIC SOURCES

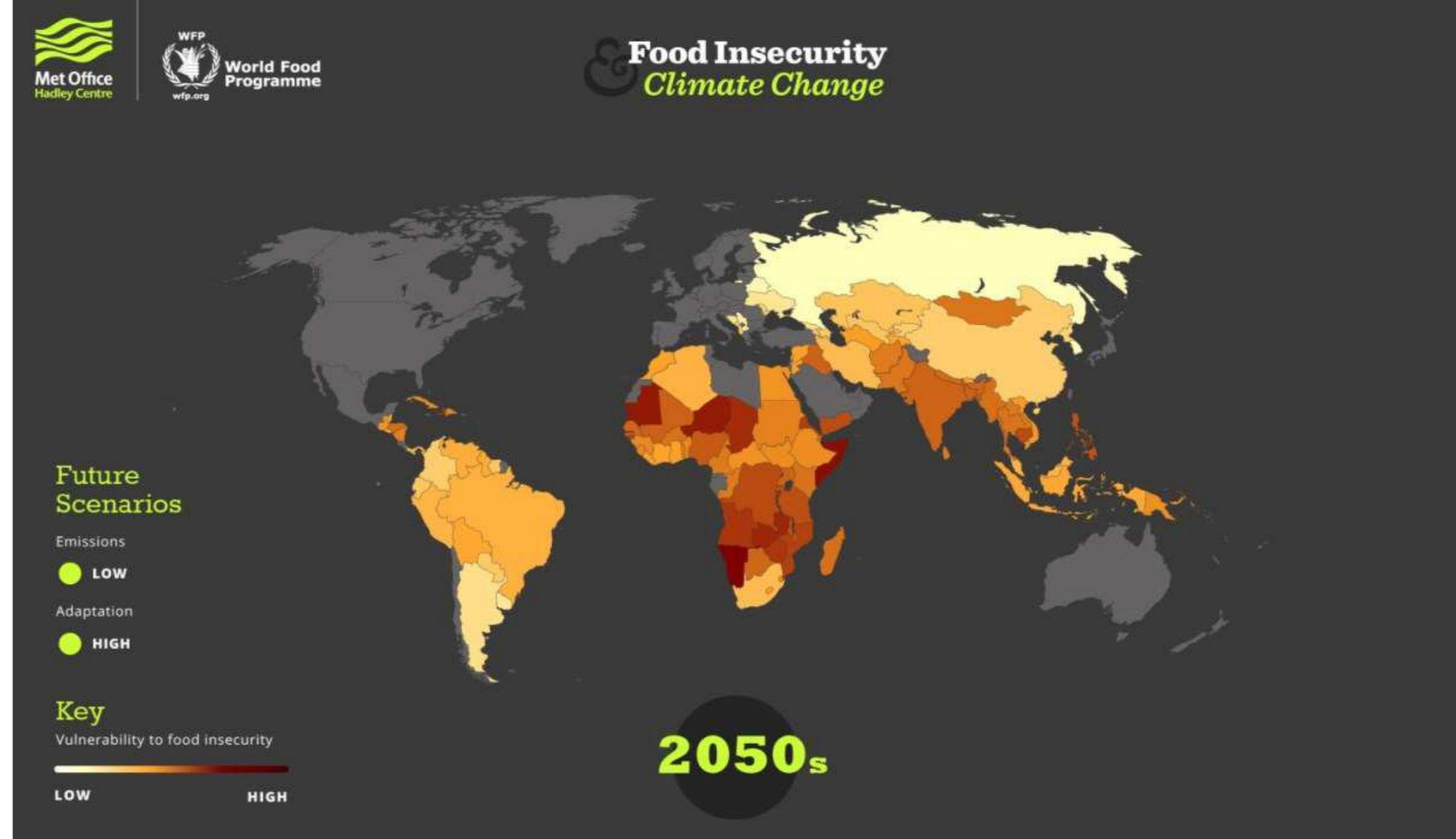
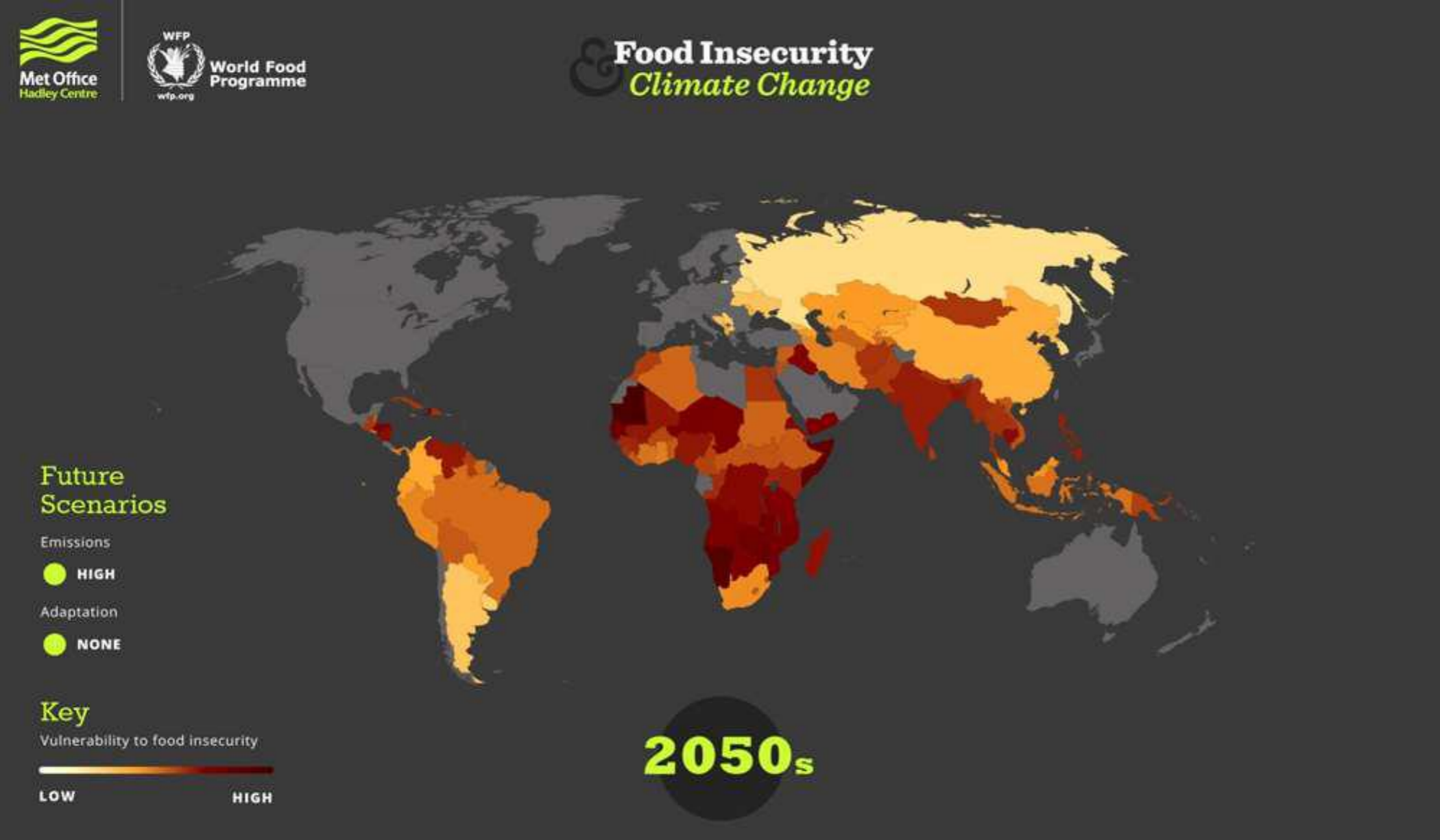
Global greenhouse gas emissions and adaptation to climate change could prevent the worst impacts on hunger globally and help make people less vulnerable to food insecurity.

Failure to adapt, along with increases in greenhouse gas emissions, could push millions of people deeper into hunger and malnutrition.

