Bio-based Industries
Joint Undertaking

BBI JU: a high impact initiative structuring the EU bio-based industries sector

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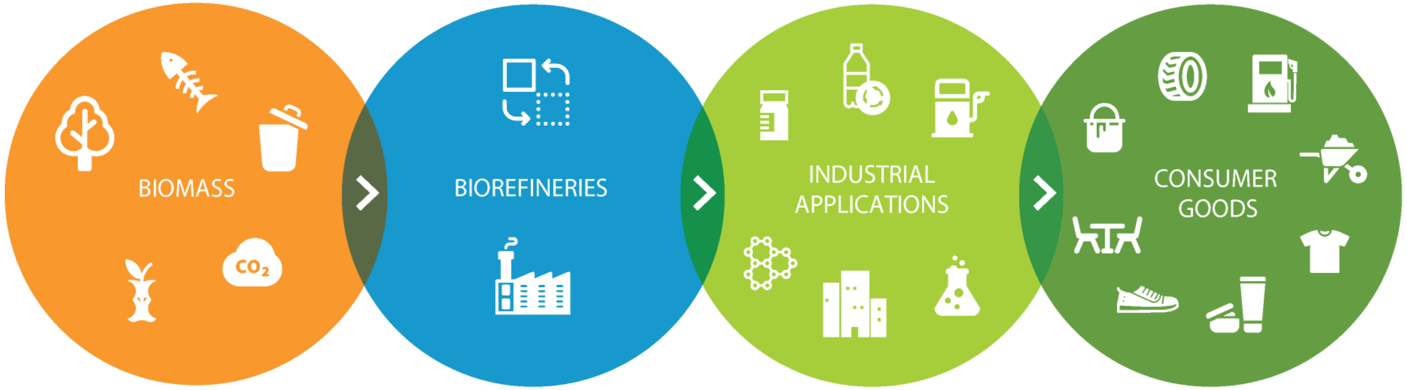
BIOEAST as a driving force in the context of the European Green Deal
Brussels, 21 February 2020

Bio-based industries value chains

BBI JU value chains represent 3.7 million jobs* and € 698 bn turnover* but are **extremely fragmented** between **actors** and across **geographies**



- Waste streams
- Multiple organic waste
- By-products & side-streams
- Forestry side-streams
- Dedicated agricultural crops and residues
- Aquatic biomass
- Food processing residues
- Process and waste water
- Bio-based CO_2

- (Pre -) treatment
- Transformation

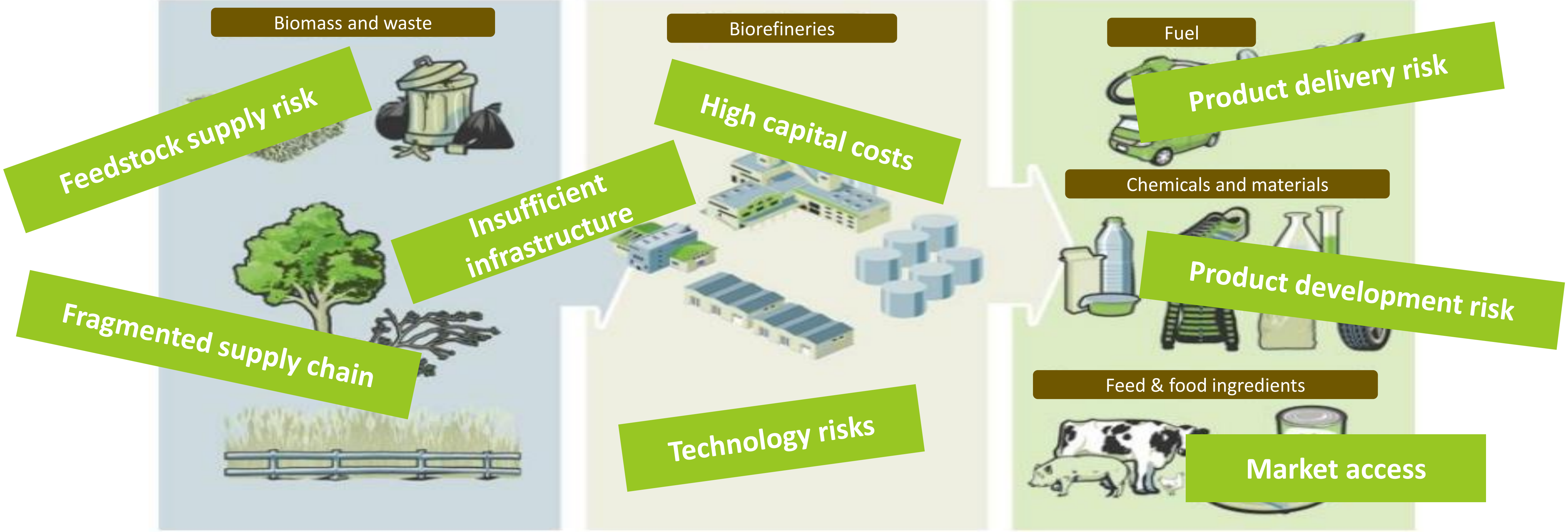
- Bioplastics
- Building blocks
- Biopolymers
- Surfactants
- Active ingredients
- Biomaterials
- Biolubricants

- Biofuels
- Textiles
- Packaging
- Solvents
- Furniture
- Personal care
- Construction materials
- Pharmaceuticals
- Clothing
- Car components

*Based on EUROSTAT figures 2015

BBI (Bio-based industries)?

BBI and their value chains are facing complex and substantial technological and innovation challenges



BBI JU was part of EU Bioeconomy strategy in 2012

Public-Private Partnership (PPP) between European Commission & BIC (Bio-based Industries Consortium)

- BBI JU Budget: € 3.7 bn (25% EU - 75% BIC)
- Support R&I programme in Bio-based industries

European public-private partnership (iPPP) aims at:

De-risk investments

Reach **critical mass**

Organize the value chains

Implementation

Trigger - Keep - Attract

Mobilising effect

Structuring effect

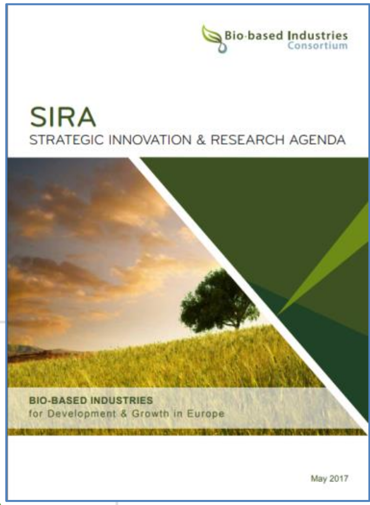
BBI JU objectives

Develop sustainable and competitive bio-based industries in Europe, based on advanced biorefineries that source their biomass sustainably.

