

1 billion tonnes* lignocellulosic biomass for biobased economy by 2030 in Europe

First version- September 2015

Dirk Carrez (*Clever Consult*)
Calliope Panoutsou (Imperial College London)

** Technical potential of lignocellulosic biomass for all biobased economy sectors*

- Purpose of work
- Current biomass use for energy fuels and biobased industry
- The resource efficient base to supply the European bioeconomy to 2030
- Resource costs
- Market growth and development for bio-based products
- Facts supporting figures

- **Purpose of work**
- Current biomass use for energy fuels and biobased industry
- The resource efficient base to supply the European bioeconomy to 2030
- Resource costs
- Market growth and development for bio-based products
- Facts supporting figures

- To establish a Vision statement for an expanded role of sustainable non-food biomass supply and delivery in the European **(EU28, Western Balkans, Ukraine, Moldova and Turkey)** bio based economy, including **stretching but realistic goals**.
- Timeframe: **2030** (with analysis for 2020)

- How do we see 2030?
What is the (expected) amount of lignocellulosic biomass to be available in 2030?
- Optimistic & realistic
- This will only be realised under optimal conditions.
What are the optimal conditions to realise that Vision (yield, costs, logistics, markets, technologies, policy framework, ...)?

- Purpose of work
- **Current biomass use for energy fuels and biobased industry**
- The resource efficient base to supply the European bioeconomy to 2030
- Resource costs
- Market growth and development for bio-based products
- Facts supporting figures

Current use of lignocellulosic biomass- Forest

Total amount of forest based lignocellulosic biomass used for energy and material uses in 2013 (E28 + WB, UKR, MD):
530 million tonnes (485 in EU28)



An estimated **261 million tonnes** (245 in EU28) of wood used as a "classical" bio-based material primarily used in the woodworking and pulp and paper industry

269 million tonnes (with 240 in EU28) of wood are used for production of energy (mainly heat and power).

Current use of lignocellulosic biomass- Agriculture



Total amount of **agricultural (non lignocellulosic) biomass** in 2013: almost 10% (8 million tonnes out of 79) of the raw materials base for the chemical industries in the EU was based on renewables:

- sugar and starch: 1.56 mTonnes)
- plant oils (1.26 mTonnes)
- bioethanol ETBE (1 mTonnes)
- natural rubber (1.06 mTonnes)
- pure bioethanol (0.46 mTonnes)
- animal fats (0.43 mTonnes)
- glycerine (0.41 mTonnes)
- ...