*Met Office and the UN World Food Programme (WFP), January 2016*

### HIGH GHG, NO ADAPTATION

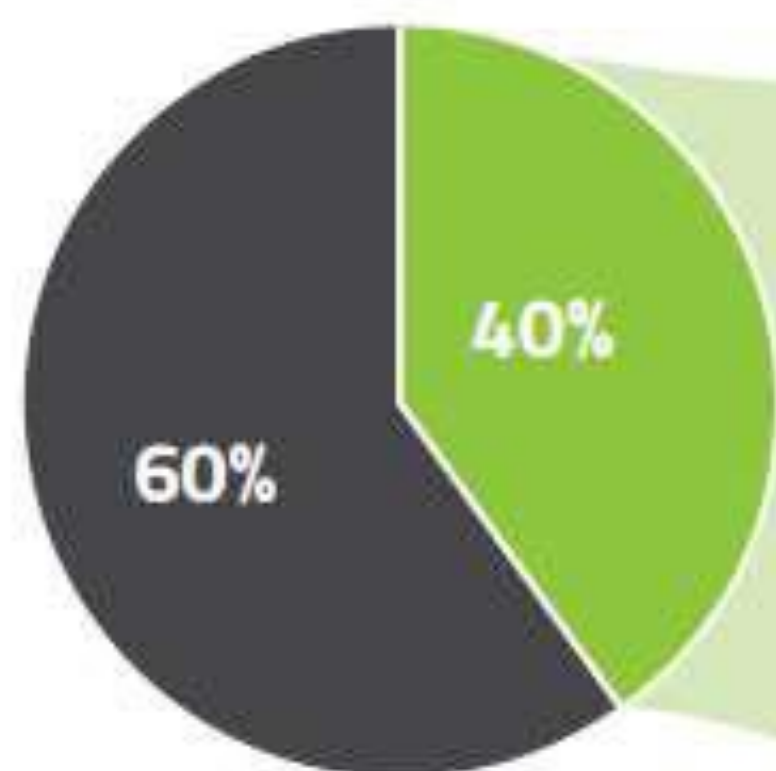
### LOW GHG, HIGH ADAPTATION



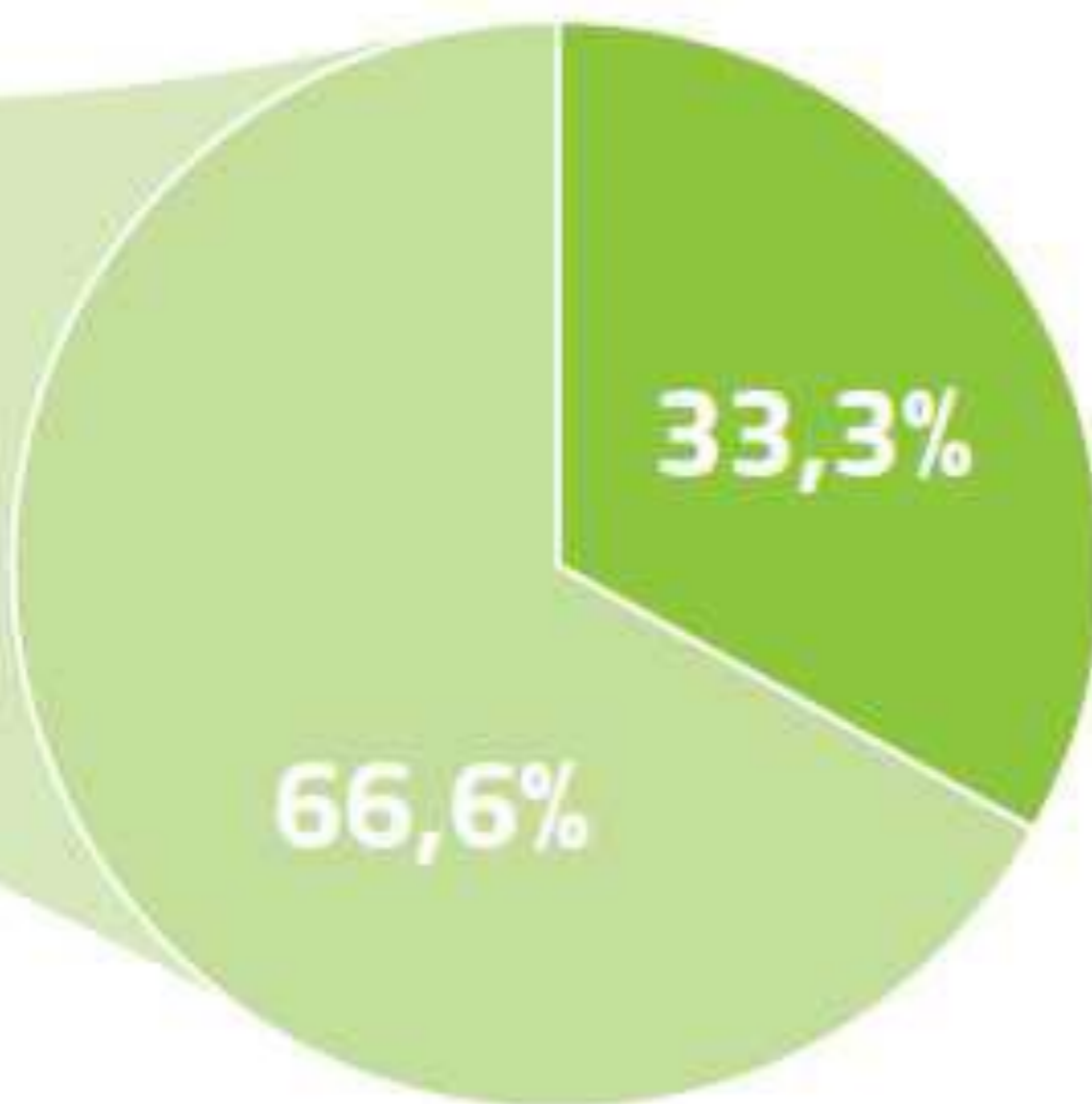


### BIOWASTE IN EUROPE


#### TOTAL WASTE





#### TOTAL BIOWASTE



 potential biowaste in MSW EU28 96 Mt pa

 regular waste

 utilized potential biowaste

 non-utilized potential biowaste

### POTENTIAL DIRECT JOBS IN THE BIOWASTE SECTOR



RURAL AREAS

1 JOB / 1380t biowaste



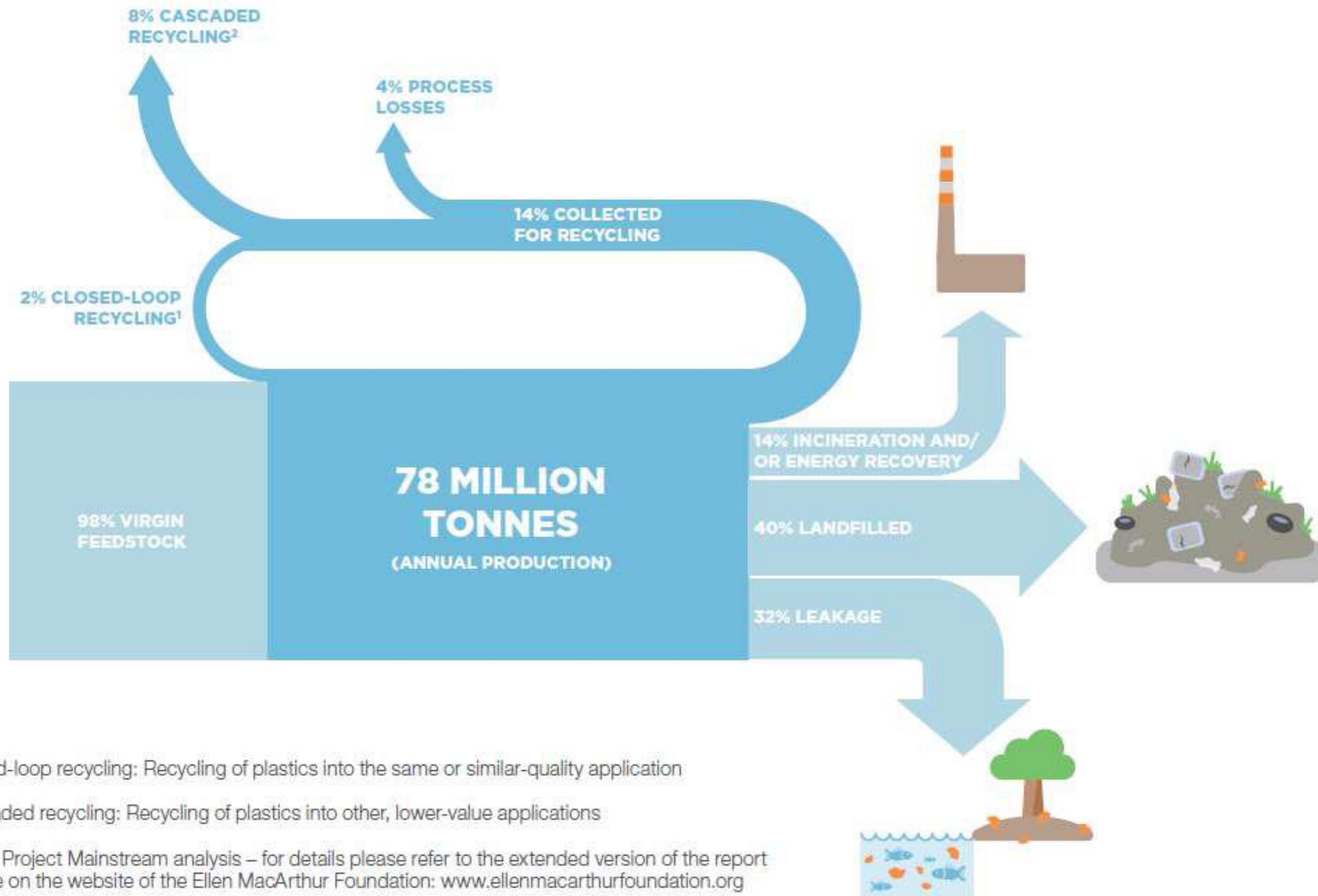
URBAN AREAS

1 JOB / 4500t biowaste



# GLOBAL FLOWS OF PLASTIC PACKAGING MATERIALS

ELLEN MACARTHUR FOUNDATION 2016 (2013 DATA)





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



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



- DESIGNED TO TACKLE REAL SOCIETAL CHALLENGES
- ELEMENTS OF A SYSTEM WHICH PROVIDE CONCRETE SOLUTIONS TO PROBLEMS GOING FAR BEYOND THE PRODUCT ITSELF