How? By implementing SIRA

1. Demonstrating new technologies	**RIA**
2. Developing business models	**Demo**
3. Set up flagship biorefinery plants	**FLAG**

SIRA Strategic Orientations (2017)



SO 1

Foster Supply of sustainable biomass feedstock to feed both existing and new value chains

- Agri-based feedstock
- Forest-based feedstock
- Aquatic feedstock
- Bio-waste and CO2

SO 2

Optimise efficient processing for integrated biorefineries through R&D&I

- Pre-treatment
- Conversion of pre-treated feedstocks to biobased chemicals and materials
- Downstream processing
- System modelling

SO 3

Develop innovative bio-based products for identified market applications

- Drop-in bio-based products
- Bio-based products that outperform fossil-based counterparts
- New breakthrough
- Chemicals
- Proteins and active ingredients

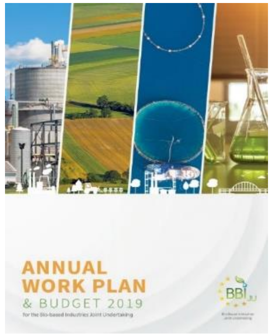
SO 4

Create and accelerate the market uptake of bio-based products and applications

- Policy & regulations, standardization
- Consumer awareness of the benefits of bio-based products
- Knowledge gathering and networking

The BBI JU annual cycle

Strategic level: SIRA
Strategic Innovation and Research Agenda
guiding document developed by BIC



Operational Level
Annual Work Plan

Drafting – Approval – Supporting

+ Scientific Committee
+ States Representatives Group

Call for proposals
(RIAs, IAs, CSAs)

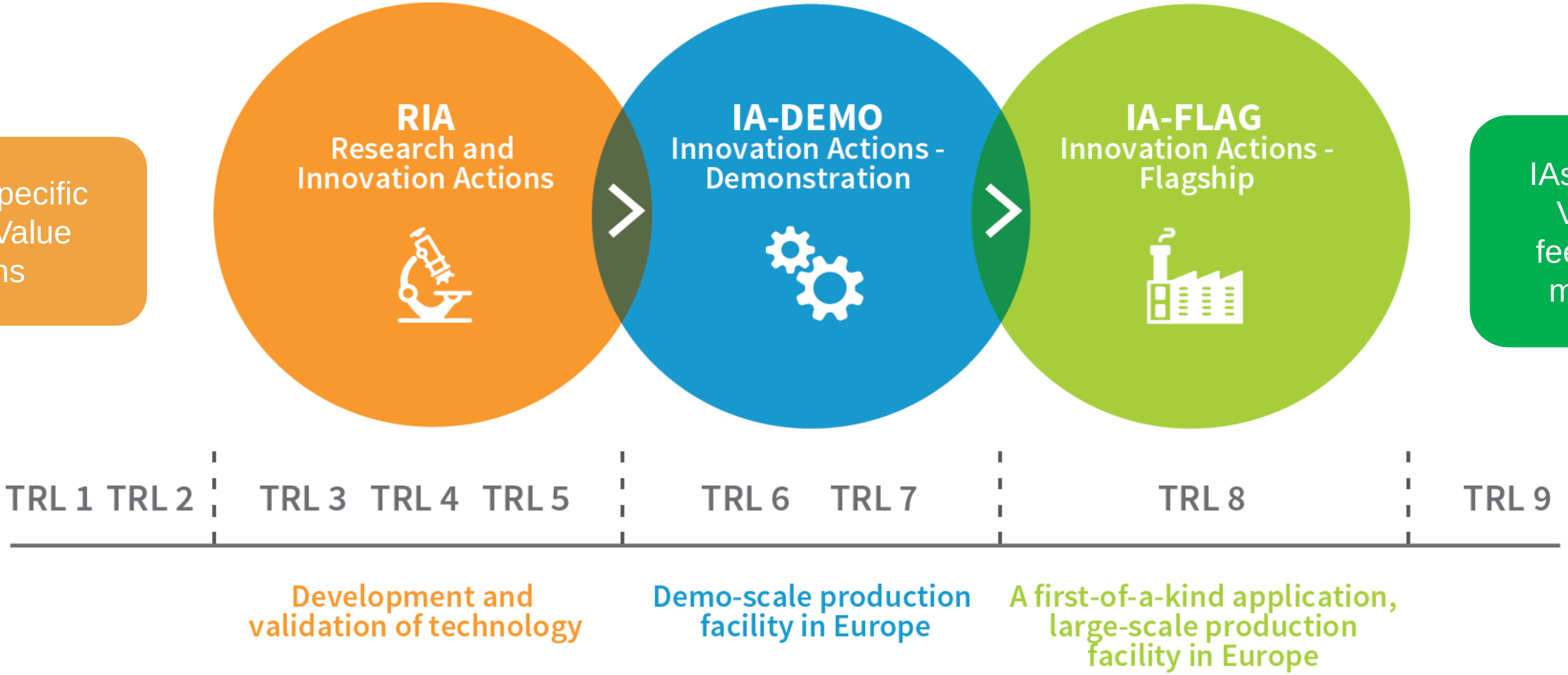
Publication &
Implementation

Portfolio management

Reporting – monitoring
Dissemination – comm.

BBI JU - Types of Actions

RIAs fill specific gaps in Value Chains



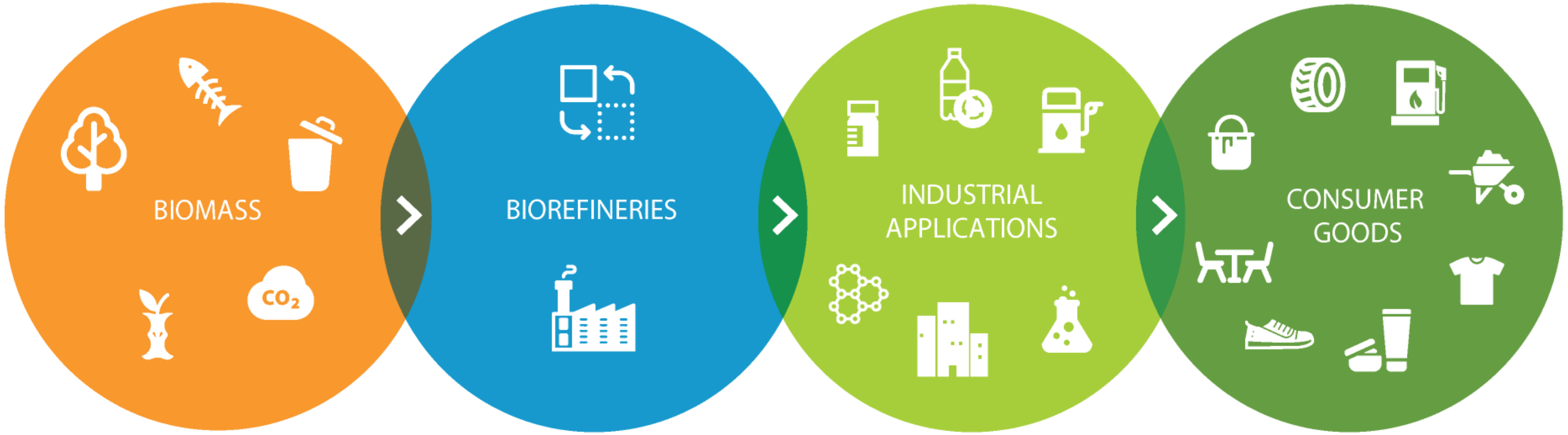
IAs address the whole Value Chains from feedstock sourcing to market applications

CSA Coordination and Support Actions - no link to TRLs*

*TRL = Technology Readiness Levels

CSAs address non-technological challenges of Value Chains

BBI JU Impact



By 2030

- ↘ 50% greenhouse gas emissions
- ↗ 20% biomass supply
- ↗ 25% mobilization of unused sources
- 30% replacement of petroleum-based products
- ✕ 10 times more bio-based materials

How to measure outcomes and impact

KPI 1 New cross-sector interconnections

KPI 2 New bio-based value chains

KPI 3* BBI JU Cooperation projects

KPI 4 New bio-based building blocks

KPI 5 New bio-based materials

KPI 6 New bio-based consumer products

KPI 7* BBI JU flagships projects

KPI 8 'TRL' gain

Socio-economic and environmental impact

- All topics address KPI 3 and socio-economic and environmental impact
- KPIs specific to
  - RIAs: KPI 8
  - IAs: KPI 6
  - FLAGs: KPI 7
- KPIs 1, 2, 4 and 5 are present in all type of actions

KPIs assessed during the evaluation!