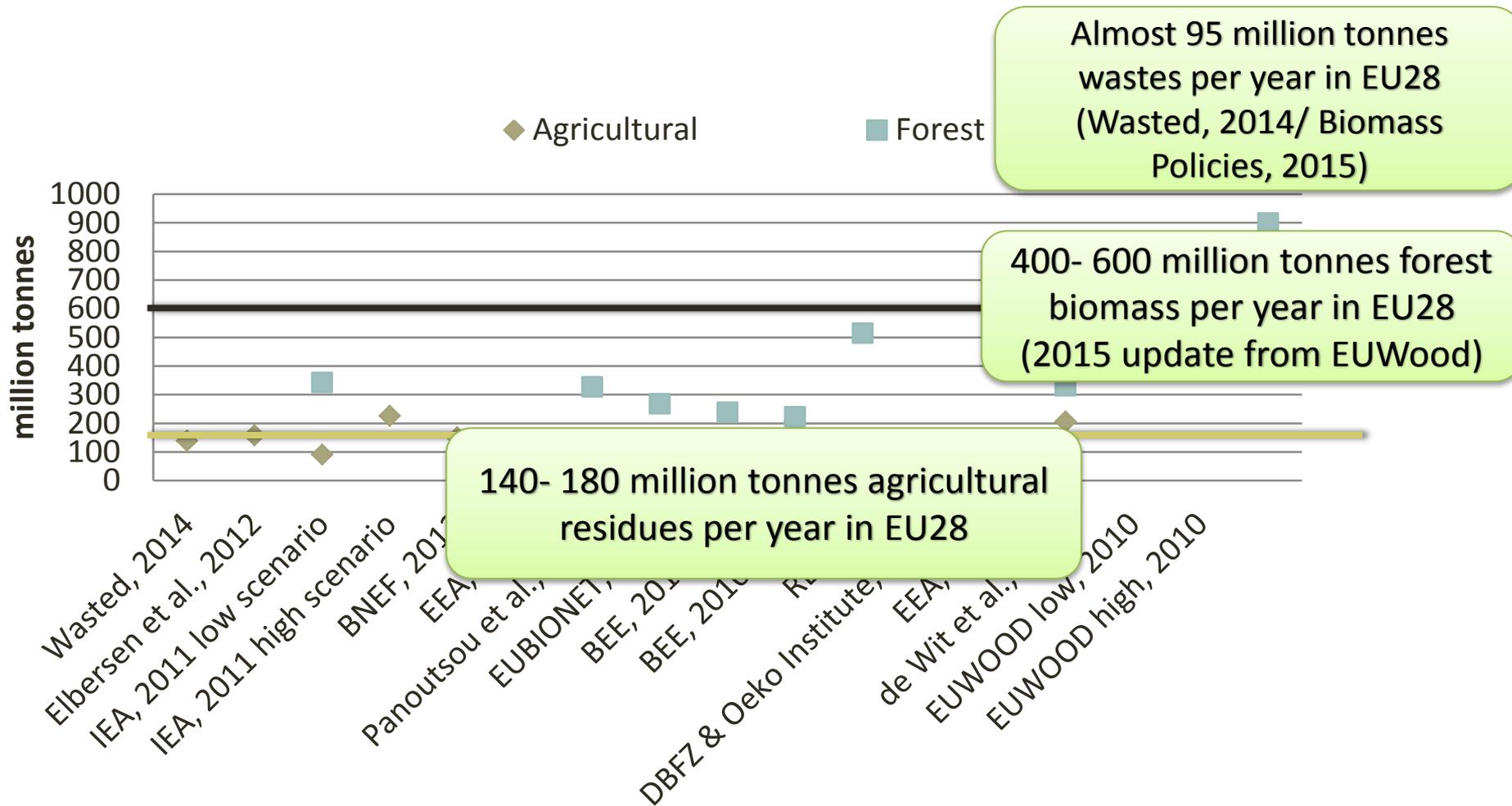
Total amount of **agriculture based lignocellulosic biomass**:
Estimates from 5-10 million tonnes (dry) but information relies on individual studies without recent harmonisation across EU

Sources: *EuropaBio, Nova Institut, Cefic, VDI, EnC*



- Purpose of work
- Current biomass use for energy fuels and biobased industry
- **The resource efficient base to supply the European bioeconomy to 2030**
- Resource costs
- Market growth and development for bio-based products
- Facts supporting figures