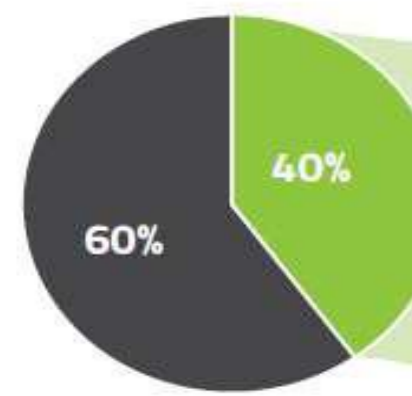


# TURNING A PROBLEM INTO AN OPPORTUNITY

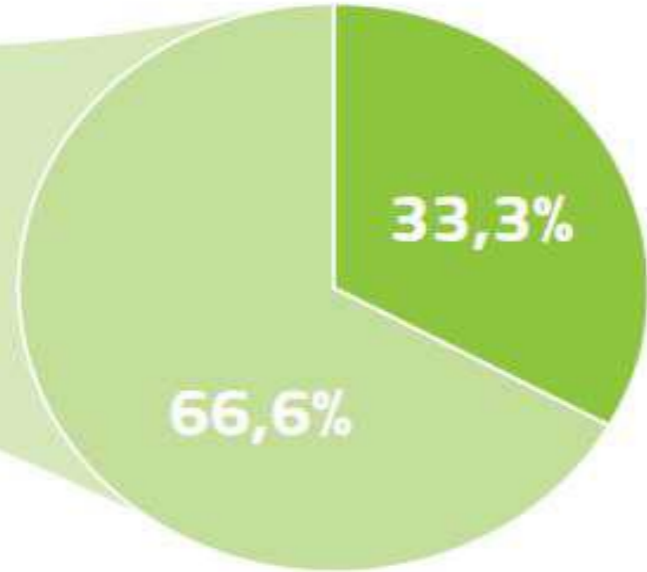
## ORGANIC WASTE IN LANDFILL



TOTAL WASTE



TOTAL BIOWASTE



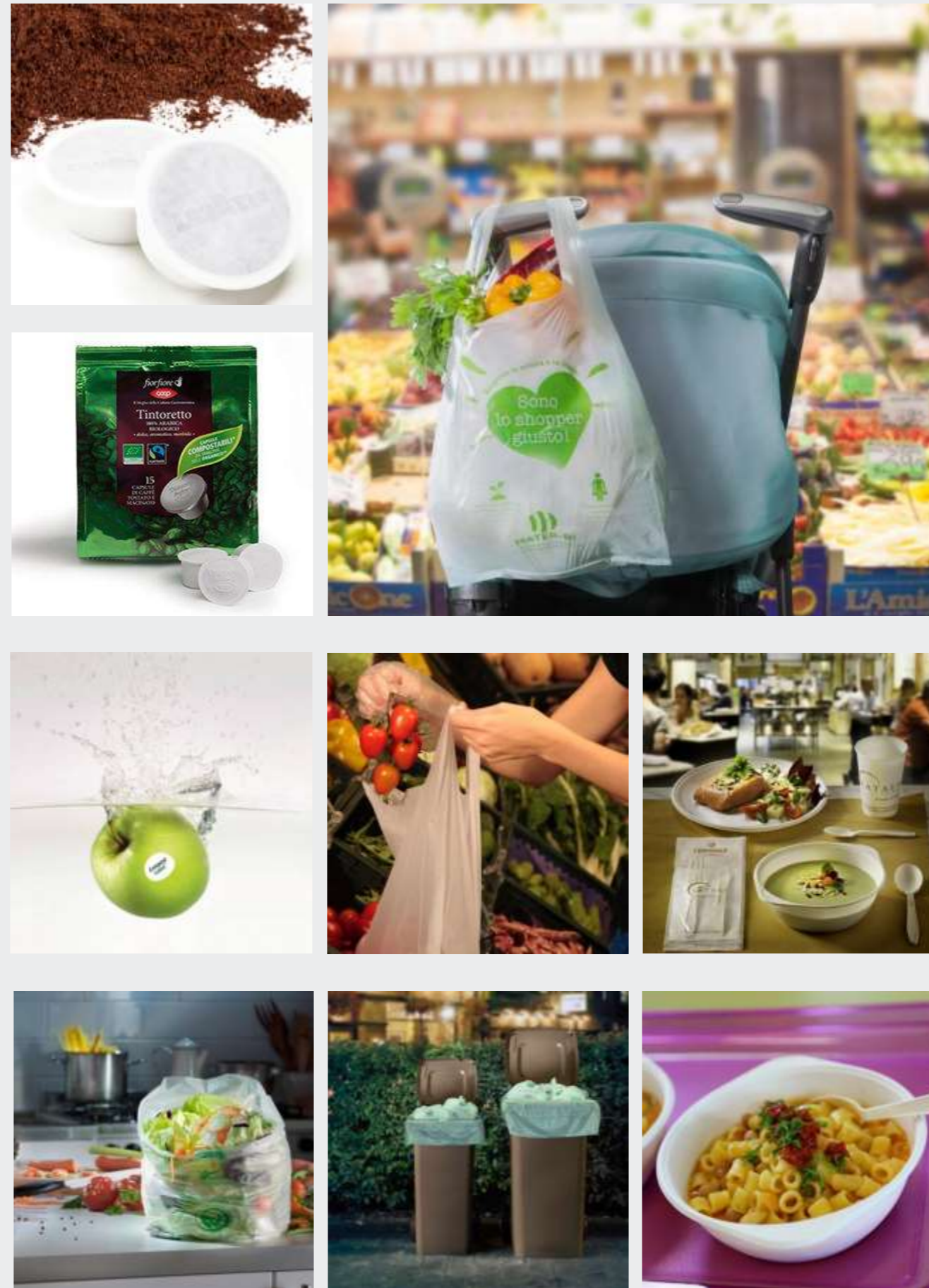
potential biowaste in MSW EU28 96 Mt pa

utilized potential biowaste

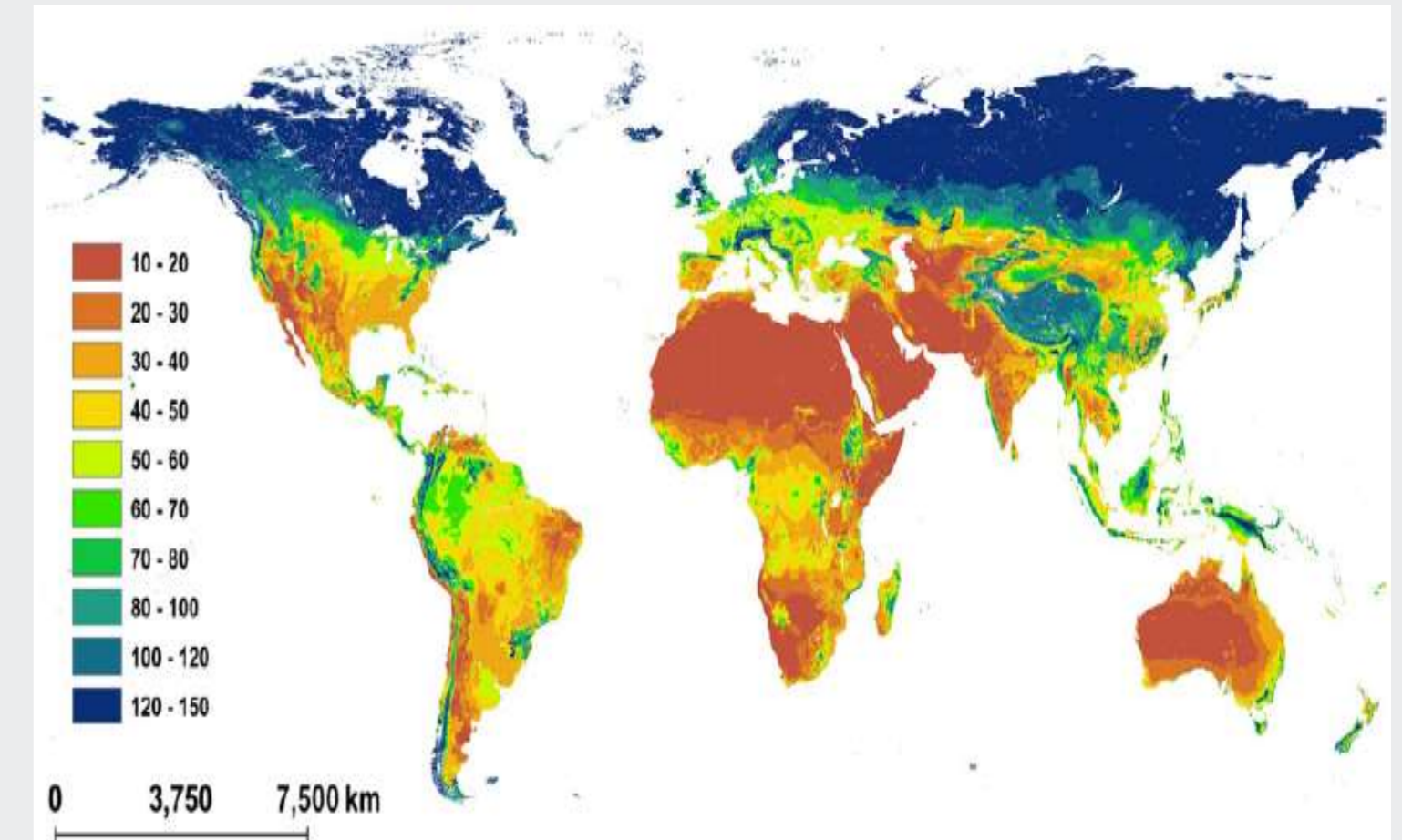
