BioTheRoS

Collaborative actions to bring novel **BIO**fuels **THE**rmochemical **RO**utes into industrial **S**cale

Alternative and Renewable Fuels

Logistics for biomass valorisation to aviation and maritime sector

The BioTheRoS Project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101122212.

23/10/2025

ABOUT CIRCE

CIRCE in numbers

CIRCE is a Technological Center specialized in **energy** and **sustainability**

RESEARCH

12,3 M€
EXECUTED COMPETITIVE PUBLIC INCOME

79
PROJECTS AWARDED IN HORIZON EUROPE

23
OF WHICH COORDINATED

TRANSFER AND SERVICES

9 M€
EXECUTED PRIVATE INCOME

+300
PRIVATE CONTRACTS

+85%
BILLED COMES FROM SATISFIED CLIENTS WHO REPEAT WITH CIRCE

+300
PEOPLE

37,5
AVERAGE AGE

36
PhD

36%
WOMEN

17
NATIONALITIES

Line of activities

CIRCE's ROLE IN BIOTHEROS

CIRCE´s role in Biotheros

New value chains for biomass valorisation to aviation and maritime biofuels

Feedstock potential at NUTS2 level (tonnes)

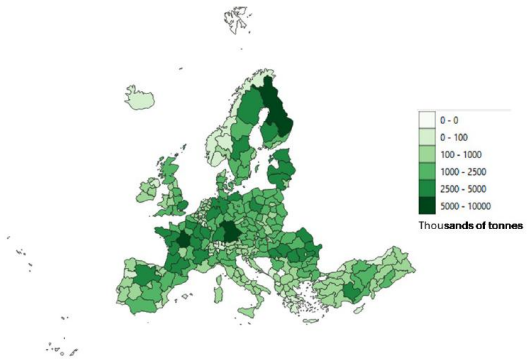
Pre-treatment and cost associated of each feedstock (€/t)

Feedstock mobilisation, cost of each feedstock, harvesting + logistic (€/t)

Design the value chain, stakeholders involved, identification of main variables that affect to the value chain

Development of a tool that integrate the previous information and process the data through AI techniques

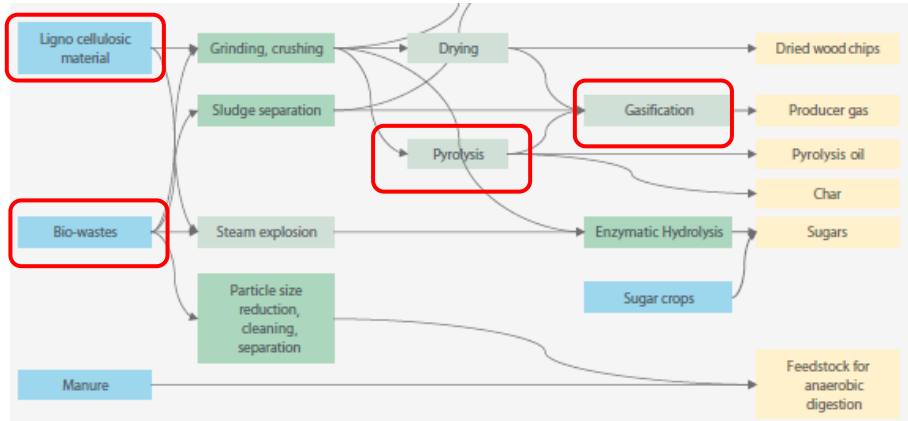
Feedstock evaluation potential



Identificati on of new plants

Feedstock potential

- Developing the methodology to assess biomass potential
- Selection of feedstock suitable for pyrolysis ang gasification at European and Global, according Annex IX of RED II and RED III