*Note * KPI3 & KPI7 will be measured at program level; the numbers will refer to successful projects. Source: SIRA*

Socio-economic and environnemental impact monitoring

Yearly survey of BBI JU projects:

- Investment and job creation
- Environmental impact
- Scientific and knowledge
- Primary producers and rural deployment
- Education and citizen
- Market and industry
- Regional and local impact
- Safety and health
- Contribution to the UN SDGs

Key achievements

Outputs and Impact

BBI JU Portfolio

Call 2014 — 1
Call 2015 — 2
Call 2016 — 3
Call 2017 — 4
Call 2018 — 5
Call 2019 — 6
Call 2020 — 7

Calls 2014 - 2018

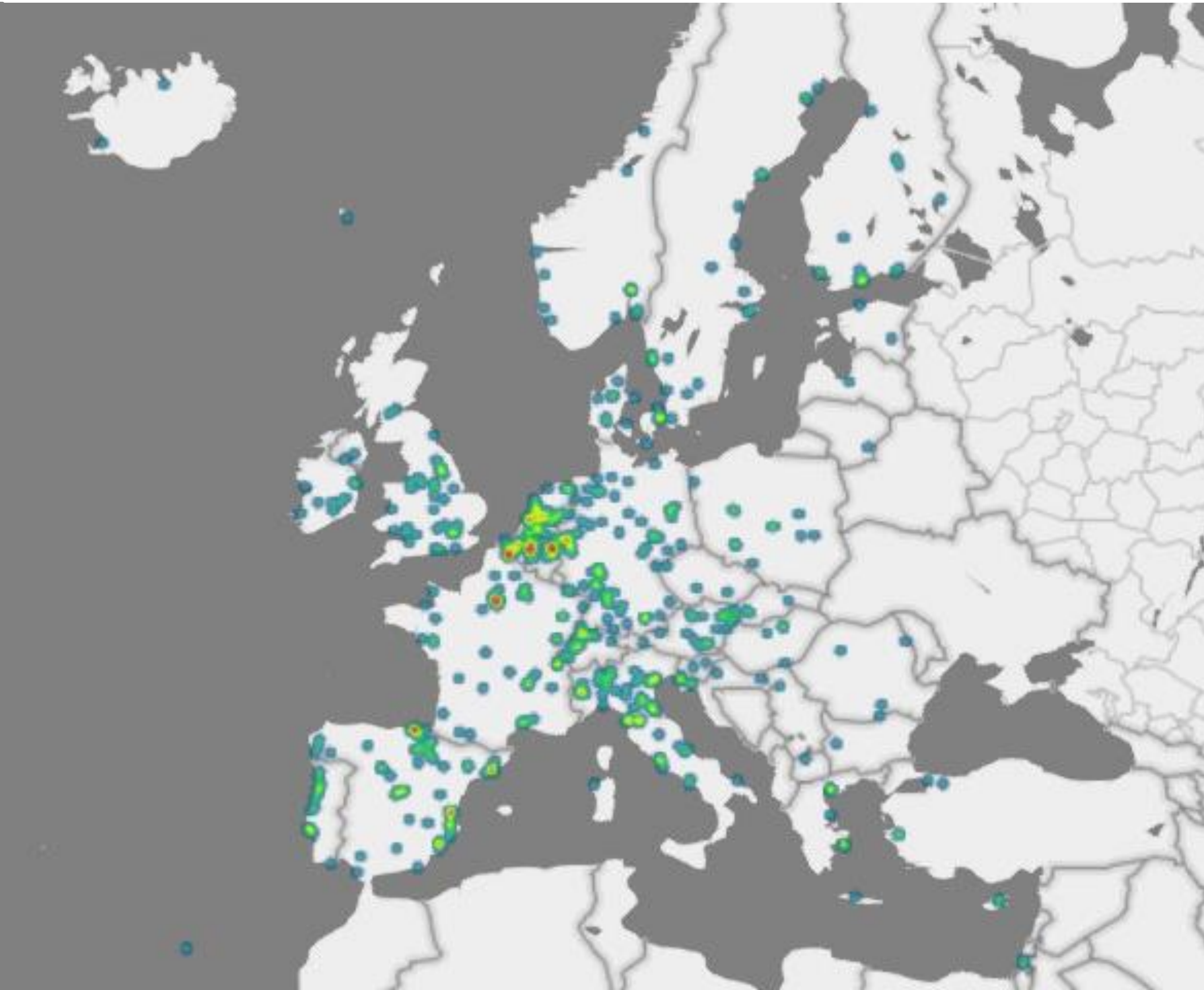
602 Million EUR

1179 Beneficiaries

35 Countries

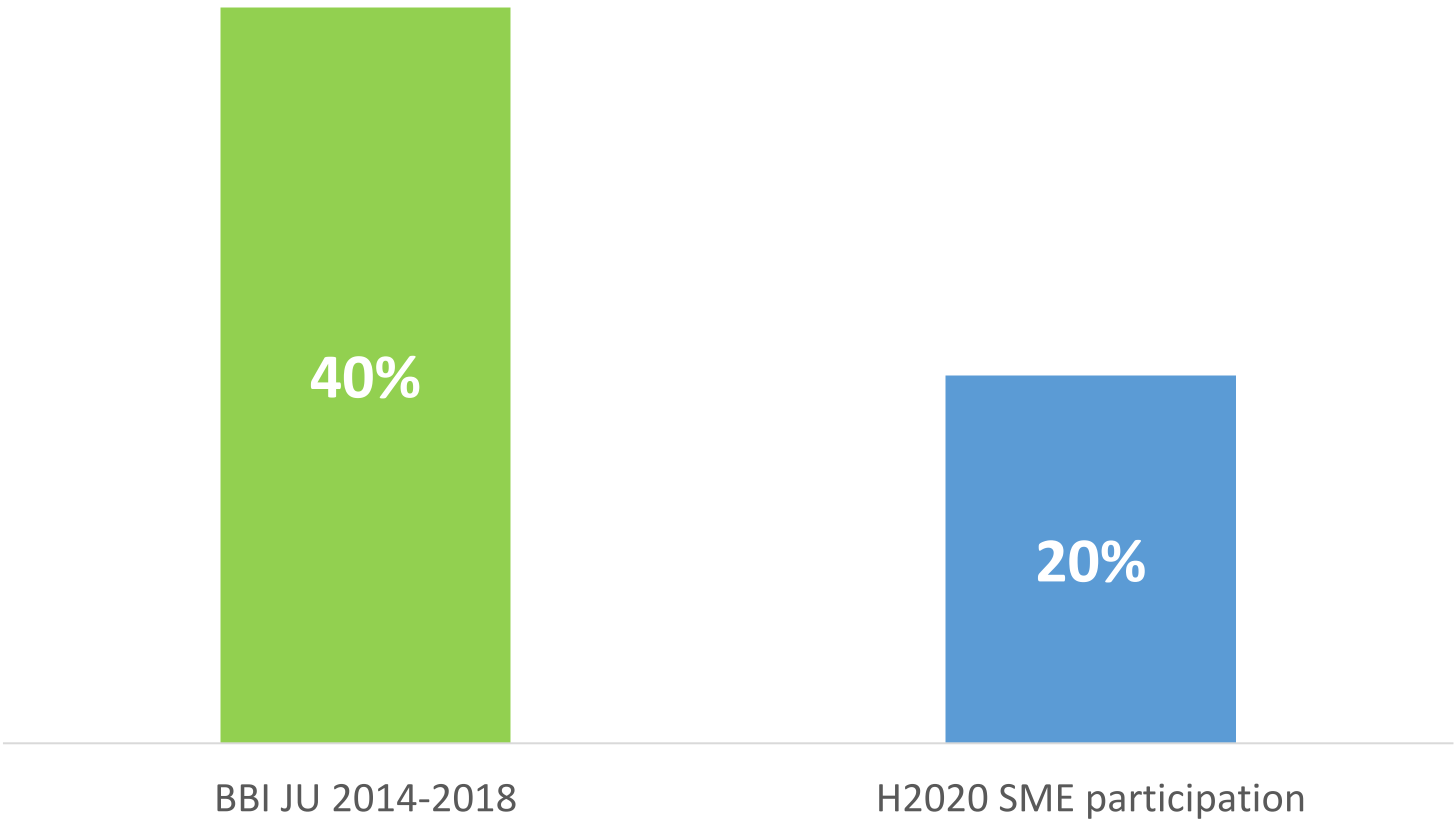
101 Funded projects

9 Flagship
29 Demonstration
52 Research
11 Coordination & Support



High representation by SMEs

Beneficiaries from Calls 2014 – 2018 **SME participation**



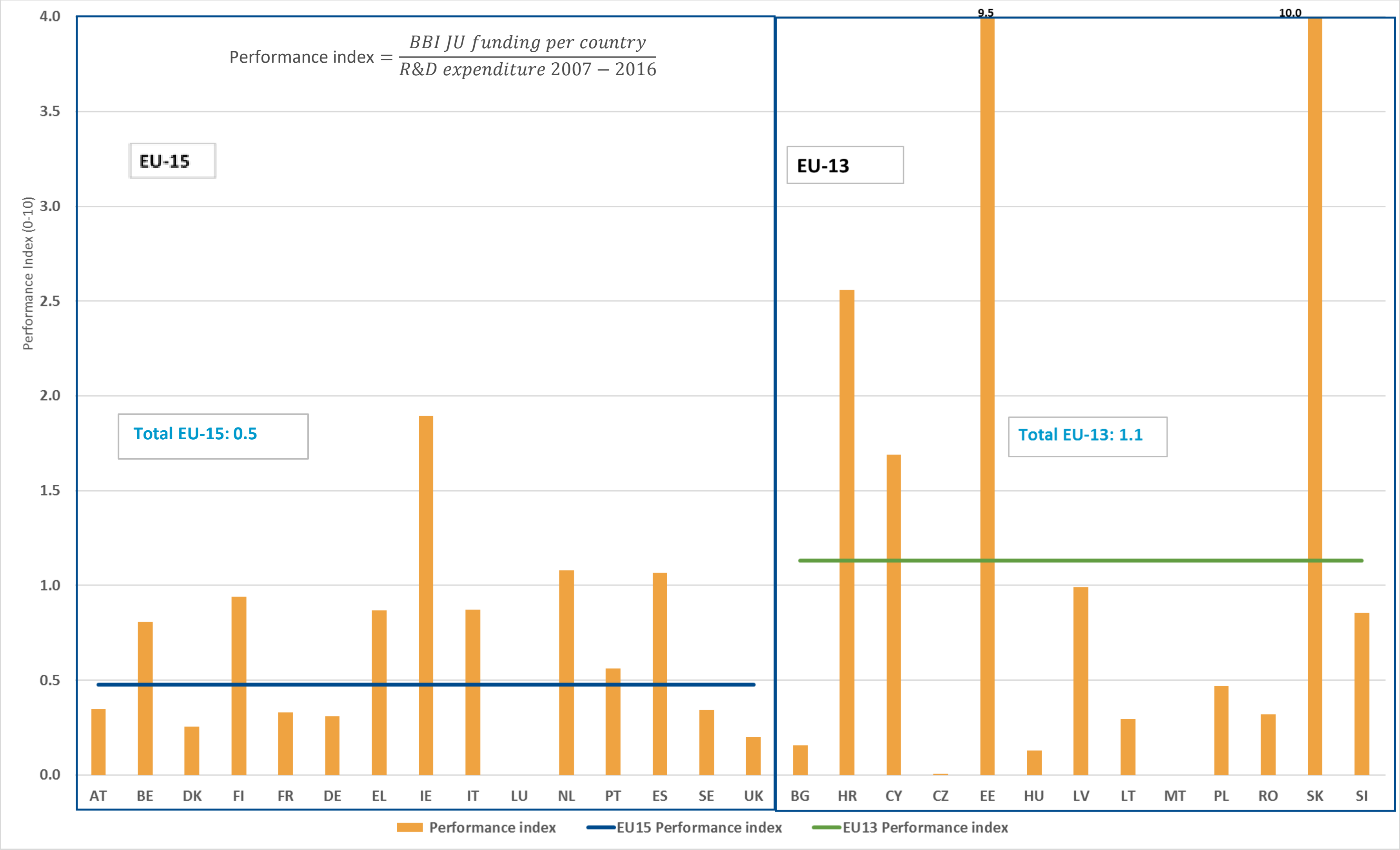
A well balanced project portfolio

Calls 2014 + 2015 + 2016 + 2017 + 2018 (*)

		Per Type of Action		
	Origin of feedstock	**RIA**	**DEMO**	**FLAGSHIP**
Per SO1 Feedstock	**Agri-based**	Carbosurf, PROMINENT, LIBBIO, HYPERBIOCOAT, Zelcor, BIOrescue, EnzOx2, InDIRECT, BioBarr, SSUCHY, ReSolve, BIOSMART, ECOXY, REFUCOAT, POLYBIOSKIN NEWPACK, Pro-Enrich, Prolific, EXCornsEED, VIPRISCAR iFermenter, **USABLE PACKAGING, ECOAT**	Pulp2Value, AgriMax, Funguschain, GreenProtein, LIPES, GRACE, OPTISOCHEM, BIOMOTIVE SUSFERT, ReInvent, EFFECTIVE **INGREEN**	FIRST2RUN, LIGNOFLAG, BIOSKOH AgriChemWhey, PEFerence, **FARMYNG** *