regular waste

non-utilized potential biowaste

## ORGANIC WASTE SEPARATE COLLECTION INFRASTRUCTURES AND BIODEGRADABLE BIOPLASTICS IN LIMITED AND SPECIFIC APPLICATIONS



## COMPOST AS DRIVER FOR SOILS FERTILITY

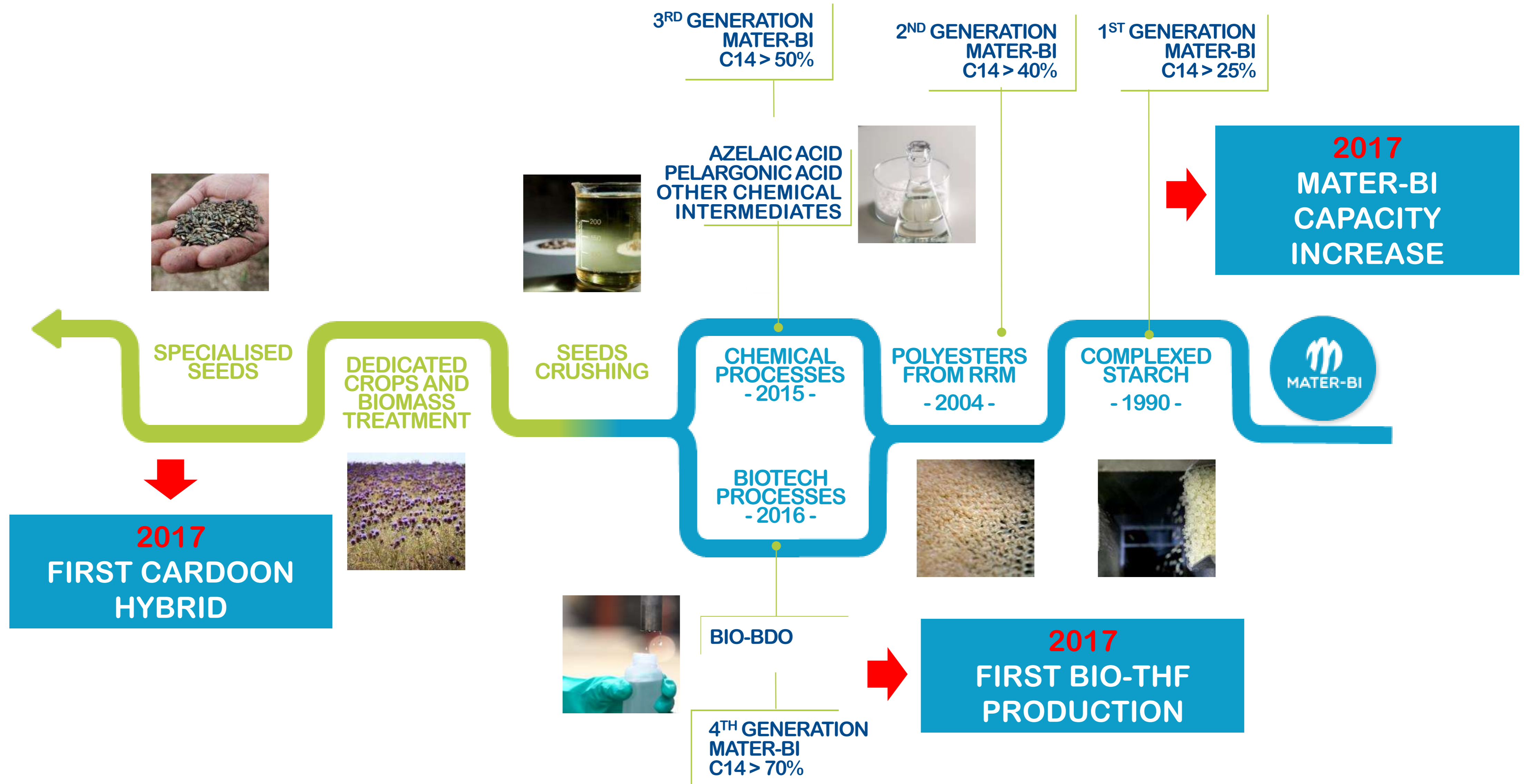






# NOVAMONT'S PROPRIETARY TECHNOLOGIES

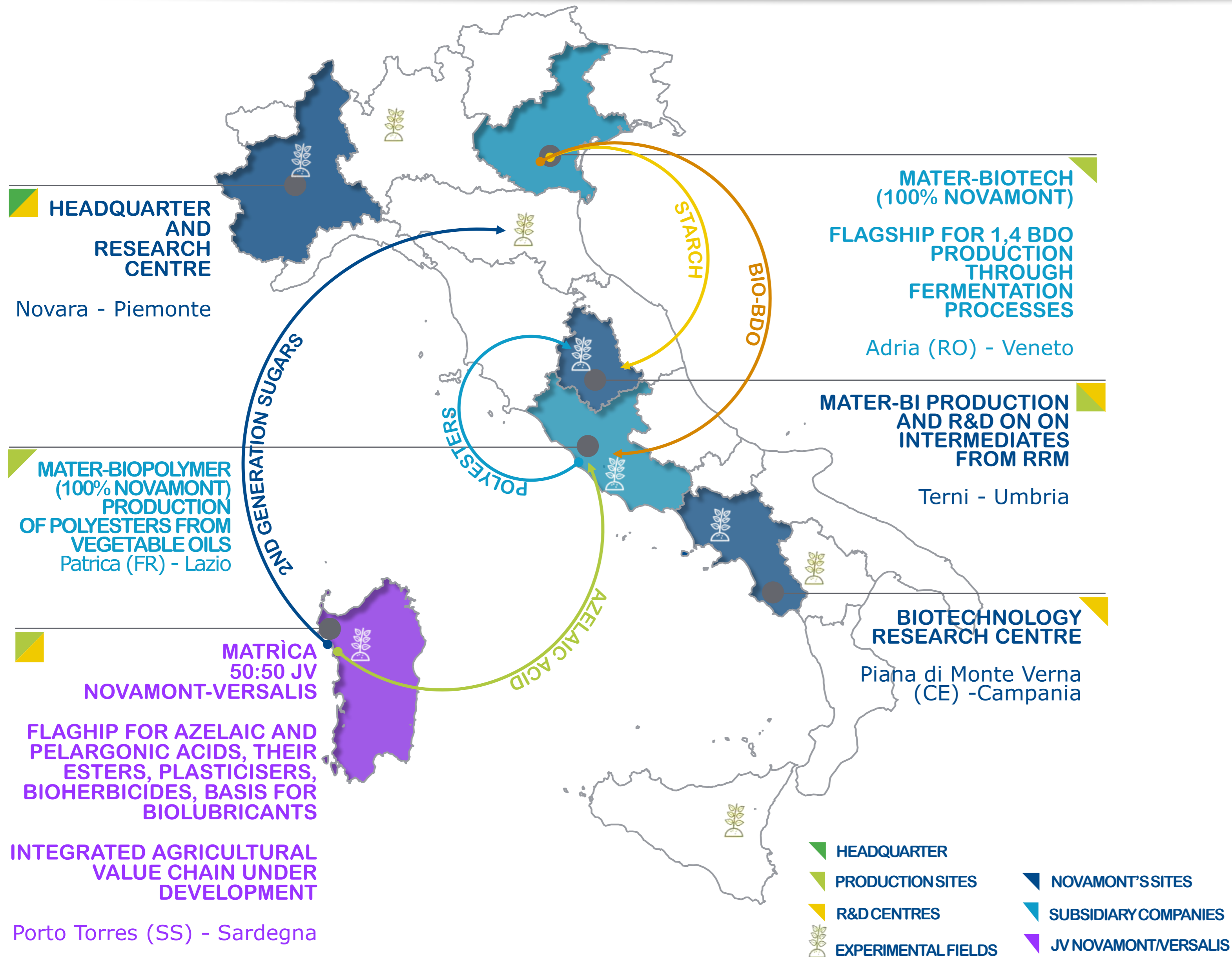