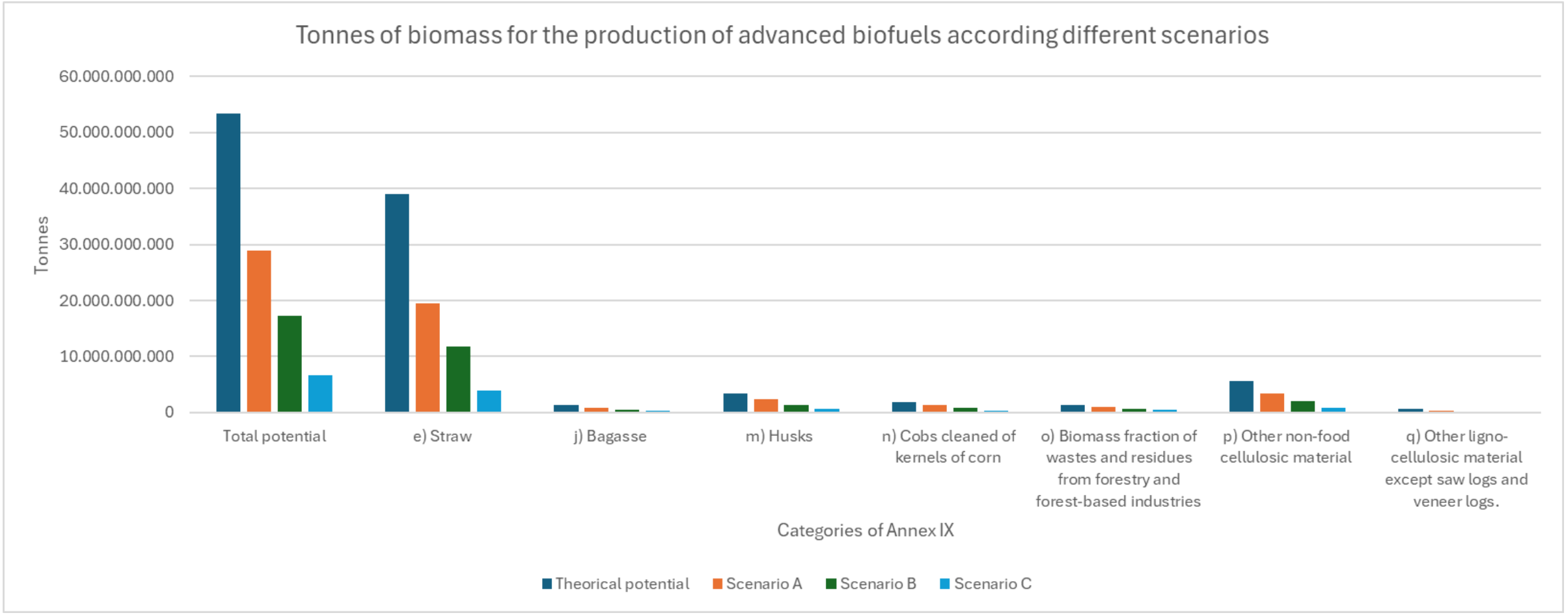


- To represent the biomass potential in Europe (NUST 2 level) and Global (NUTS 0 level) for the production of aviation and maritime biofuels via pyrolysis and gasification

Categories Annex IX	Biomass considered at European level	Biomass considered at Global level
e) Straw	Maize Stalk	Maize Stalk
	Barley Straw	Barley Straw
	Wheat straw	Wheat straw
	Soya straw	Rice straw
	Rye straw	Sugar cane straw
	Oats straw	Soya beans straw
	Triticale straw	Yams straw
	Rape seed straw	-
j) Bagasse	-	Sugar cane bagasse
m) Husks	Wheat husk	Wheat husk
		Rice husk
n) Cobs cleaned of kernels of corn	Maize cob	Maize cob
o) Biomass fraction of wastes and residues from forestry and forest-based industries	Primary residual forestry biomass	Primary residual forestry biomass
	Secondary forestry biomass	Secondary forestry biomass
p) Other non-food cellulosic material	Fruits pruning	Apples pruning
	Grape pruning	Grape pruning
	Olive pruning	Grape pomace
	Potatoes leaves	Orange pruning
	Sugar beet leaves	Potatoes leaves
	Sunflower seed leaves	Potatoes peel
	Grape pomace	Sugar beet leaves
	Olive pomace	Sweet potatoes leaves
	Rape seed pomace	Sweet potatoes peel
	Potatoes peel	Yams peel
q) Other ligno-cellulosic material except saw logs and veneer logs.	Forestry wood fuel	Forestry wood fuel

