Importance of open access pilot and demonstration infrastructures within the development of Bio economy and industrial biotechnology and how to finance

Synergies workshop ESIF & H2020
Brussels October 11th 2016
Brecht Vanlerberghe,
Outline

• IB & Bio Economy
• What’s missing
• Shared Pilot facilities
• Bio Base Europe Pilot plant
• Sum up & Outlook
• SMARTPILOTS project
Bio economy & ket IB

addressing societal challenges:
GHG reduction, jobs, re-industrialisation, resource independecy

**Bio Economy:** from fossil to (local) renewable resources
White Biotechnology:
The use of microorganisms and their enzymes to produce chemical substances, materials and bio-energy from renewable resources.
Deployment IB & Bio economy: What’s missing?

RESEARCH:
• mainly (bio) catalyst development (IP)
• typically lab environment
• scientists

INNOVATION
• Techno economical feasibility, LCA?
• Market validation & value chains >> Prototypes
Or
Process & down stream process development & engineering

>> expertise, skills / “software” or people
>> larger infrastructure/ hardware
>> Money & time
Deployment bio economy: What’s missing?

Valley of death

- Fundamental research
- Laboratory scale
- Development/Optimization
- Pilot/demo scale
- Market Entry
- Market-ready product

Technological risk

Capital requirements

Time

What's missing?
Bio Base Europe Pilot plant: a shared pilot facility

Innovation in IB & Bio economy:

- **Risky:** uncertain political climate (CO2 taxes, incentives, penalties, ….)
- **Low risk premium & longer payback time:** profit margins lower than in Pharma or red biotech

>> difficult to convince management and/or private investors

Shared Pilot Facilities = risk sharing/reduction
Bio Base Europe Pilot plant: a shared pilot facility

• shared investments in innovation infrastructure, equipment, capabilities & expertise >> 24/7 activity with needed critical mass
• open access test sites that bring innovations from the laboratory into industrial practice.
• Open to (all) companies and research institutes
• bridging the valley of death
Project Bio Base Europe
Interreg IV Vlaanderen-Nederland

Bio Base Europe iVZW was founded in 2008 as a joint initiative of:

GHENT BIO-ENERGY VALLEY
BIOPARK terneuzen
Bio Base Europe Pilot Plant
Bio Base Europe Training Center

Project Leader: prof. dr. ir. Wim Soetaert
Project Bio Base Europe
Interreg IV Vlaanderen-Nederland

Public Organisations:

Industrial Members:
Project Bio Base Europe
Interreg IV Vlaanderen-Nederland

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Location Ghent:
Pilot Plant
13 mio €

Location Terneuzen:
Training Center
8 mio €

Location Ghent:
Pilot Plant
13 mio €
Project Bio Base Europe
Interreg IV Vlaanderen-Nederland

Bio Base Europe is supported by:
Once the money raised, the building starts
Idle fire station:
Bio Economy: a lot of steel and concrete
Hall 2: White Biotech ~ fermentation and DSP
Hall 3: Green Chemistry and ATEX proof DSP
Bio Base Europe Pilot Plant

- Multi-purpose pilot facility for bio-based products and processes in Ghent (Belgium)
- Independent organisation without industrial shareholders
- Current number of employees: 47
Bio Base Europe Pilot Plant

Rodenuizedok:
300,000 ton Bio diesel
200,000 m³ Bio ethanol
200 MW Bio electricity
Bio Base Europe Pilot Plant:

- Process Hall 2: Fermentations and DSP
- Lab Hall 1: fermentation, analysis
- Maintenance Hall
- Process Hall 3: Green chemistry (ATEX)
- Process Hall 1: Pretreatment, DSP and biocatalysis
Process Hall 1
Biomass pretreatment, biocatalysis and DSP
Process Hall 3
Green chemistry and ATEX proof DSP
Laboratory

Analysis and process development
Storage

Storage of different kind of biomass
Bio Base Europe Pilot Plant
Our unique offer:

‘A flexible and diverse pilot plant that covers the whole process, from green resource to final product, under one roof’
Bio Base Europe Pilot Plant
What we do!

PRIVATELY FUNDED PROJECTS

PUBLICLY FUNDED PROJECTS:
Technology development, scale up and Creating awareness & building new value chains

- (financial) stability mid long term
- building expertise
- communication/ publicity/ awareness
- developing IP, “creates FTO”

No manure, waste waters, no undefined, toxic, untraceable,… feedstocks
No Anaerobic digestion

Bio-surfactants
Specialty carbohydrates
Development of a 2nd generation technology

Anaerobic and gas fermentations
Bio Base Europe Pilot Plant

What we do!