The lignocellulosic biomass base in EU28 in 2030: Forest, Agriculture, Wastes



Cropped biomass and released agricultural land in EU28 in 2030

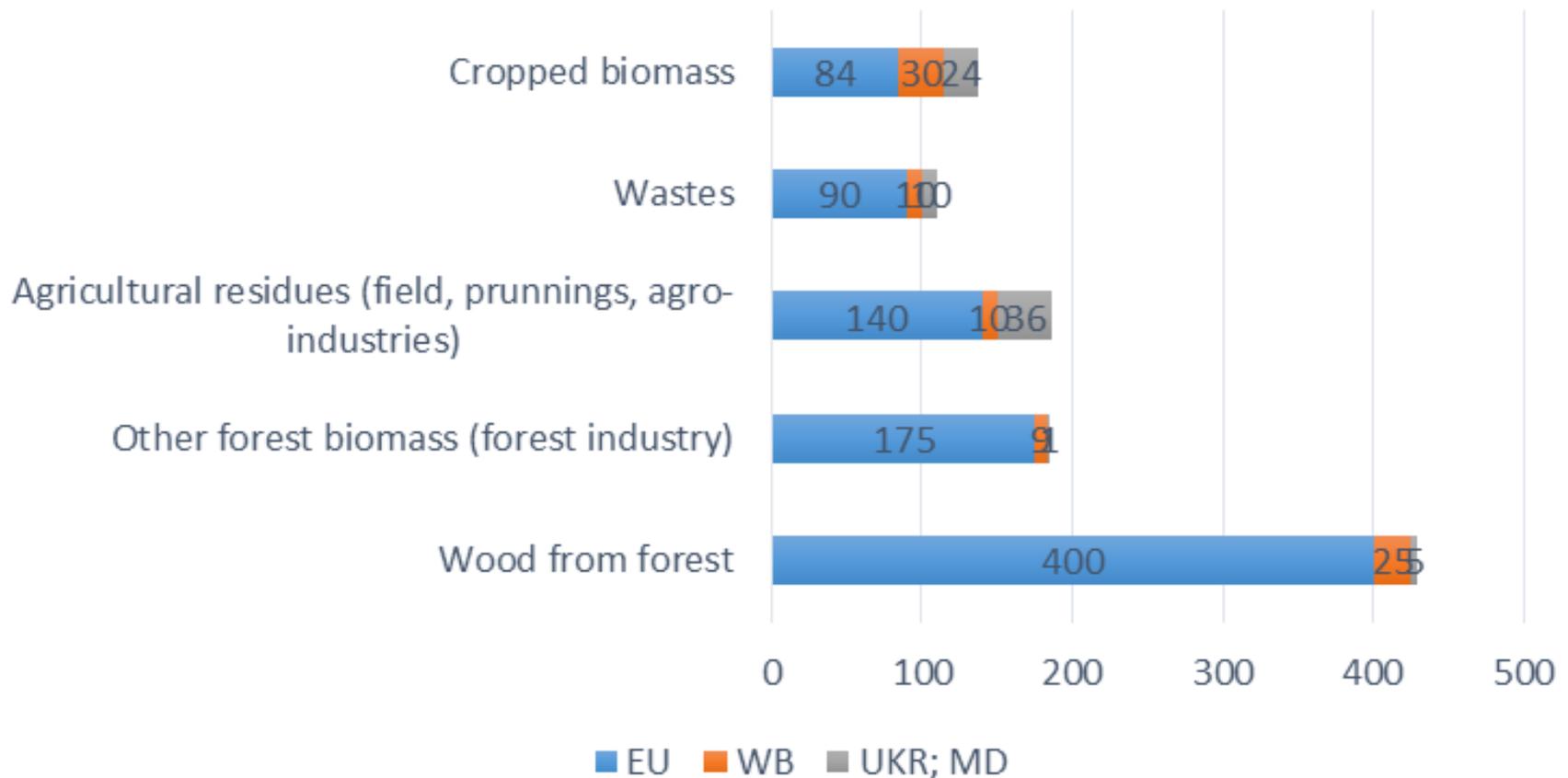


Study	Cropped Biomass Potential (million tonnes)	Comments
Commission's 2030 impact assessment for BBI JU (2014)	84- 180	The impact assessment estimates 7-12 million ha being available for biomass crops. We assumed that the low value will result in 84 million tonnes by using an average crop yield of 12t/ha while the high mobilization will result in 180 million tonnes by using an average crop yield of 15t/ha
Biomass Policies (2015)	230	20 million ha in 2030, reference scenario - Biomass Policies project
EEA, 2012	217	16.7 million ha available in 2020 in Storyline 1 (economy & market first)
Biomass Futures, 2012	234	18.8 million ha in 2030, reference scenario - Biomass Futures project
REFUEL, 2010	575	Agricultural land potentially available for growing biofuel feedstocks in 2030: EU27 & Ukraine/ LU-Env scenario: 44.2 million ha