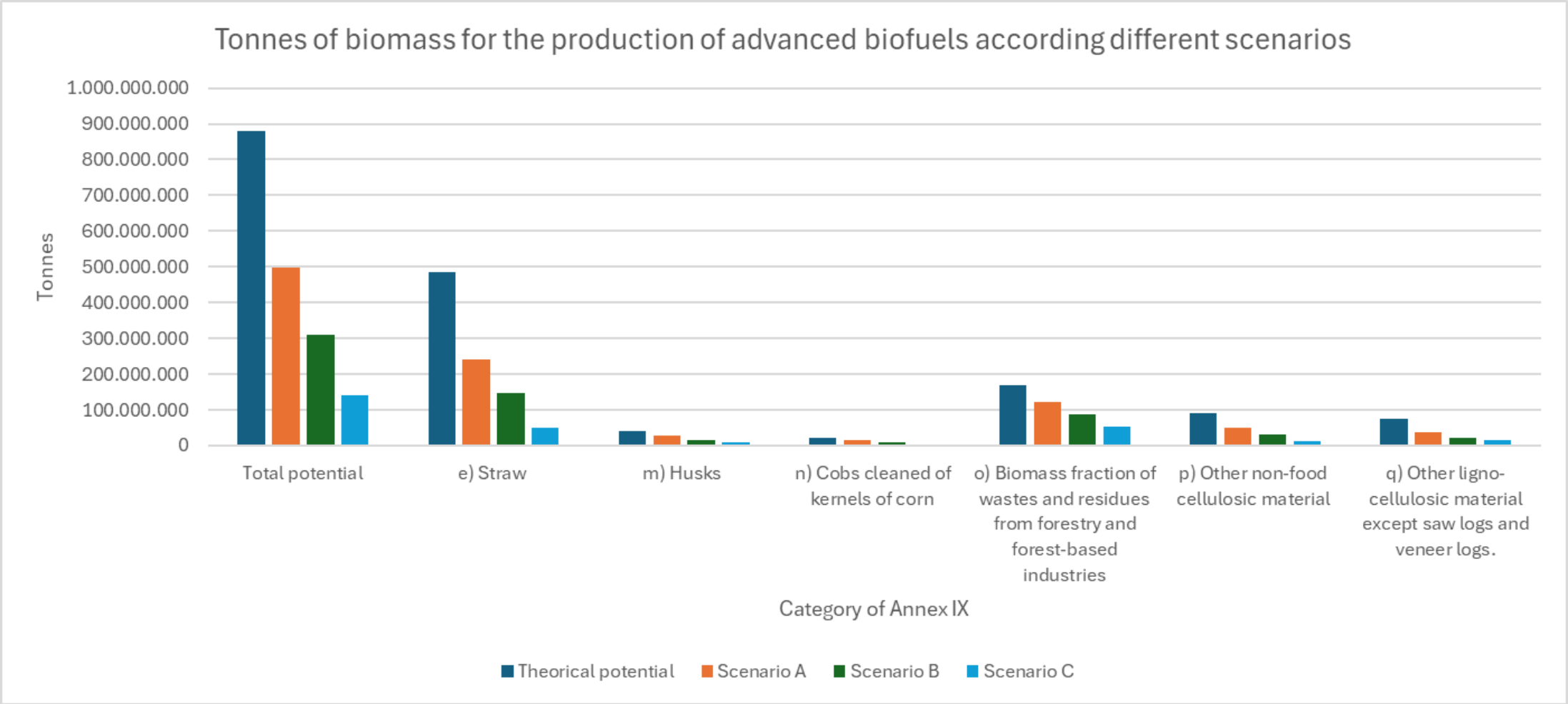
Feedstock potential

Global biomass potential according different scenarios



Feedstock potential

European biomass potential according different scenarios



Feedstock potential

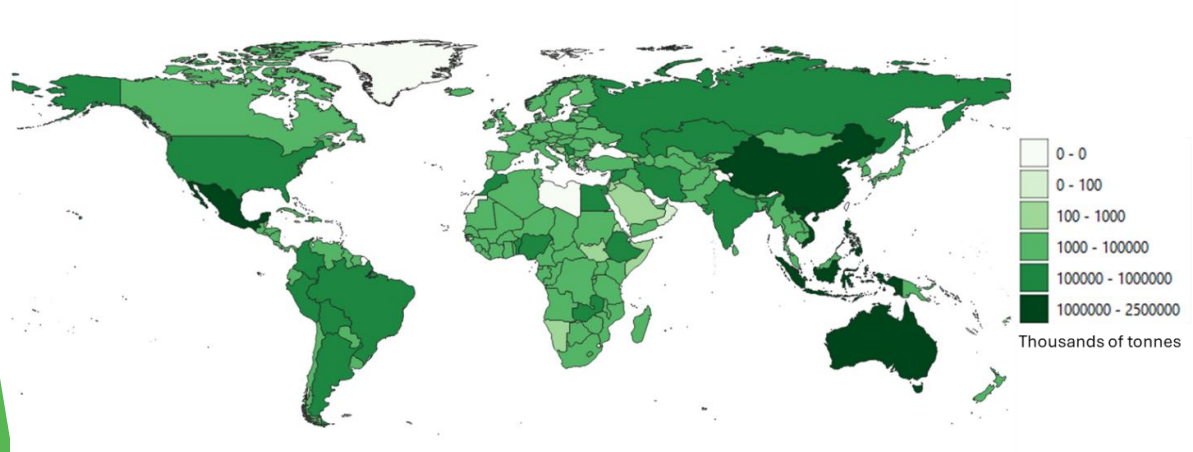
Contribution of biomass categories to meet energy demand for decarbonizing aviation and maritime sectors