UPSTREAM INTEGRATION 1989-2017: INTEGRATED VALUE CHAIN OF MATER-BI BIOPLASTICS AND BIOCHEMICALS





# NOVAMONT'S BIOECONOMY INFRASTRUCTURES

NOVAMONT'S NETWORK FOR THE BIOPLASTICS AND BIOCHEMICALS VALUE CHAIN



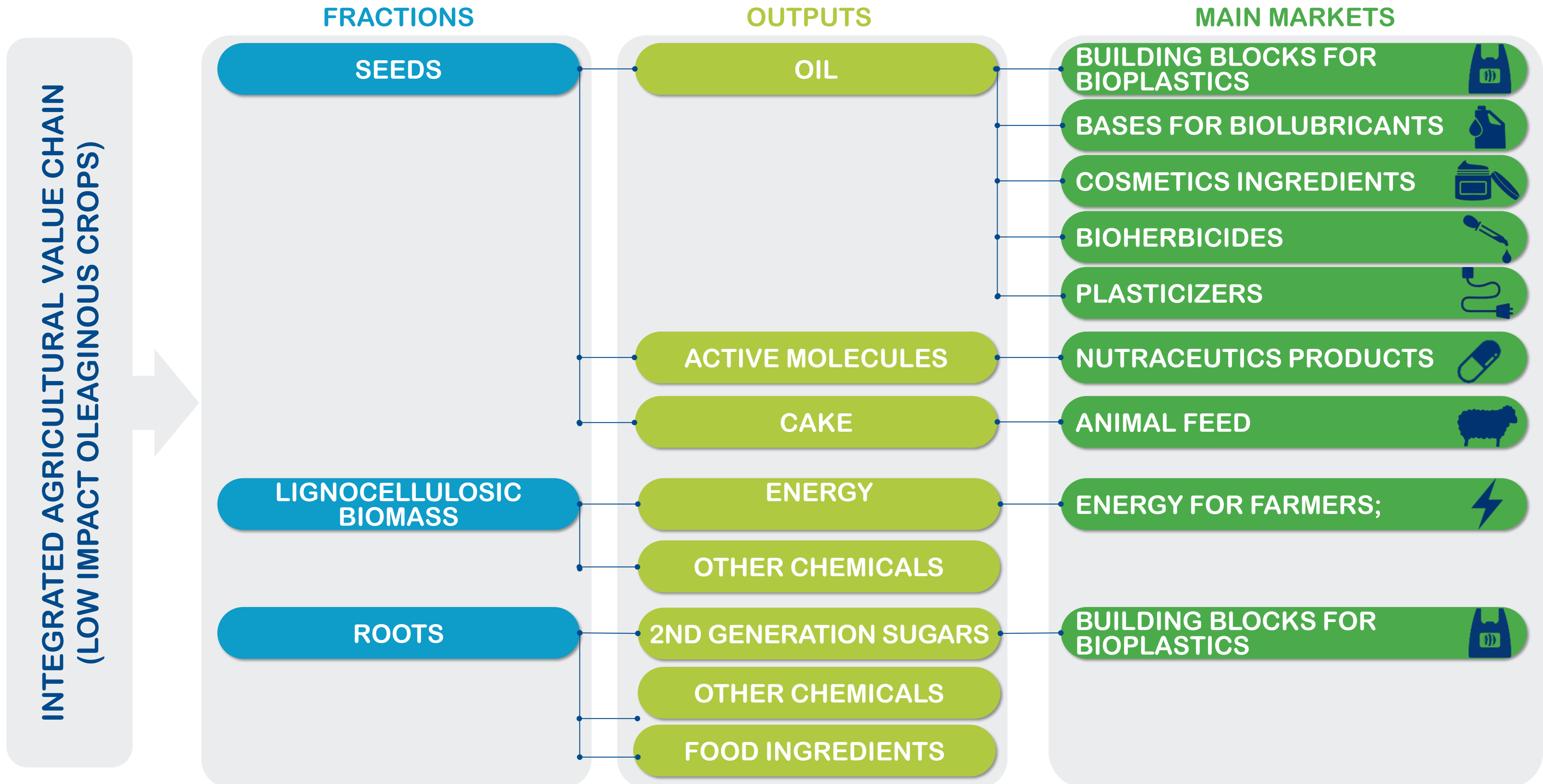
## FROM A RESEARCH CENTER IN 1996 UP TO....