- Process development & optimisation:
  - proof of concept, opex, capex, LCA
- Upscaling mg to g, kg, ton scale
  - product validation, market validation
- First series production
  - Market development
Bilateral collaboration with industries
129 projects

Rest of the world:
Canada: 1
Hong Kong: 1
Japan: 3
US: 2

2013-2014-2015

60%
39%
1%

Large Company  SME  University
PUBLICLY FUNDED PROJECTS:
Technology development, scale up and
Creating awareness & building new value chains

CURRENT:

FP7:
NANO3BIO (chitosan)

H2020:
2GBIOPIC (2G ethanol)
Marisurf (marine biosurfactants)
ERIFORE (circular economy forestry based)
Life+ RENEWPACK: biofilms from coproducts
REHAP (valuable compounds from forestry residus)
Superbio (support actions for biobased value chains)
NanoPack, DAFIA, FALCON: GA negotiation

H2020 BBI-joint undertaking:
Pulp2value (Demo) (valorisation coproducts)
Carbosurf (R&IA) (speciality carbohydrates & biosurfactants)
DEMETER (demo) (enzymes for anaerobic digestion)

INTERREG NWE:
Bio Base 4 SME (Support actions to SMEs)

Interreg EU:
SmartPilots (network shared pilot facilities for Bio Economy)

Interreg VI-NDL:
BioHart (renewable aromatic molecules)

UNDER EVALUATION:
FISCH-ICON (FL): Enzymase
H2020-BBI-2016: 6 projects (Pilots4U, RESOLVE, APPROACH, AFTERLIFE, WISER, MIND)

IN PREPARATION:
H2020- INFRAIA-02-2017 (2nd stage): Rls for Gasfermentation
H2020-Biotec-05-2017: gasfermentation
H2020-Biotec-06-2017: optimisation cell factories
H2020-SC5-14-2017: enhanced mineral recovery
PUBLICLY FUNDED PROJECTS:
Technology development, scale up and
Creating awareness & building new value chains

PAST Projects

**FP7**: BIOSURFING (*biosurfactants*); NOVOSIDES (*novel glucosides* via biocatalysis); IB2Market (*biosurfactans & specialty carbohydrates*)

**ERA-IB**: Chito bio engineering (*chitosans*)

**IWT**: VISIONS (*2nd generation* technologies for *organic waste streams*)

**INTERREG NWE**: Bio Base NWE (support activities for the biobased economy with focus on *SME’s*)

**INTERREG VL-NDL**: Bio Base Europe (BBEPP & BBETC)

**EFRD**: investment in *15m³ bioreactor* and auxiliary equipment

**Enterprise Flanders**: Ghent Syngas cluster (*syngas to chemicals*); DEMOPROBIO (*in situ product recovery* linked to ABE fermentation); BIKALTYSE (*biocatalysis*) BIOCLUSTER (*renewable products*)

**EU DG Enterprise**: Mkets-pilotlines: analysis actual situation & *policy recommendations* for pilotlines for KETs
Consortia projects

Geographical distribution of European project partners within consortia based projects
SUM UP:

our history:

- Investment in infrastructure (2009 – 2012)
  - European Structural & Investment Funds (ESIF):
    - Interreg project VI-NL (2009 – 2013): 13 M€
    - Interreg NWE (2013-2015): 1,3 M€
    - EFRO (2014-2015): 1,3 M€
  - Interreg VI-NL (2016-2019): 0,2 M€

- Operational costs of demonstration projects (2011 - now)
  - Private funding (direct collaboration with companies)
  - Public projects (FP7, Horizon2020, national programs,...)
The Future: What does it take?

Critical mass to service companies:
- People & Expertise
- Equipment: state-of-the-art & new technologies

Challenges for us:
- Continuity in projects/funding to
  - keep growing team employed and
  - to pay the bills
- Further (support for) investment in “hardware” required
The Future: What does it take? Our recommendations for the future

- Further Investment in open, multifunctional (ideally independent) pilot & demo infrastructure by public funds (e.g. EFRD). *(Bear in mind: it’s not the SPF who get’s the benefits of the innovation! Societal impact)*

- Pilot & demonstration activities to be funded by public (e.g. H2020) or private funding.