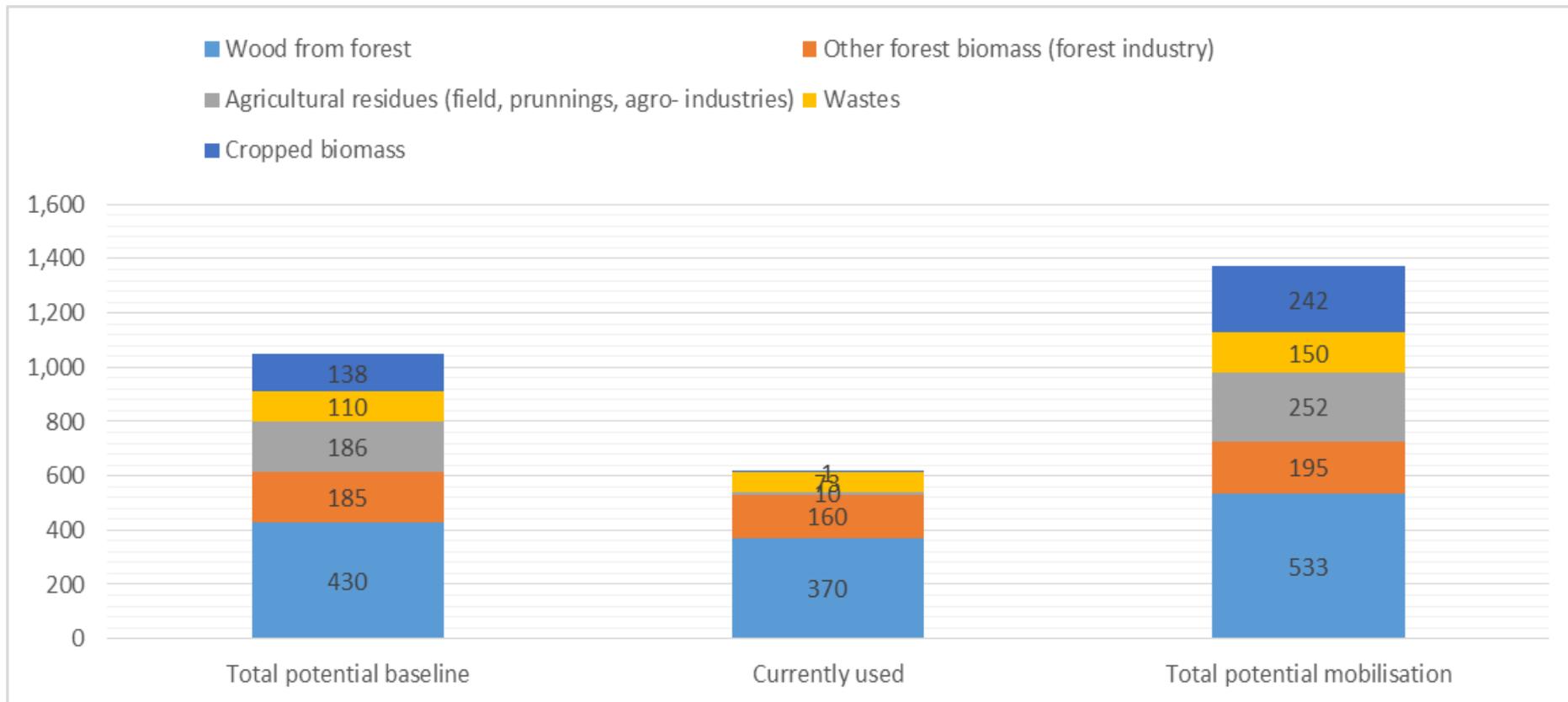


Total potential baseline EU28 + WB, UKR, MD

Biomass potential estimates (million t)



1 Billion tonne supply by 2030



- Purpose of work
- Current biomass use for energy fuels and biobased industry
- The resource efficient base to supply the European bioeconomy to 2030
- **Resource costs**
- Market growth and development for bio-based products
- Facts supporting figures

- **Local agricultural residues** were estimated to
 - €60-80 per tonne (delivered) for northern/ central Europe
 - €30-40 per tonne for southern and eastern Europe.
- Current market prices for **industrial wood chips** of around €59-65 per tonne.
- Biorefinery operations might be able to charge a **gate fee** in the range of €20-40 per tonne for accepting the material.