- Pioneer and world leader in the development of bioplastics and bioproducts
- Consolidated turnover (2016): 170M€
- > 600 people
- 3 R&D centers
- 20% of people in R&D activities
- >7% of turnover in R&D activities
- About 1.000 patent cases filed
- 4 production sites
- 4 new technologies up and running



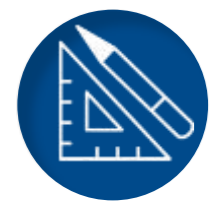
# NEW PRODUCTS FOR THE QUALITY OF THE ENVIRONMENT

AND RELATED BUSINESS OPPORTUNITIES ALL ALONG THE VALUE CHAIN





**THE PIONEERING ACTIVITIES ON BIODEGRADABLE CARRIER AND WASTE BAGS AND THEIR VALUE-CHAIN IN ITALY ARE BECOMING A POWERFUL DEMONSTRATIVE CASE OF RELEVANT DIMENSIONS FOR SUSTAINABLE DEVELOPMENT AND CULTURAL GROWTH**



Redesigning entire application sectors



Affecting the way raw materials are produced through integration of entire agro-industrial chains



Modifying use and disposal of products



Extending the experimental activity of research labs to local areas

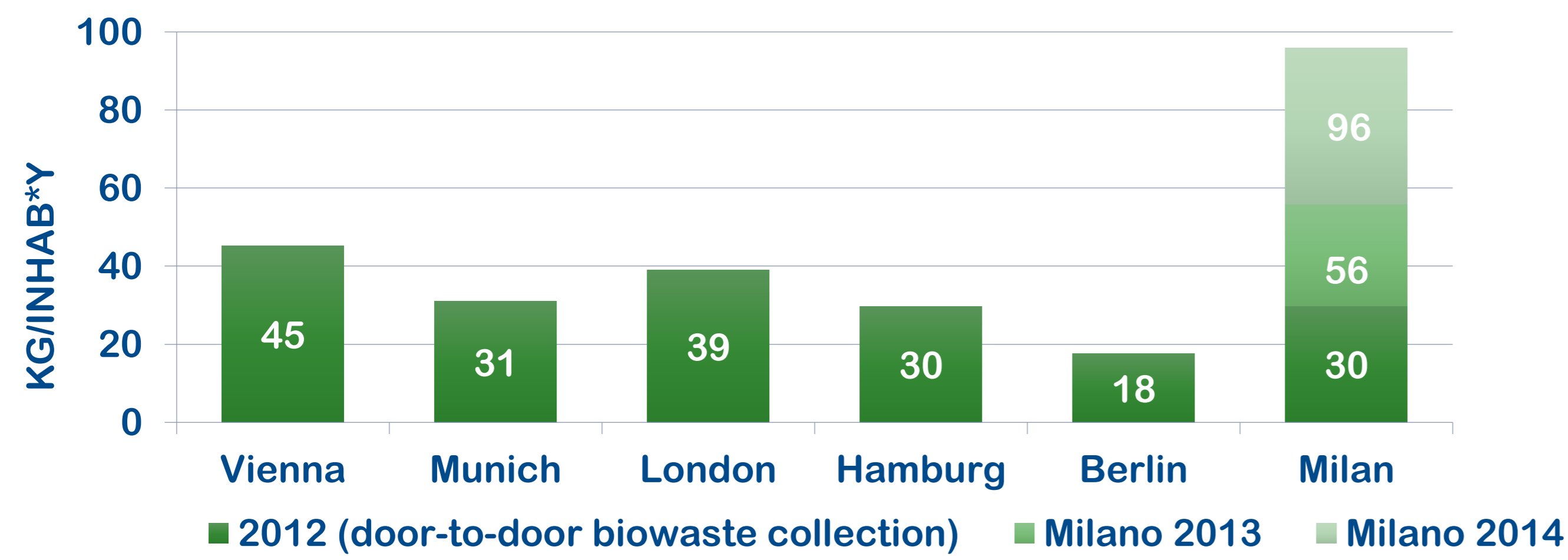
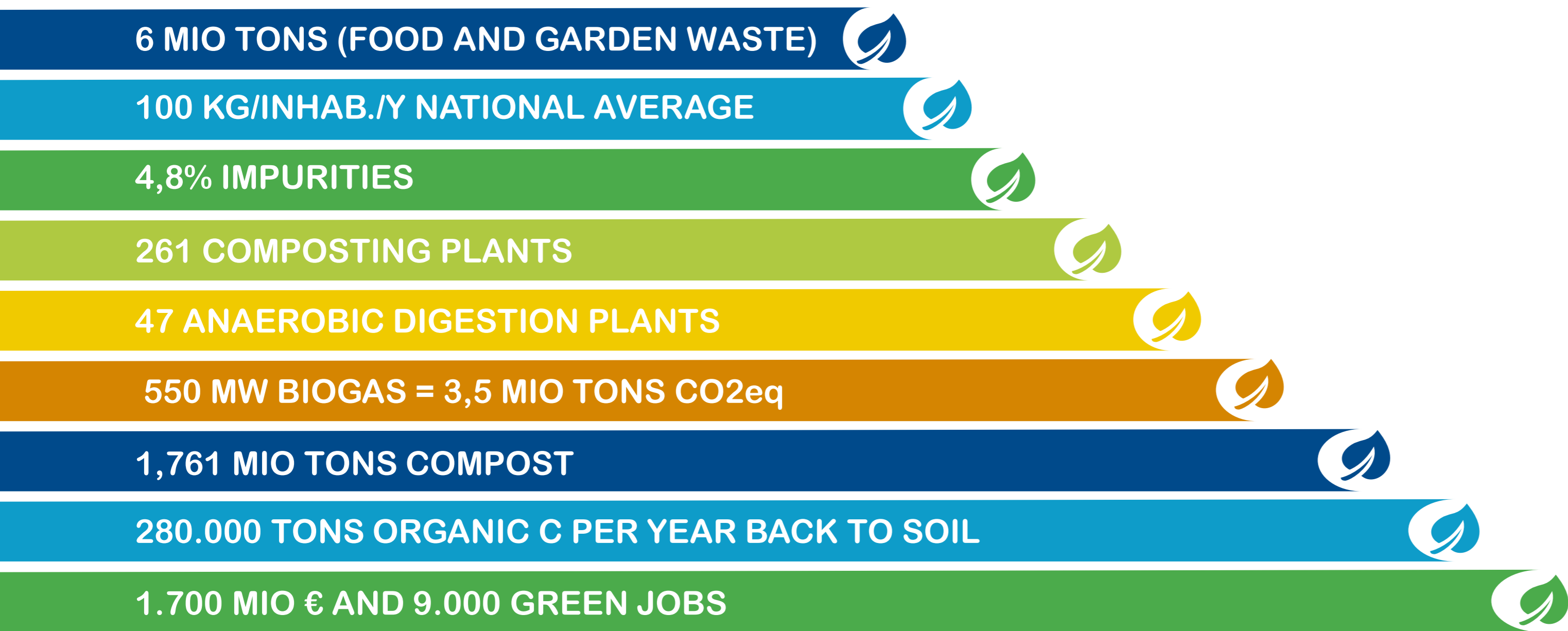


Defining reliable standards



# ORGANIC WASTE SEPARATELY COLLECTED IN ITALY 2016

CIC (Italian Composting Association ) DATA 2016 AND THE CASE STUDY OF MILAN



### IL RICICLO ORGANICO DELLE BIOPLASTICHE IN ITALIA

**68,8%** IMBALLAGGI IN BIOPLASTICA AVVIATI AL RICICLO ORGANICO

45.000 TON IMMESSI AL CONSUMO

**31.000 TON** AVVIATI AL RICICLO ORGANICO

**0,85%** PRESENZA DI IMBALLAGGI IN BIOPLASTICA NEL SISTEMA DEL RICICLO MECCANICO DELLA PLASTICA

**3,1%** PRESENZA DI IMBALLAGGI IN PLASTICA NEL RIFIUTO ORGANICO

Fonte: CIC, Plastic Consult, Corepla (2017)