	Forest based	SmartLi, Greenlight, PROVIDES, US4GREENCHEM NeoCel, LIBRE, TECH4EFFECT, EFFORTE, SHERPACK SusBind, WoodZymes, UNRAVEL, **GRETE, SElectiveLi, CelluWiz, SMARTBOX**	ValChem, BIOFOREVER, GreenSolRes, PULPACKTION, FRESH, LigniOx Dendromass4Europe SYLFEED, EUCALIVA, **VEHICLE**	EXILVA SWEETWOODS
	Bio-waste and CO_2	NewFert, AFTERLIFE, PERCAL, BARBARA, **BIOnTop, MANDALA**	EMBRACED, URBIOFIN, DEMETER, Biowaste, **B-FERST, DEEP PURPLE, VAMOS**	
	Aquatic Biomass	MACROCASCADE, BIOSEA, ABACUS, MAGNIFICENT, VALUEMAG, AQUABIOPROFIT, **STREAMLINE**	SpiralG	
Per SO4 Market uptake	**SO4**	**Policy, regulations and standardization**	**Consumer awareness of the benefits of the bio-based products**	**Knowledge gathering and networking**
	CSA	STAR4BBI	BioCannDo, BIOWAYS BIOBRIDGES	BIOPEN, Pilots4U, RoadToBio ICT-BIOCHAIN **CELEBio, UrBIOfuture, LIFT**

Distribution of funding in Calls 2014-2018 per country normalised by GERD

- Highest success comes from the EU13 countries Slovakia (BIOSKOH) and Estonia (SWEETWOODS)
- Despite the higher BBI JU funding received by EU15 countries in absolute terms, EU13 countries perform more than two times better, when normalized against R&D investment
- Greece performs better than the average of EU15, despite the low BBI JU funding received



Project outcome monitoring
KPI 2/8 from SIRA

>100 expected new bio-based value chains
against a target of 10 by 2020

Main aspects of novelty reported in the expected new value chains	
70% new market/product	50% new technology
50% new feedstock	40% new business model

New value chain means either the **feedstock,** the **processing & technologies** or the **final product** is new in relation to existing value chains