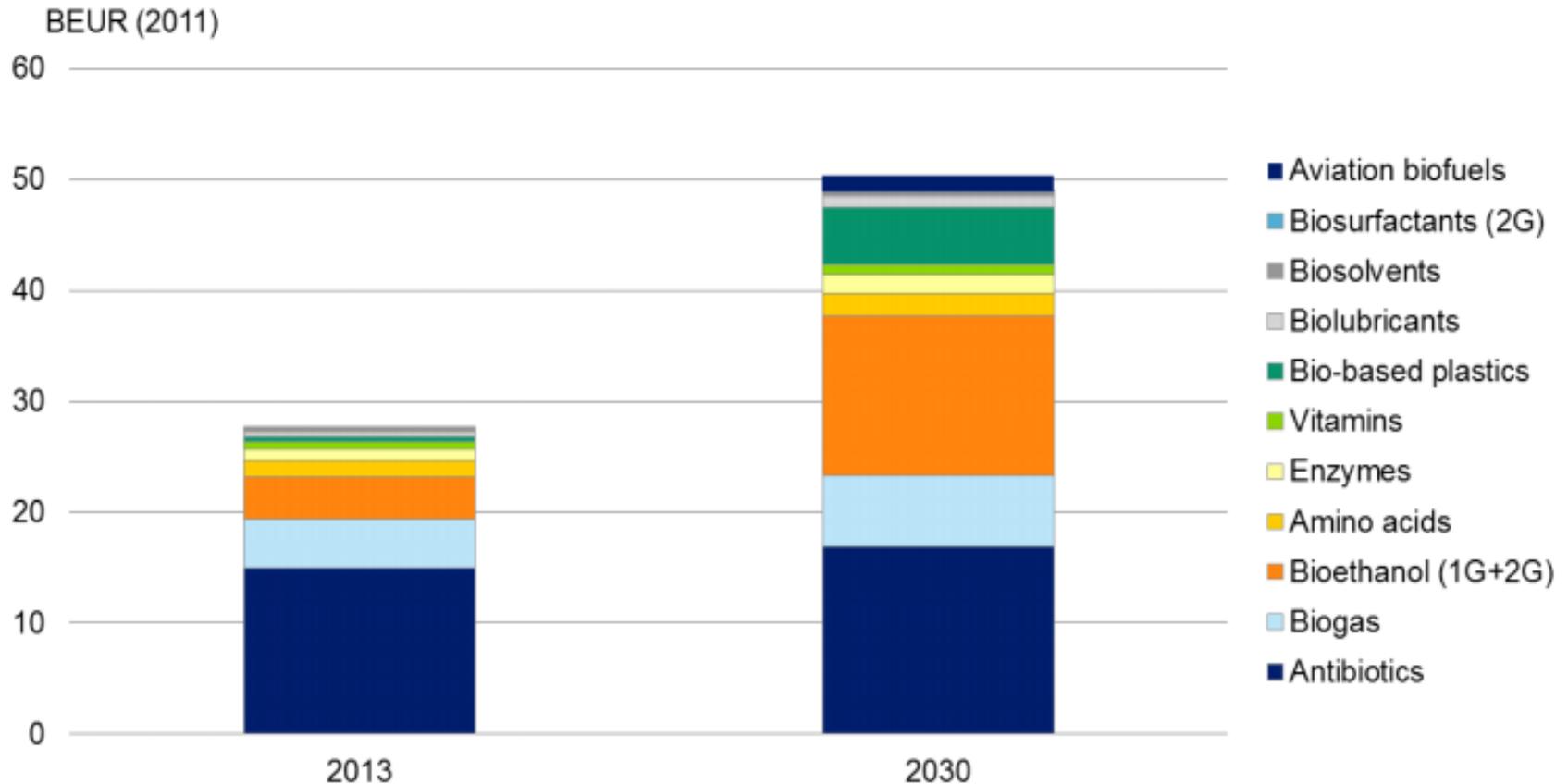
These are only average representative examples, and one should bear in mind that there will be significant variation in actual feedstock costs, depending on the actual project details