- *The report of the International Transport Forum 2023 indicates an estimated data of kerosene for the aviation sector and fossil fuels for the maritime sector per year:*
  - *Aviation sector: 320 MToe at Global level and 50 Mtoe at European level*
  - *Maritime sector: 310 Mtoe at Global level and 65 Mtoe at European level*
- *Different efficiency (15 and 30 %) for conversion from biomass to advanced fuels has been considered*

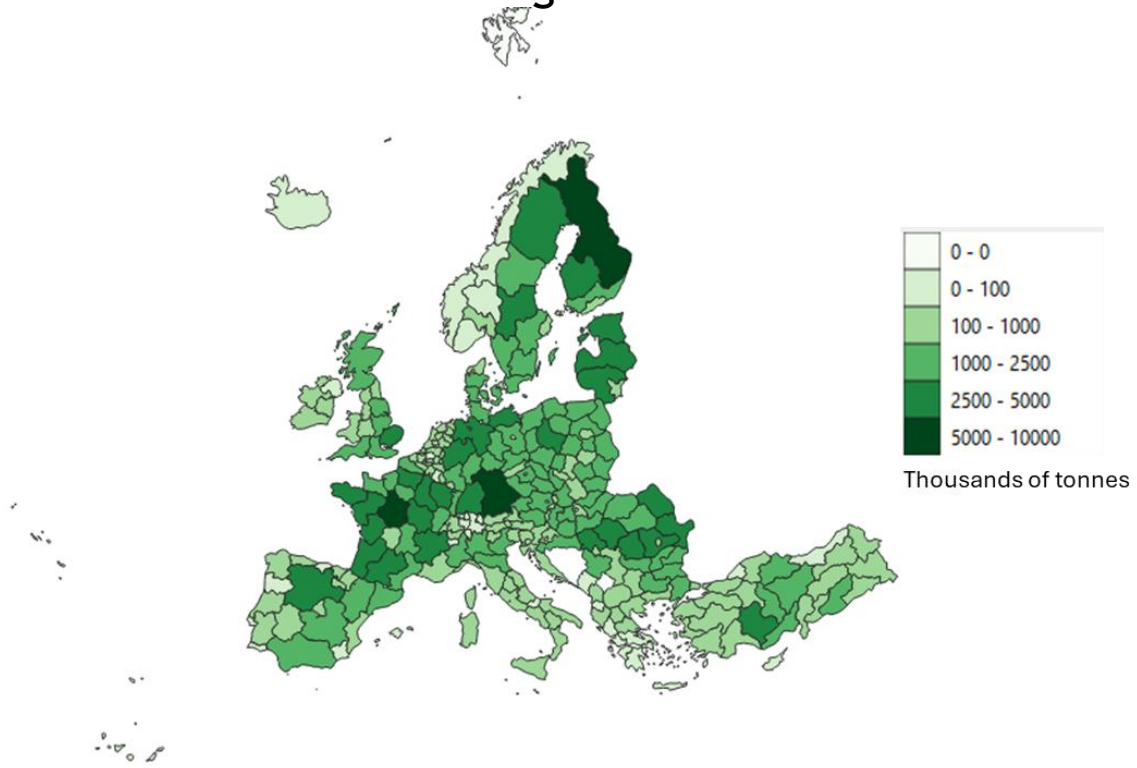
Categories of Annex IX	Europe, scenario B		World, scenario B	
	Efficiency of 15 %	Efficiency of 30 %	Efficiency of 15 %	Efficiency of 30 %
e) Straw	7%	15%	120%	240%
j) Bagasse			5%	10%
m) Husks	1%	2%	14%	28%
n) Cobs cleaned of kernels of corn	0%	1%	8%	15%
o) Biomass fraction of wastes and residues from forestry and forest-based industries	4%	9%	7%	14%
p) Other non-food cellulosic material	2%	3%	20%	41%
q) Other ligno-cellulosic material except saw logs and veneer logs.	1%	2%	2%	4%
Total	16%	31%	159%	317%