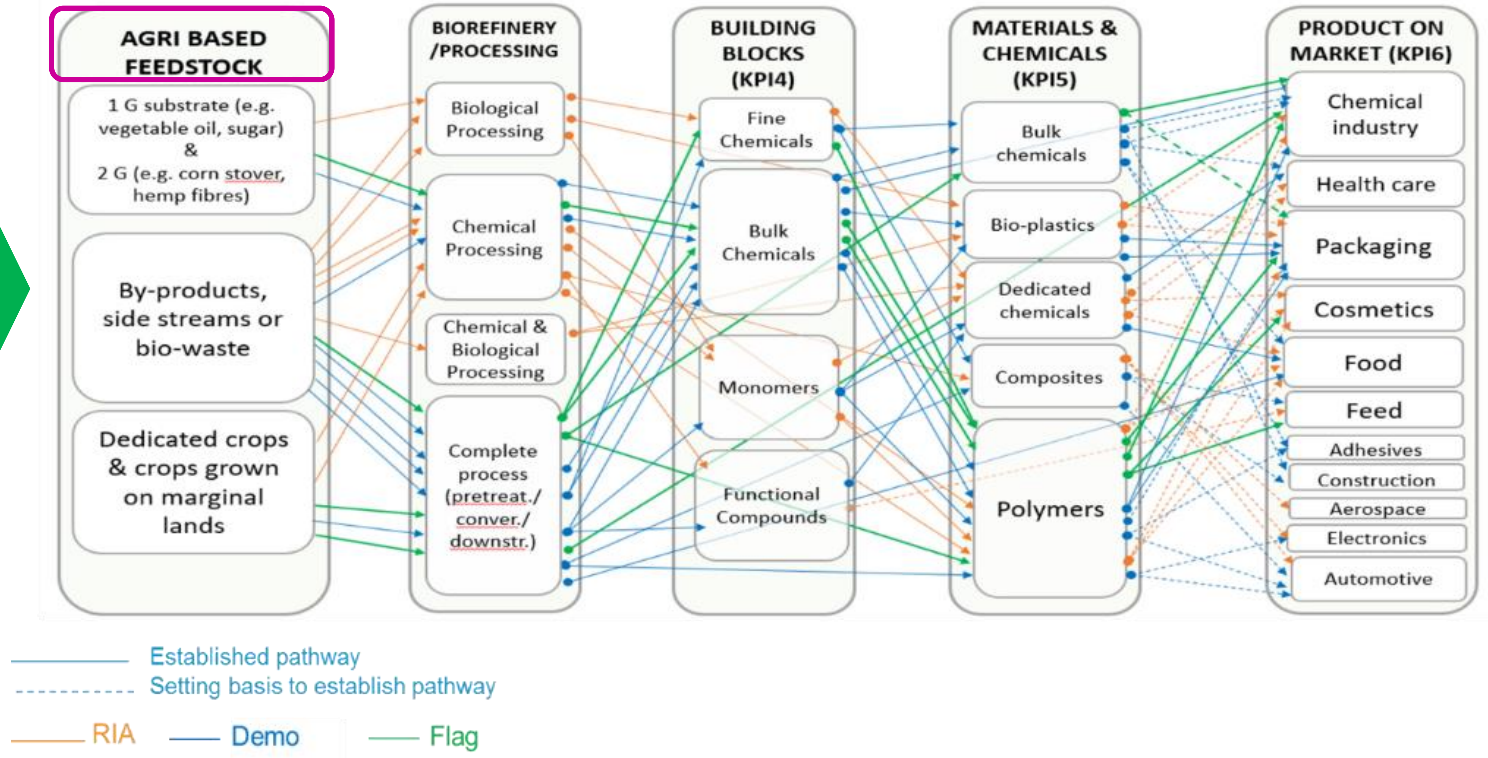
→ Detailed information in AAR2018

Project outcome monitoring
KPI 2/8 from SIRA

The reality of the sector

SIRA 2014 defined
a **linear value chain** in which:

1 feedstock → non-food value chain → 1 product



Outcome monitoring
KPI 5/8 from SIRA

>140 expected new bio-based materials
against a target of 50 by 2020

30% drop-in

60% improved functionality

Some important aspects of novelty reported in the expected new bio-based materials

>70% CO_2 emissions reduction

> 40% Improved biodegradability

> 35% Improved health & safety aspects

→ Detailed information in AAR2018

Outcome monitoring – KPI 6/8 from SIRA

>60 expected new bio-based consumer products (TRL 6-8)
against a target of 30 by 2020 (KPI defined for IAs only)

Percentage of projects reporting expected improvements in the new bio-based consumer products

>70% CO_2 emissions reduction

> 40%
Improved biodegradability

> 40%
Improved recyclability

> 40%
Improved health & safety aspects

> 40%
Reduction in energy consumption

Sectors of application
Some examples

Packaging

Bio-based packaging for food & others

FRESH, PULPACKTION, SHERPACK, BioBarr, BIOSMART, PEFerence

Medical & healthcare

Nutritional products
AQUABIOPROFIT, MAGNIFICENT

Bioactive compounds
BIOrescue

Textiles

Advanced bio-based materials

EFFECTIVE
NEOCEL

Food & Feed

Food & feed ingredients
SYLFEED, BIOSEA, GreenProtein, MACROCASCADE, MAGNIFICENT, Pro-Enrich

Automotive

Advanced materials
BIOMOTIVE, GreenLight, BARBARA

Personal & home care

Cosmetics
BIOSEA, EXILVA, LIBBIO, ABACUS

Detergents & soaps EXILVA

Agriculture

Fertilisers
NewFert, SUSFERT

Herbicides
FIRST2RUN

Sustainable management of resources

Forest management:
EFFORTE, TECH4EFFECT
Rural revitalization
FIRST2RUN
Algae cultivation:
BIOSEA