Sources: S2Biom, Biomass Policies, Wasted, EnC

- Purpose of work
- Current biomass use for energy fuels and biobased industry
- The resource efficient base to supply the European bioeconomy to 2030
- Resource costs
- **Market growth and development for bio-based products**
- Facts supporting figures

Opportunities for bio-based industries

Estimated biobased products market demand in the EU up to 2030*

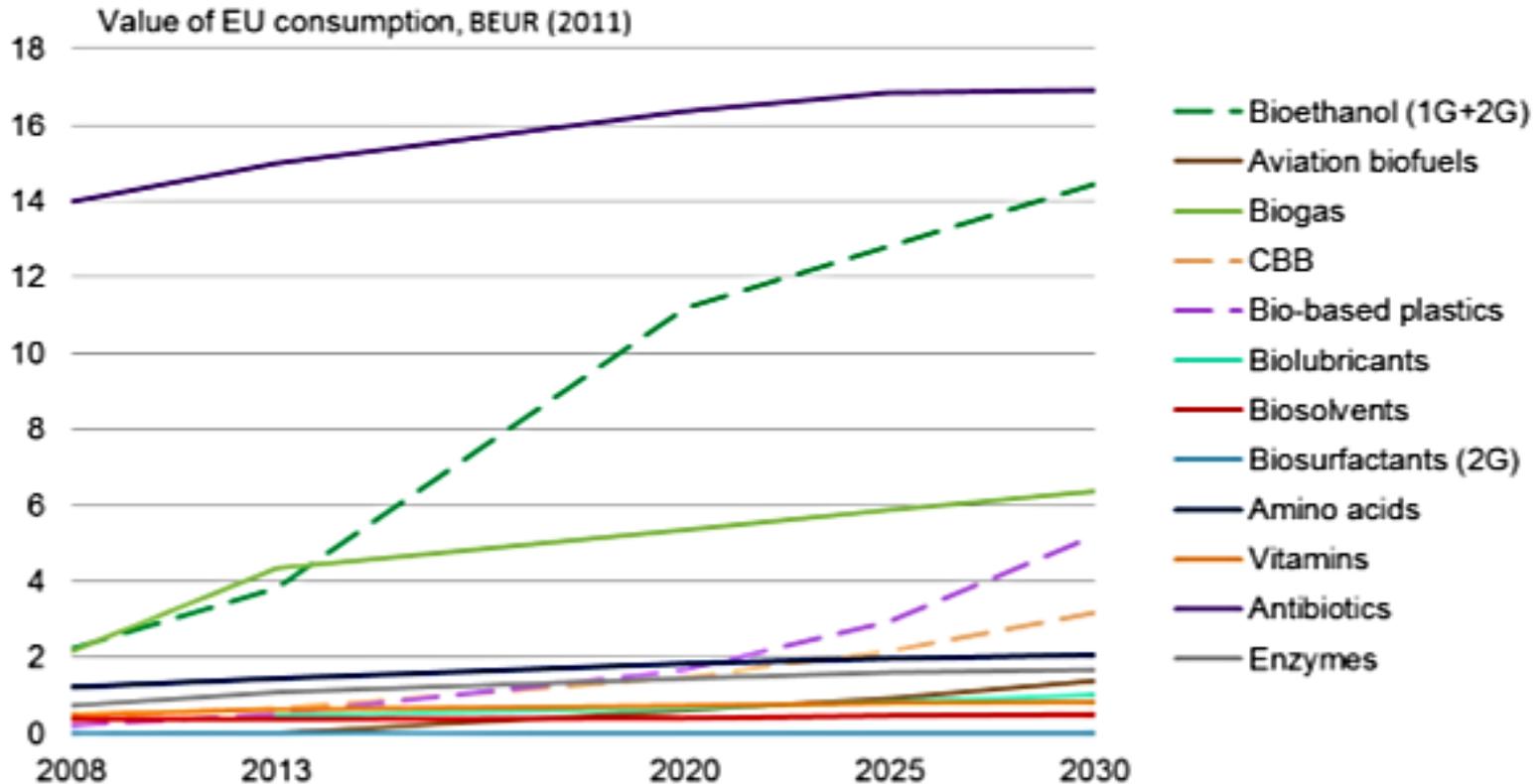


* BIO-TIC project



Opportunities for bio-based industries

Estimated market demand in the EU up to 2030 – by product segment*



* BIO-TIC project

Chemicals and materials: existing studies

	Current state	2020	2030
Bioplastics	<ul style="list-style-type: none"> European Bioplastics: 280 kT (2013) BioTic: around 1 B€ 	<ul style="list-style-type: none"> European Bioplastics: 512 kT (2018) BioTic: around 2 B€ 	<ul style="list-style-type: none"> - BioTic: around 5,2 B€
Biolubricants	<ul style="list-style-type: none"> ERRMA: 137 kT (2008) BioChem: 150 kT (2008) 	<ul style="list-style-type: none"> ERRMA: 420 kT (2020) BioChem: 230 kT (2020) 	<ul style="list-style-type: none"> -
Biocomposites	<ul style="list-style-type: none"> ERRMA: 362 kT (2010) Nova institute: 315 kT (2010) 	<ul style="list-style-type: none"> ERRMA: 920 kT (2020) Nova institute: 830 kT (2020) 	<ul style="list-style-type: none"> - -
Biochemicals	<ul style="list-style-type: none"> Chemical industry is estimated to use 8-10% renewable raw materials BioTic: around 1 B€ (Chemical building blocs - 2013) 	<ul style="list-style-type: none"> The share of biobased chemicals is expected to be 20% BioTic: around 1,5 B€ (Chemical building blocks) 	<ul style="list-style-type: none"> The share of biobased chemicals is expected to be 30% (BIC Vision) BioTic: around 3 B€ (Chemical building blocks)