80% OF MARINE LITTER COMES FROM LAND-BASED SOURCES

## CIRCULAR ECONOMY PRINCIPLES

### 1

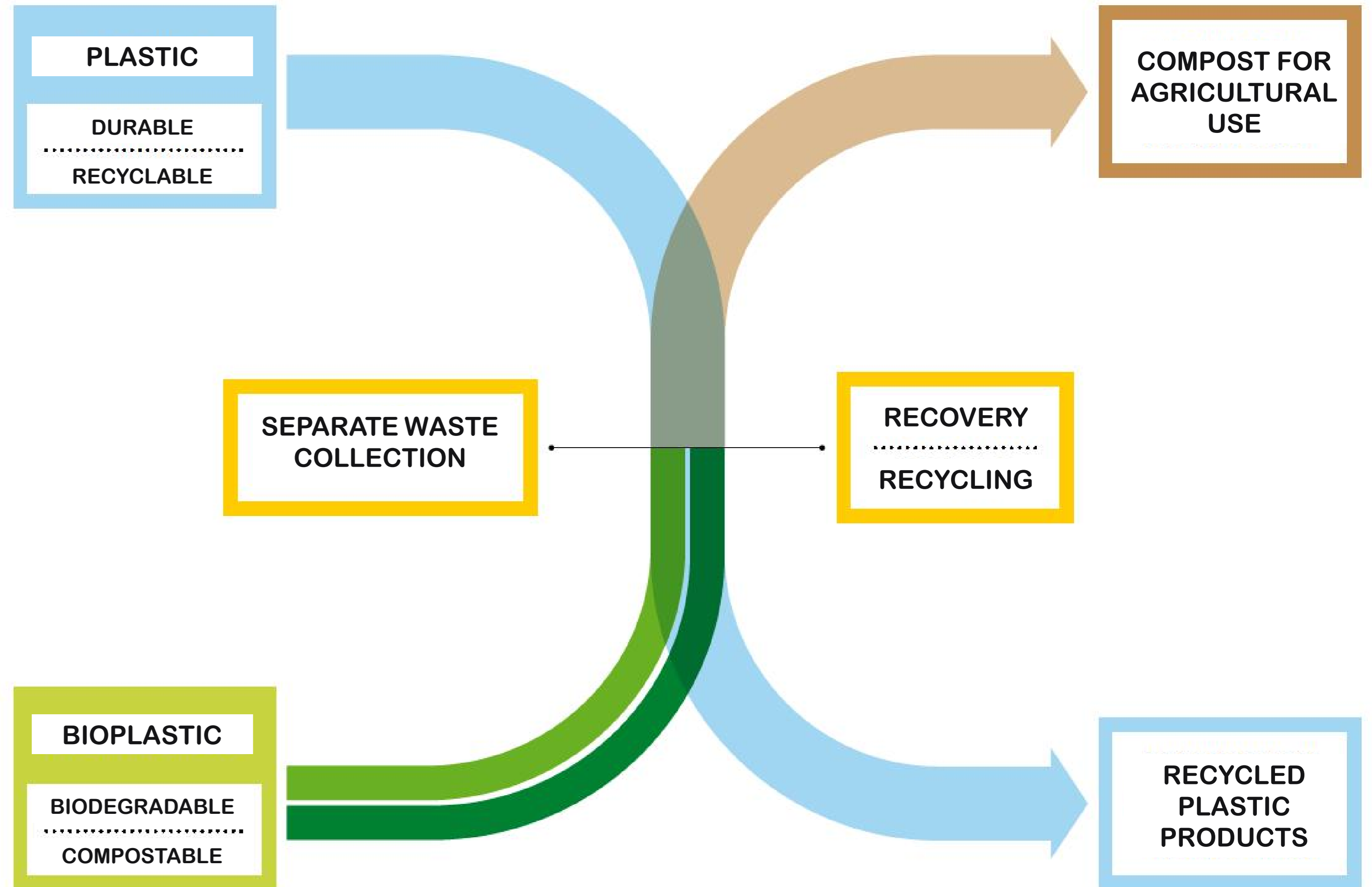
Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows  
ReSOLVE levers: regenerate, virtualise, exchange

### 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

### 3

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





**DICHEPLASTICA6**  
PLASTICA E BIOPLASTICA - DUE RISORSE DA CONOSCERE



IMBALLAGGI DI PLASTICA E BIOPLASTICA

**GUARDALI  
BENE  
SEPARALI  
MEGLIO**

ImageWare

Gli imballaggi in plastica e bioplastica sono diversi e vanno smaltiti separatamente. **Riconoscerli è facile, basta guardare i simboli.**

Fai una corretta raccolta differenziata! **Separali nei contenitori della plastica e dell'umido:** la plastica si trasformerà in nuova materia prima per utili prodotti, la bioplastica biodegradabile e compostabile in compost per la terra.

Scopri di più su [dicheplastica6.it](http://dicheplastica6.it)





# ITALY TOWARDS ZERO ORGANIC WASTE IN LANDFILL

A 5-YEAR PROGRAMME FOR ITALY TO ACHIEVE LEVELS OF EXCELLENCE AND ZERO ORGANIC WASTE IN LANDFILL



## Italy towards zero organic waste in landfill

EU strategies, funds for infrastructure and increasing spending efficiency in municipal solid waste management (OFMSW): a 5 year programme for Italy to achieve levels of excellence and zero organic waste in landfill

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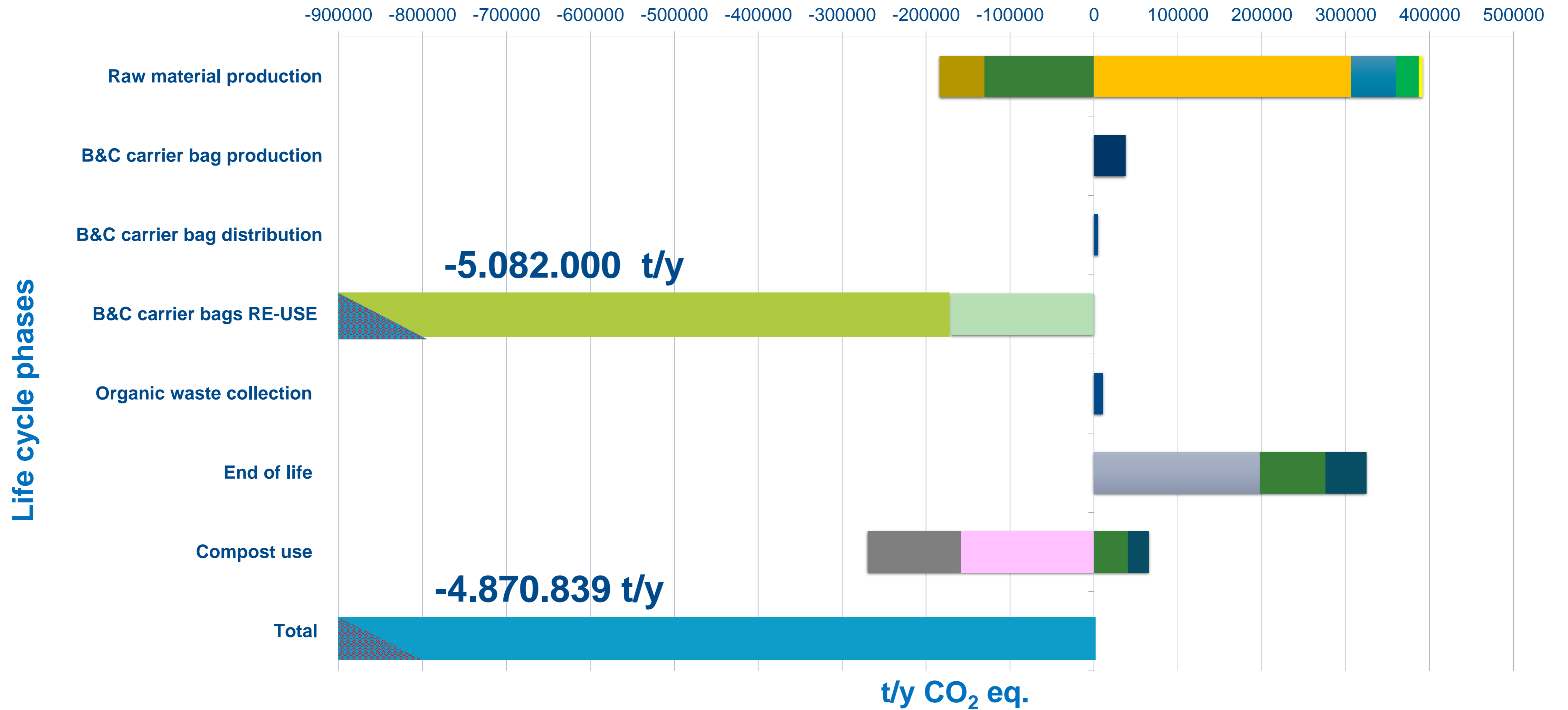