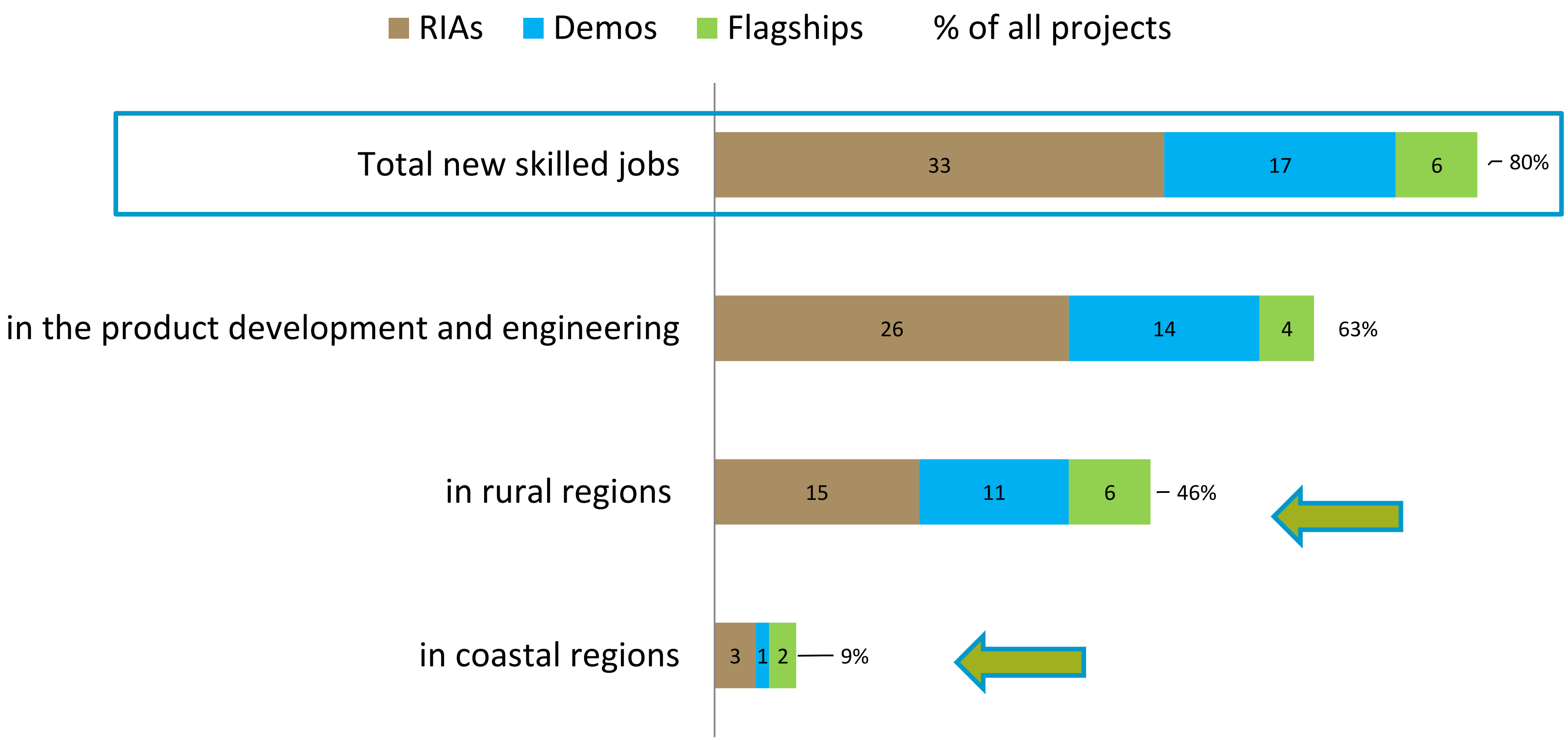
Construction

Construction materials
ECOXY, GreenSolRes

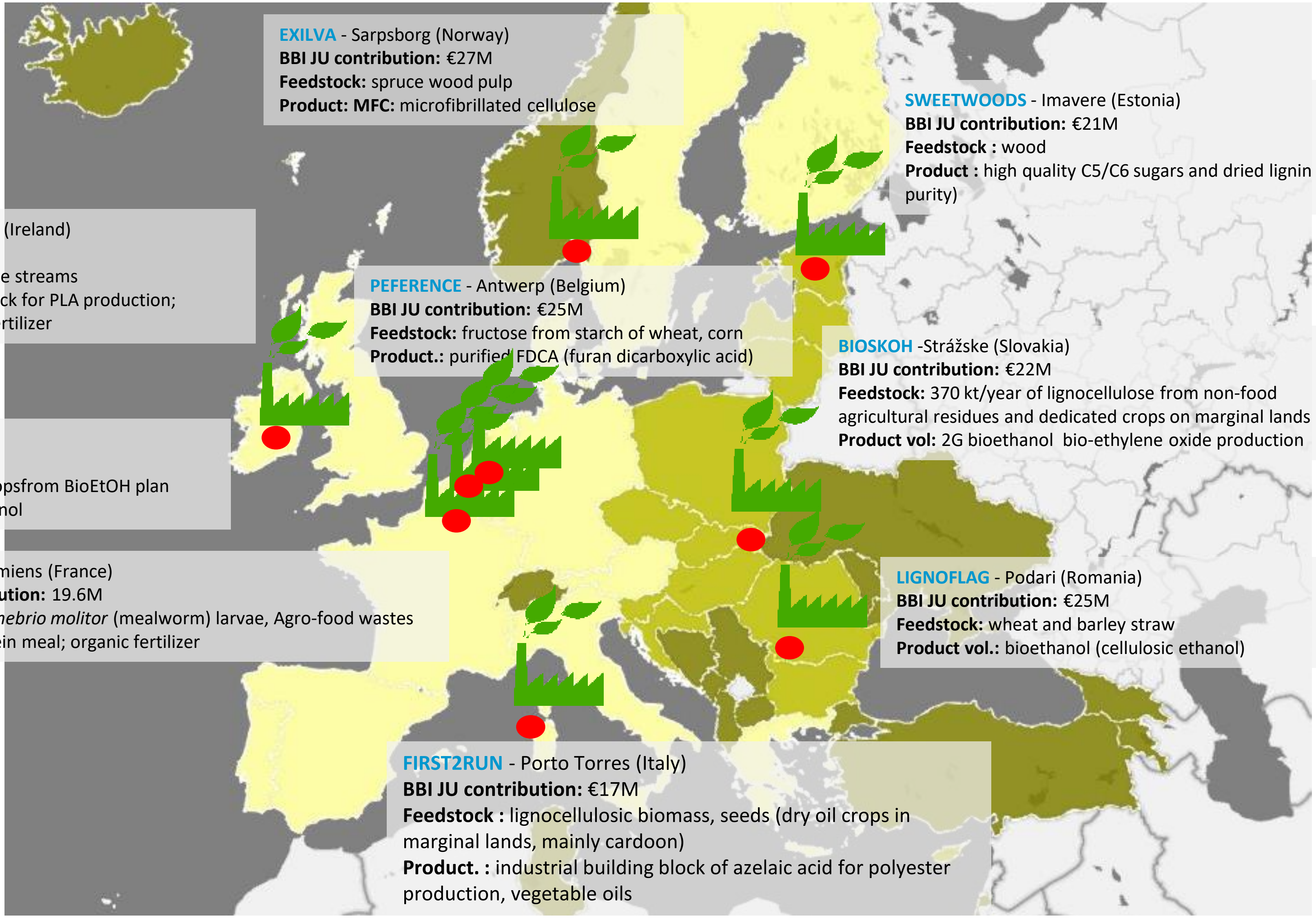
Bioenergy

BIOSKOH
LIGNOFLAG

Project impact on jobs & investment



Outcome monitoring – KPI 7/8 from SIRA



EXILVA - Sarpsborg (Norway)
BBI JU contribution: €27M
Feedstock: spruce wood pulp
Product: MFC: microfibrillated cellulose

SWEETWOODS - Imavere (Estonia)
BBI JU contribution: €21M
Feedstock : wood
Product : high quality C5/C6 sugars and dried lignin (85% purity)

AGRICHEMWHEY - Co. Tipperary (Ireland)
BBI JU contribution: €22M
Feedstock: > dairy processing side streams
Product.: lactic acid (building block for PLA production; minerals for food supplement; fertilizer

PEFERENCE - Antwerp (Belgium)
BBI JU contribution: €25M
Feedstock: fructose from starch of wheat, corn
Product.: purified FDCA (furan dicarboxylic acid)

BIOSKOH -Strážske (Slovakia)
BBI JU contribution: €22M
Feedstock: 370 kt/year of lignocellulose from non-food agricultural residues and dedicated crops on marginal lands
Product vol: 2G bioethanol bio-ethylene oxide production

PLENITUDE - Ghent (Belgium)
BBI JU contribution: €17M
Feedstock: sustainable cereal cropsfrom BioEtOH plan
Product.: mycoproteins;; bioethanol

FARMYNG - Amiens (France)
BBI JU contribution: 19.6M
Feedstock: *Tenebrio molitor* (mealworm) larvae, Agro-food wastes
Product: protein meal; organic fertilizer

LIGNOFLAG - Podari (Romania)
BBI JU contribution: €25M
Feedstock: wheat and barley straw
Product vol.: bioethanol (cellulosic ethanol)

FIRST2RUN - Porto Torres (Italy)
BBI JU contribution: €17M
Feedstock : lignocellulosic biomass, seeds (dry oil crops in marginal lands, mainly cardoon)
Product. : industrial building block of azelaic acid for polyester production, vegetable oils