- Avoid scattering of resources/ euros: a few well equipped open pilot & demo infrastructures with sufficient critical mass

- Dedicated pilot lines, demonstration plants and certainly flagship plants if not multifunctional: they are product & process specific, beneficiaries are therefore largely “private” and should be funded accordingly
Smartpilots: Improving policies in support of shared pilot facilities to increase their impact on the Key Enabling Technology Industrial Biotech and the European Bio-economy

Brecht Vanlerberghe

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Shared Pilot Facilities & their respective regions:
• Bio Base Europe Pilot Plant (Flanders, Belgium) with EWI
• Centre for Process Innovation (Tees Valley, United Kingdom)
• VTT (Helsinki Uusimaa, Finland),
• Bioprocess Pilot Facility (Zuid-Holland, The Netherlands) with the province Zuid-Holland

as Region without SPF:
Innovhub SSI for Lombardy (Italy).

As partners/case studies to the consortium:
• ARD (France)
• Fraunhofer CBP (Germany)
SMARTPILOTS: Subobjectives

1. Optimizing direct support mechanisms for SPF:
   - Investments in hardware/infrastructure, maintenance and replacement of equipment needs
   - Regions will exchange direct support practices - best value for money for each region

2. Optimizing indirect support for SPF:
   By promoting innovators to use of SPF
   - Innovations have an increased chance to make it to the market
   - The long term viability of the SPF are supported
   Best practices including impact analysis will be exchanged between the regions

3. Facilitate interregional cooperation for pilot activities:
   - By promoting regional innovators to use an SPF from outside the region
   - By co-investment of different regions in the same SPF
Key Messages
Interreg EU project SMARTPILOTS
Adressing societal challenges!

Message 1:
Bio economy & industrial biotechnology as KET address societal challenges such as developing a sustainable, innovative and knowledge-based economy in Europe, creating jobs and meeting climate targets.

Shared Pilot Facilities are a crucial element to make it happen

from fossil to renewable resources
Why is it not happening? The Valley of death!

Message 2: Shared Pilot Facilities (for the KET IB / Bio-economy) are open access research and demonstration facilities investing in a broad spectrum of state-of-the-art equipment and offering required expertise with the aim to help innovative companies scale-up their successful research to an industrial scale. (= Shared Pilot Facilities are shared investments in equipment and expertise).

Message 3: The long lead time associated with commercialization of novel industrial biotechnology processes causes many companies to fail. Shared Pilot Facilities help companies to bridge this ‘valley of death’ by scaling up innovations from lab scale to industrial scale.

Message 4: Collaboration, in an early stage of innovation, with open access shared pilot facilities maintaining a high level of innovation capability substantially lowers the financial risk for the innovating company and speeds up the commercialization of their new product or process.

Message 5: Europe recognizes too much R&D is deployed outside of Europe. Funds for support of the demonstration phase of promising innovations in the field of industrial biotechnology / bio-economy, are available, but companies find it difficult to access these funds. Shared Pilot Facilities can help companies to access these funds.
Why “SMARTPILOTS”?

Message 6: SmartPilots brings together the main six European Shared Pilot Facilities (SPF) for the Key Enabling Technology Industrial Biotechnology, with the aim to discuss and share best funding/operating practices and improve policies in support of SPF.

Message 7: Engaging with SmartPilots will provide effective mechanisms for open discussion between policy makers and managing authorities of policy instruments with intermediaries and beneficiaries of the funds.

Message 8: To be effective and relevant, critical mass is required both in hardware and people (=equipment and expertise). As SPFs get no risk premium for the continuous and large investment needed to remain state-of-the-art, a full commercial business model is not viable. Therefore public investment in SPF is indispensable and there is a need to develop a specific business model for such facilities.

Message 9: Public investment in Shared Pilot Facilities ensures that the high cost of pilot and demonstration actions can be mitigated for SMEs through the availability of open access capabilities.
Solutions the “SMARTPILOTS” project offers

Message 10: If operational programs are not amended and implemented so they allow direct and indirect funding for SPF and their users, SPF will disappear, which will hamper companies to innovate.

Message 11: Regions should keep investing in existing facilities to safeguard their expertise and to keep their state-of-the-art equipment up to date. Starting new initiatives risks diluting available technologies and expertise.

Message 12: The international nature of the bio-based economy can restrict access to regional funds, limiting the benefits to regional economies.

Message 13: To maximize the impact of SFP, regional policy makers should create mechanisms to allow support for international collaboration (cross border) between SPF, their users and regions.