Feedstock potential

Geographical distribution of global biomass potential of sustainable biogenic feedstock for the production of advanced biofuels according to the Scenario B



Geographical distribution of European biomass potential of sustainable biogenic feedstock for the production of advanced biofuels according to the Scenario B



Design of the value chain

To design the value chain:

- *From the field/source of the biomass to the transformation plant*
- *Identification of the type of stakeholders involved*
- *Identification of harvesting and transportation cost to the transformation plant*

PRODUCERS OF THE BIOMASS

Agreement and collaboration to transfer the biomasss

BIOMASS SUPPLY & PROCESSING

Agreement on biomass format, quality and price

NEW BIOREFINERIS AND REFINERIES (Production of intermediate and final alternative sustainable fuels)

Key role:
- Find the best form to produce savings in the management of biomass
- Establish dialogue and collaboration with actors downstream

Farmers

Cooperatives/Agroindustry

Key role:
- Establish dialogue and agreement with producer of the biomass
- Organise the logistics and processing to preserve quality whilst keeping expenses low

Agro-service companies

Biomass suppliers

Cooperative/Agroindustry

Biomass platforms

Key role:
- To produce the alternative sustainable fuels with the quality required by the final users
- Ensure this product can be utilized in its facilities prior any actor performs an investment

New units

Current refineries

Boundary conditions for new pyrolysis and gasification plants

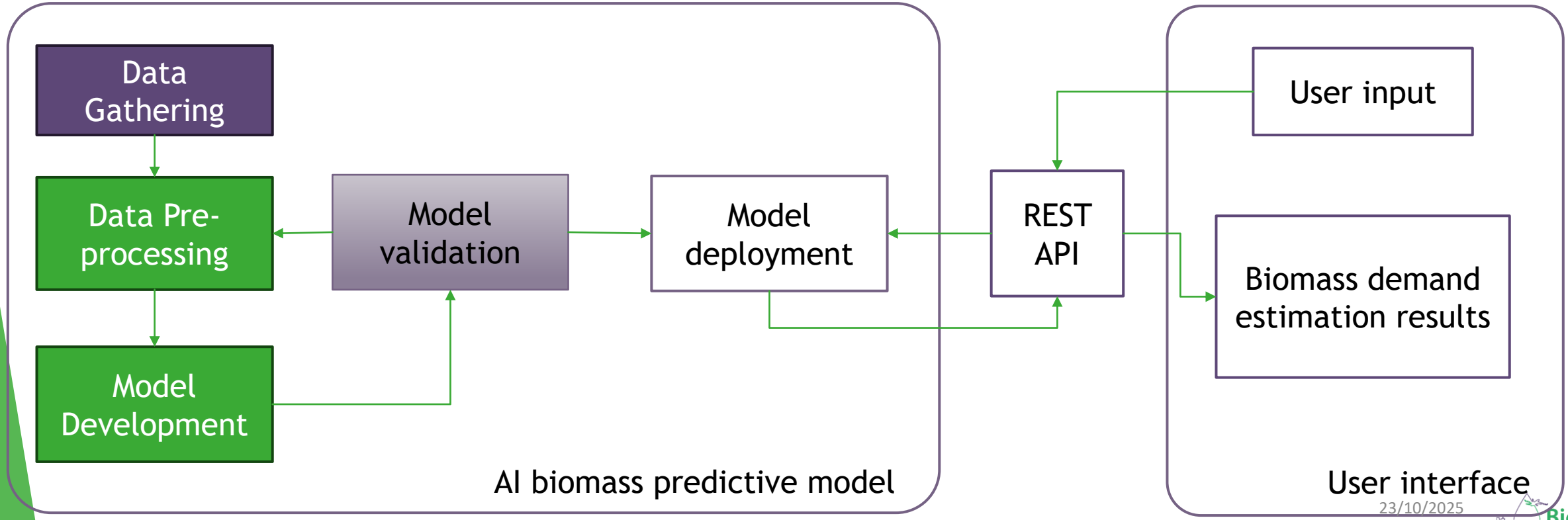
Users will have the ability to specify several critical factors for siting new pyrolysis and gasification, including:

- Feedstock capacity: The desired volume of feedstock the plant should be capable of handling, ensuring the design matches the availability of resources in the chosen area.
- Average cost: The target cost for the feedstock, factoring in variables such as collection, transport, and pretreatment, to maintain economic viability.
- Feedstock flexibility: Whether the plant should accommodate a single feedstock type or a mixture of different feedstocks, depending on the local resource profile.
- Plant configuration: The choice between a decentralized system with smaller intermediate plants feeding into a centralized upgrading facility or a fully centralized system combining both steps in a single location.
- Infrastructure requirements: The level of infrastructure needed at potential locations, such as transport networks, access to utilities, proximity with current refineries and existing industrial setups.
- Energy needs: The plant's energy consumption and potential contribution of biomass categories to meet energy demand for decarbonizing aviation and maritime sectors

Development of a tool for predictive biomass and new siting industries

The user will have the ability to change those variables with the greatest impact

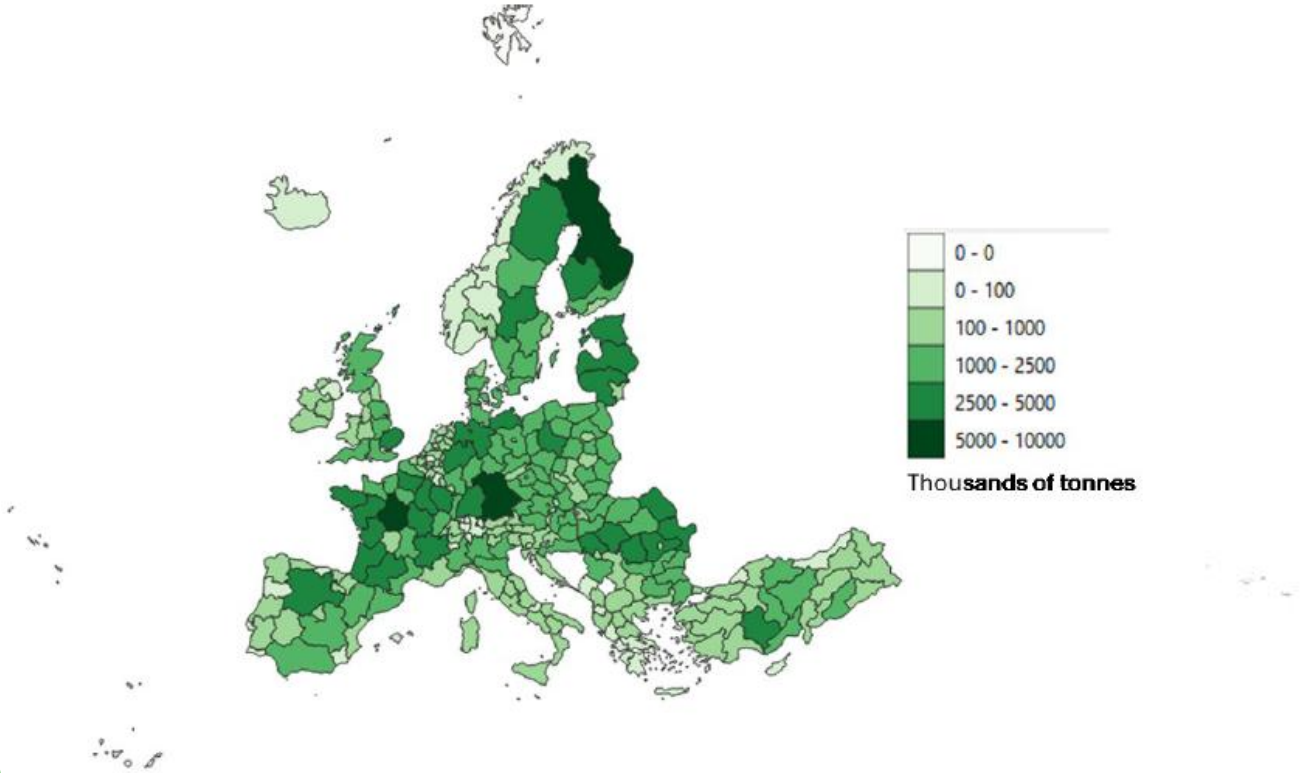
- *Biomass availability*
- *Harvesting and collection cost*
- *Transportation cost*
- *Boundary conditions for new pyrolysis and gasification plants*
- *Optimisation+AI techniques will be developed*
- *Identification of the location of new plants, and representation through a data visualisation interface*



Development of predictive biomass demand models

Main outputs of the tool:

Feedstock evaluation potential:



Identification of new plants:

Thank you!

Contact

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The BioTheRoS Project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101122212.