9 FLAGSHIPs

3.300 direct jobs

> 10.000 indirect jobs

Total Grant: € 195million

€1.2 billion private investment

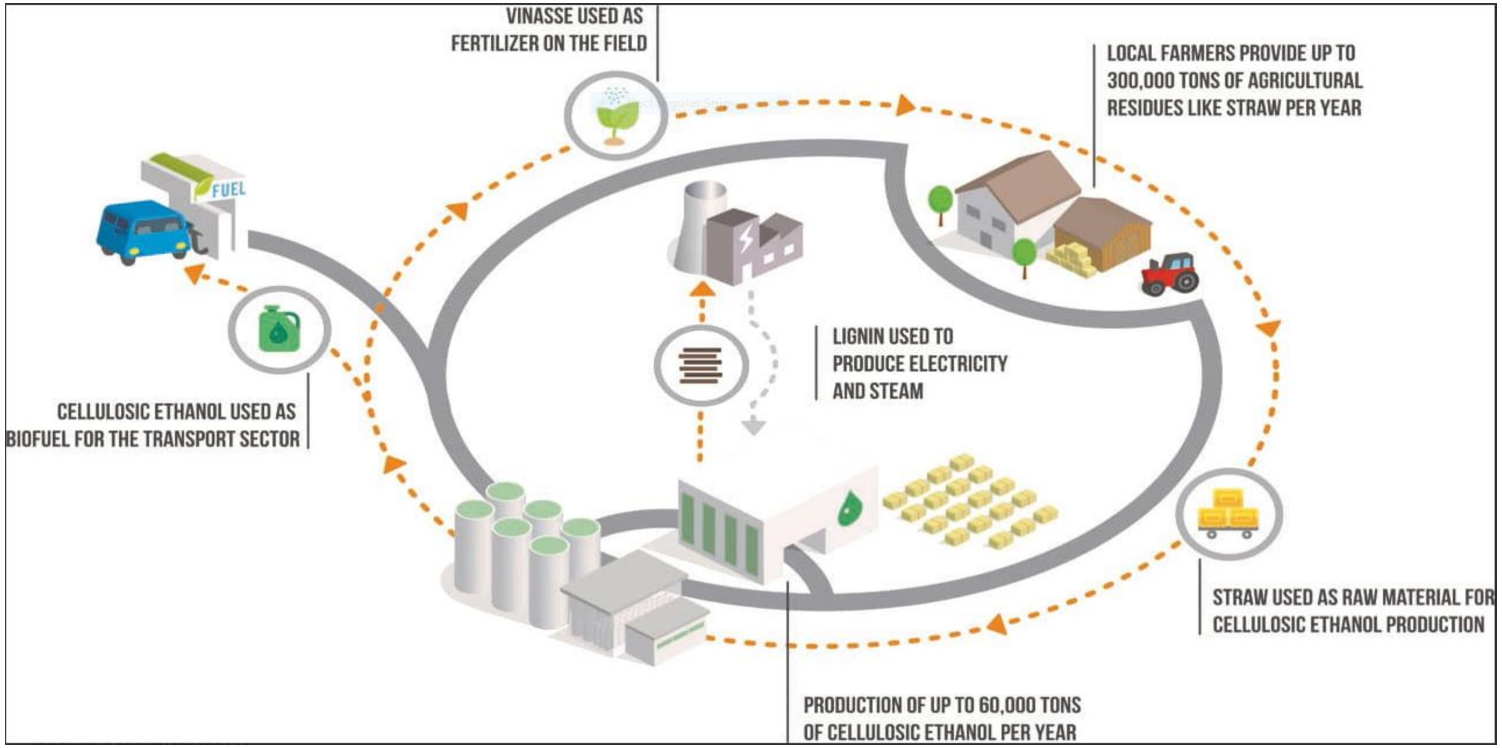
High replicability potential

Examples of 2nd generation biofuels and bioenergy projects

- Flagship in Podari, Romania
- Biomass: agriculture residues (**wheat straw**)
- Objective: establish an energy self-sufficient, **highly sustainable production** process for **cellulosic ethanol** by **using co-products** for renewable energy production (50.000 ton/year) and soil fertilization.
- Extension of current biofuel production to new, currently **underutilized non-food biomass**

Contribution to economic growth, job creation and rural development

- Plant in Craiova:contribution to EU Strategy for Danube Region
- Diversify **farmers income**
- **Green jobs** in agricultural and transport sector



New jobs linked to feedstock supply: local farmers, transport and logistics to secure up to **300.000 tons** of agricultural residues like straw per year

Development of appropriate contract systems to accommodate **different straw suppliers needs**

Dedicated workshops to **local farmers** to share know-how and best practices with local farmers for **sustainable harvesting**

BIOSKOH

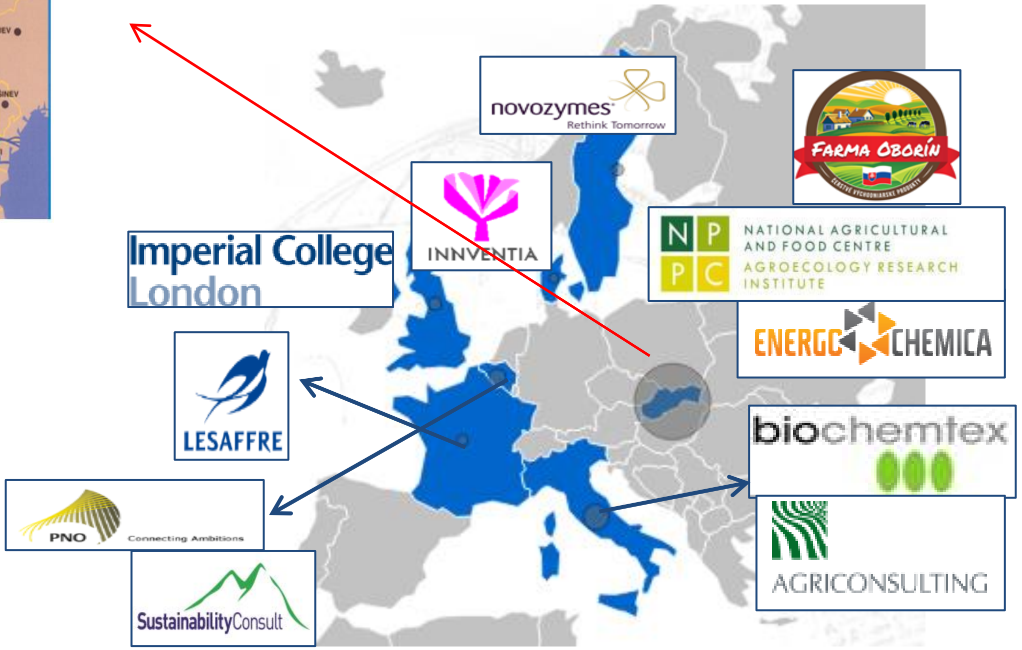
BIOSKOH's Innovation Stepping Stones for a novel European Second Generation BioEconomy

- Flagship inStrážske (SK), in the East of Slovakia
- Biomass: **agrobased residues and dedicated crops**
- Objective showcase the first **full commercial scale biorefinery in Europe for the production of 2G bioethanol (55 kton)**. To realise a new local 2G biomass to ethanol value chain based on multi-biomass feedstock available made of agricultural residues and energy crops to be grown in marginal lands.

Impact

- Demonstrate a new concrete **regional bio-based value chain**, by valorising side streams from conventional land and by growing and valorising cellulosic fractions of dedicated crops grown on marginal land
- Create estimated **160 direct and 500 indirect green jobs** per year
- Improve innovation capacity and the integration of new knowledge

The consortium



Timing: 60 months

- Start date: 1st June 2016
- End date: 1st June 2021

Project budget: € 30.122.313,75

- € 21.568.195 public contribution
- € 9.201.318,75 private contribution
  - € 8,554,118.75 In-kind
  - € 647.200 Additional activities

DEMETER

- DEMO project (8 DEMO plants)
- Objective : To demonstrate a yield increase and cost reduction of the **C1-LC4 enzyme production process** as well as its positive effect on biogas production in Europe
- Demonstrate improved production process at **15.000 L scale**
- Develop a **predictive model** of the effect of enzyme addition on the biogas yield of a given process
- The improvement of the biogas production process due to the use of the enzyme is being demonstrated in practice in **8 field trials**

Impact:

- Higher process yields of at least 20% compared to the state of the art
- Cost reduction of at least 15% compared to conventional down-stream processing of the fermentation broth
- Increasing the overall productivity leading to more economically feasible processes, to be proven at demonstration scale