Bioenergy & biofuels	<ul style="list-style-type: none"> BioTic: bioethanol around 4 B€ Nova institute: biofuels (all) around 6 B€ (2011) DG Agri: bioethanol 3,3 Mtoe (2013) 	<ul style="list-style-type: none"> BioTic: bioethanol around 11 B€ and 0,5 B€ aviation fuels DG Agri: bioethanol 6,1 Mtoe (2023) 	<ul style="list-style-type: none"> BioTic: bioethanol around 14,2 B€ and 1 B€ aviation fuels



- Purpose of work
- Current biomass use for energy fuels and biobased industry
- The resource efficient base to supply the European bioeconomy to 2030
- Resource costs
- Market growth and development for bio-based products
- **Facts supporting figures**

Facts supporting figures



- The inventory consists of over 350 studies covering a period of the last ten years (2005- 2015) for EU28 and the Energy Community.
- S2Biom started in August 2013 and the presented “Vision aggregate numbers” have been narrowed (for consistency and harmonised approach reasons) to BEE, Biomass Futures, Biomass Policies, Wasted, EUBIONET I, II, III, Bioboost and recent work in the Energy Community (Synenergy, Energy Community Biomass Consumption, Word Bank Study on Biomass).
- This version is a draft which will be informed by the S2Biom toolset, against which views will be sought and debated (online consultation on project website early November 2015- end January 2016), and which will finally form the basis for as a series of strategies, implementation plans and an R&D roadmap within 2016.



Thank you for your attention !