# AN EFFECTIVE CONTRIBUTION TO DECARBONISATION (1/2)

GHG EMISSION BALANCE IN CASE OF ZERO ORGANIC WASTE IN LANDFILL IN ITALY WITH 100 KTY OF MATER-BI IV BAGS



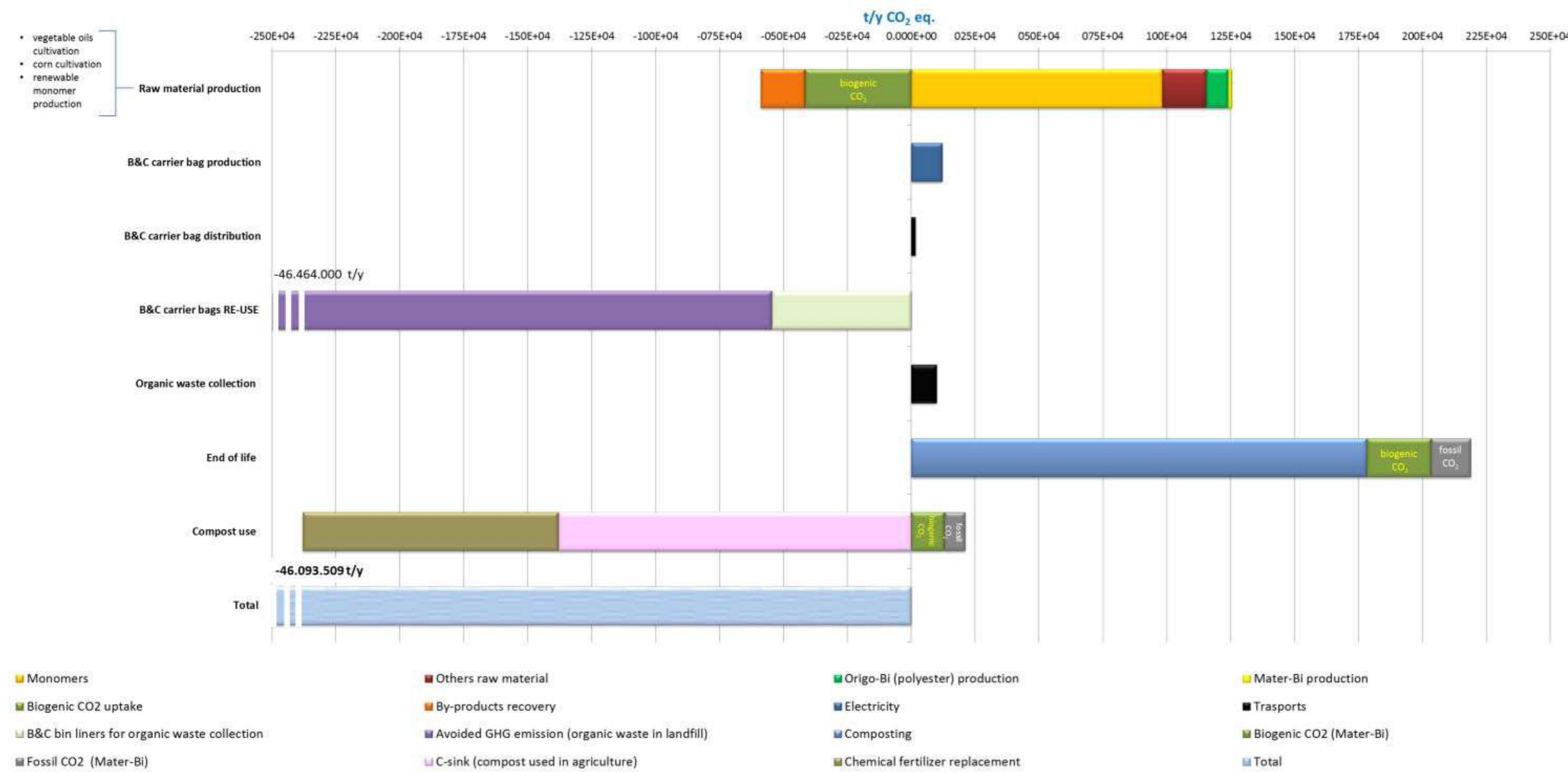
- Monomers
- Biogenic CO<sub>2</sub> uptake
- B&C bin liners for organic waste collection
- C-sink (compost used in agriculture)
- Others raw material
- By-products recovery
- Composting
- Chemical fertilizer replacement
- Origo-Bi (polyester) production
- Electricity
- Biogenic CO<sub>2</sub> (Mater-Bi)
- Mater-Bi production
- Trasports
- Fossil CO<sub>2</sub> (Mater-Bi)



# AN EFFECTIVE CONTRIBUTION TO DECARBONISATION (2/2)

## GHG EMISSION BALANCE FOR 320 KT/Y OF B&C CARRIER BAGS AND 39 Mt OF ORGANIC WASTE (ONLY FOOD WASTE)

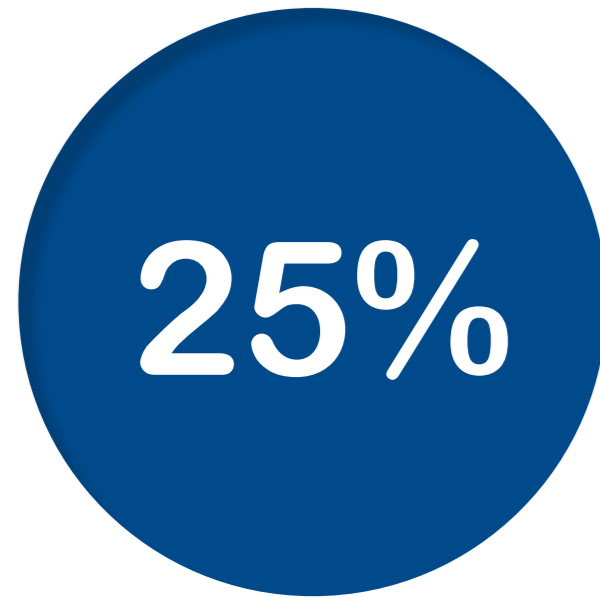
Life cycle phases



- +39 million tonnes of organic waste (only food waste\*) per year
- 320.000 t/y biodegradable bags
- Project objective: «zero organic waste»

# - 46.093.508,68 ton/y

\*estimation based on CIC annual report (2015) where food waste represents about 65%  
 \*\* of organic waste collected in Italy



AGRICULTURE & RELATED ACTIVITIES

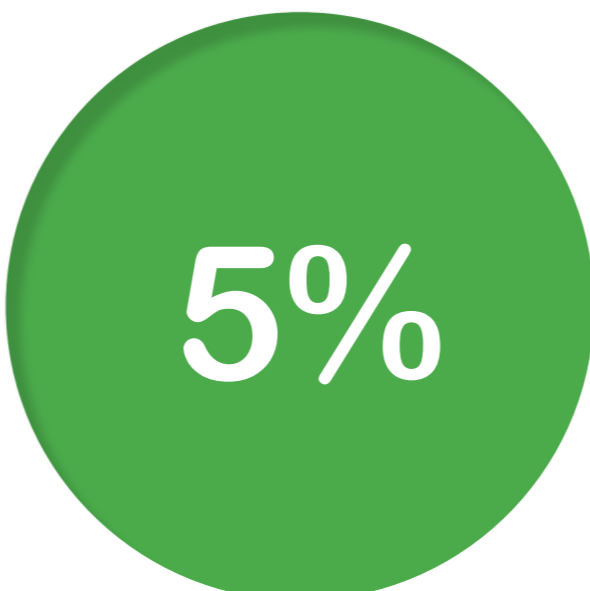
**1.000 tons**  
of bioplastics = creation  
of  
**60 new jobs**  
which means 100.000  
potential jobs in the  
European Union

COMPOSTING AND  
ANAEROBIC DIGESTION  
PLANTS



PRODUCTION OF BUILDING  
BLOCKS FOR THE INDUSTRY

BIOPLASTICS  
TRANSFORMATION INDUSTRY



RESEARCH, DEVELOPMENT  
AND INNOVATION

# 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 that fuels populisms jeopardizing our democracies. 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.*

**THANKS FOR YOUR ATTENTION**