DEMETER

Web site

http://www.demeter-eu-project.eu

Project details

Type of action:	Innovation Action - Demonstration
Value Chain:	Across VCs
Start date:	01 August 2016
End date:	31 July 2019
BBI JU contribution:	€ 4,629,586.00

PARTNERS

THE NETHERLANDS
GENENCOR INTERNATIONAL BV (PART OF DUPONT INDUSTRIAL BIOSCIENCES GROUP)

BELGIUM
BIO BASE EUROPE PILOT PLANT VZW

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www.biomoer.nl

Lessons learnt (1/2)
Key achievements

- **Specific KPIs** and **socio-economic & environemental impact** from SIRA **well on track** and monitoring works;
- **BBI JU is achieving its objectives with two main effects:**

  - Structuring effect: value chain-driven cooperation across sectors creating competitiveness

  - Mobilizing effect: innovation-driven mobilising key stakeholders
- **Financial leverage effect overall on track** with some contrast
- **Well balanced portfolio** showing an optimal value chains coverage
- **Public funding of high TRL research projects:** Demonstration and Flagships coverage (geographic and feedstock)
- **High % of SME participation (**and with key role)
- **The industry invest in EU**: in 2014: € 2 bn → 2018: € 5.5 bn
- **Europe back on the map** (BIC CEOs, BBI JU Advisory bodies)

Lessons learnt (2/2)
“*We are not there yet*” – Horizon Europe

- **Huge and still risky investments**
  - ✓ Issues accessing private capital
  - ✓ Remaining funding gaps in Demo and Flag
- **Structuration still ongoing: market and demand risks**
- **Some areas not yet covered enough**
  - ✓ Farmers participation
  - ✓ Full feedstock potential
  - ✓ Geographic coverage
  - ✓ …
- **Brand owners and retailers participation**
- **Sector request coherent, supportive and stable regulatory framework**
- **Better tell the story of BioEconomy & Bio-Based products: Consumer awareness, education**
- **Go beyond “fossil to biobased” story: climate mitigation, water quality, human and animal health, biodiversity…**

Join us

- **Register on our partnering platform:** https://bbi-ju.lifepartnering.com/
  - Access a network
  - Receive all relevant information about our calls
  - Acces to reports and information
  - E-Newsletter

- **BBI JU Info-day 2020 in Brussels**
  - Information on Call for Proposals 2020
  - Brokerage and networking event
  - 2019 edition had 550 participants and 1200 face-to-face meetings

22 April 2020

Charlemagne building, European Commission, Brussels

Contact us

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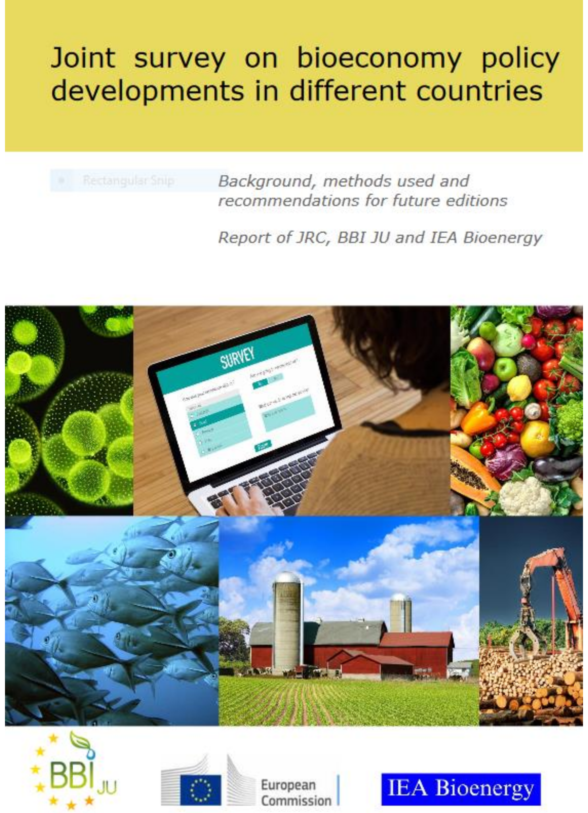
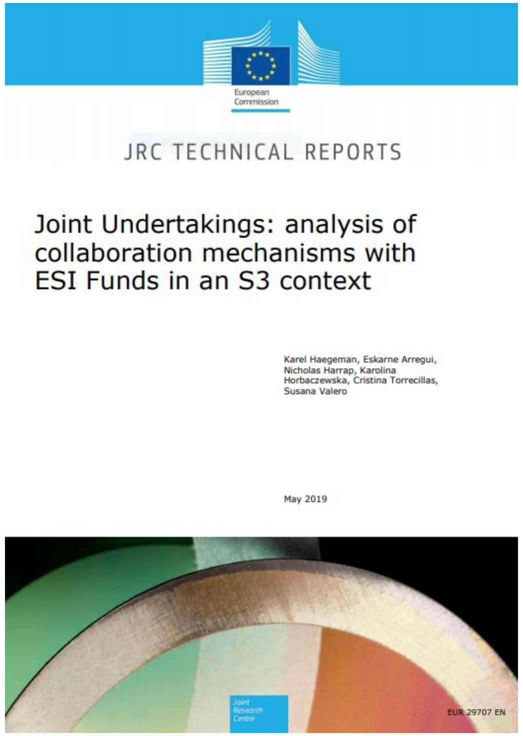
BBI JU contribution to technical and policy-relevant reports



Outcomes of the joint survey JRC-IEA- BBI JU to understand the status of policies and strategies and other activities taken at national level on bioeconomy

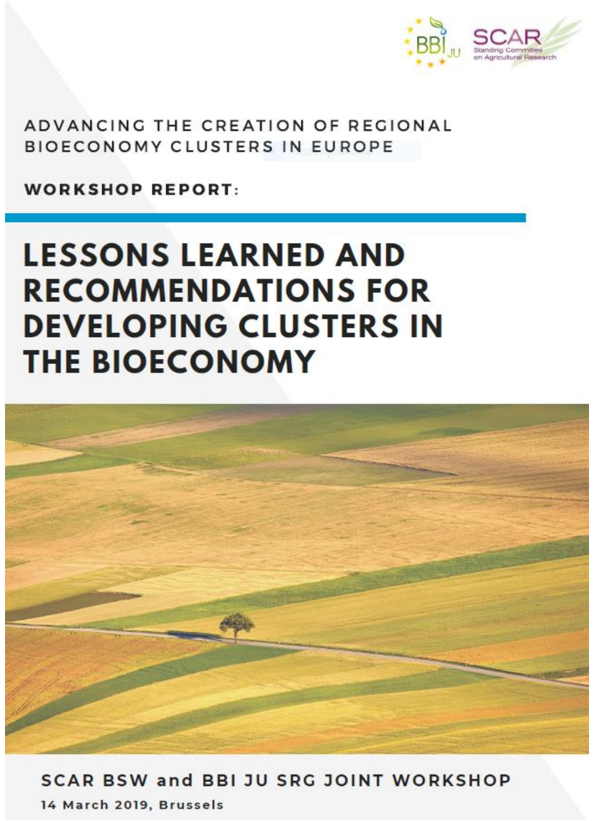
Article on the role of BBI JU as an opportunity for the development of a sustainable, competitive and innovative bio-based industries sector in Europe.



Outcome of the JRC's event with the participation of CleanSKY and FCH describ different models and opportunities for collaboration with regions applied by vari JUs.

BBI JU policy-relevant reports

Overview of the status of policies and strategies to support the bio-based industrial sector at national level during 2017. It provides examples of good practices and lessons learnt as reported by SRG to support the deployment of the BBI JU and enhance its impact at national level.



Outcome of the joint workshop organised by BBI JU & SCAR BSW to encourage the participation of less active regions in bioeconomy and BBI JU