VANGUARD INITIATIVE
New growth through smart specialisation

Bioeconomy Pilot

Interregional cooperation on innovative use of non-food biomass

Interactive Bioeconomy Pilot Meeting

Results 2025 & Planning 2026

16 February, 2026

Bioeconomy Pilot in brief

- **Launched in 2014**
- **Lead region:** Lombardy
- **Technical coordinator:** Lombardy Green Chemistry Association
- **Linked to S3 Bioeconomy S3 Industrial Modernization TSSP**

9 Participating regions

1. Emilia-Romagna
2. Flanders
3. Lombardy
4. Lower Saxony
5. North Rhine-Westfalia
6. Saxony-Anhalt
7. Slovenia
8. Southern Netherlands
9. Wales

Mapping of key participants

Short list of the current most representative players

- **Flanders**: **VITO**, Solvay, **Biorizon Shared Research Center** (over 30 members, including research centers, industries, clusters, and startups in the bio-aromatics sector) , Plantics, Rodenburg Biopolymers, BioScienZ, **B4P**, **Relement, Bio Base Europe Pilot Plant,** CENTEXBEL, Kamp C
- **Lombardy**: Lombardy Green Chemistry Association, **Vegea**, Italbiotec, Maganetti Spedizioni.
- **Lower Saxony:** Fraunhofer CBP, Hans Knoell Institut
- **North Rhine-Westphalia: BASF, Bayer,** Worlée Chemie, **Covestro**
- **Saxony-Anhalt: STEINBEIS 2I GMBH, TECNARO GmbH,** RWTH Aachen University
- **South Netherlands**: **Bergen op Zoom**, **TNO**, Wageningen UR, Baril Coatings, Agro & Chemie, NNRGY Crops, Rabobank, **Latexfalt**, **Avantium**, **Millvision**, MaasJacobs, van Iersel-Coppens, Hendriks, Holland Circular Hotspot, Green Chemistry Campus
- **Slovenia: Anteja ECG**.
- **Wales**: Cardiff Met, Biocomposites Centre

Objectives 2025

1. STRENGTHENING GOVERNANCE & ALLIANCES

- Improving **governance** involving more VI regions in decision-making.
- Establishing **new strategic alliances** with EU bioeconomy platforms and networks
- Integrating **EU-funded bioeconomy projects** into regional policy initiatives

2. ADVANCING BIO-BASED SOLUTIONS

- Supporting **new project proposals** to scale up large-scale production of bioaromatic molecules
- Organising EU events engaging the bio-based community
- Securing funding through I3 and **VInnovate** instruments on biopolymers applications

3. CAPACITY BUILDING & MARKET READINESS

- Supporting SMEs & industry through **AI-driven supply chain tools**.
- **SMEs & Clusters Training & coaching** in Austria, Belgium, Germany, France, Italy, Spain & Eastern Europe.
- Expanding the **VCG.AI platform** across VI regions, enhancing collaboration & market access.

Key activities in 2025

1. STRENGTHENING GOVERNANCE & ALLIANCES

- New partnerships with **EU-funded projects SYMBIO, RURAL BIOUP, DRIVE, DIVERSE, ARGONAUT;**
- Contributed to a **cross-regional study** on Alpine **bioenergy value chains;**
- **12 regional workshops** (S3-based) engaging authorities, industry & innovation hub in **Italy, Slovenia, Belgium, Austria, Spain and 3 Roadshows in Slovenia, Greece and France (Engaged 200+ participants and 60+ SMEs/start-ups in the circular bioeconomy)**
- **2 international workshops** at the **Expo 2025 Osaka, Japan**

2. ADVANCING BIO-BASED SOLUTIONS

- The LignoValue Pilot Plant completed a **new large-scale delivery** for the LEGACY project
- Advanced developments in bio-aromatics, BPA-free epoxy resins, and sustainable materials
- Launched **new European projects** (CIRCULAR-C, UPLIFT, BIO-CAPPP)
- Activated **innovation vouchers** to support SMEs in four European regions (**Zeeland**, **Brabant**, **Limburg**, and **Flanders** regions)
- **Securing** funding via **VInnovate**.

3. ENHANCING CAPACITY & MARKET READINESS

- **VCG.AI** deployed in **12 regions → 10+ AI-driven supply chain simulations.**
- Benefits: **80–90% faster partner search**, improved visibility of residual streams, stronger investment decisions.
- Portfolio: **12 bio-based products** (PLA, PHA, lactic acid, glycerol, succinic acid, furfural, etc.) selected for market and innovation potential.
- Next milestone: **10 validated zero-waste business models** replicable across EU regions.

Key outputs of 2025

- **LignoValue Pilot Plant completed** 2nd large-scale delivery of depolymerised lignin for LEGACY (bio-based, BPA-free epoxy resins)
- Bioaromatics portfolio expansion through projects and calls: **SAUNA** (zero-waste pulping), B4/Circoplast (lignin-based flame retardants), **CIRCULAR-C** (SSbD adhesives/coatings), UPLIFT (call for industrial partners), **BIO-CAPPP** (bio-based plasticisers + innovation vouchers)
- **CIRCUROAD** advanced with new trial sections (InnovA58 follow-up + N210 IJsselstein) and expanded Proeftuin Biobased Asfalt validation pipeline (TRL 6–9, monitoring plan)
- **VCG.AI platform deployed in 12 regions**; generated 10+ AI-driven supply chain simulations leveraging databases (450+ companies, 150 technologies, 50 models)
- **N 10+ proposals submitted**
- **N 1 project Vinnovate 2025 funded**

Key outcomes of 2025

- Strengthened governance via **strategic alliances** with EU initiatives/projects (SYMBIO, RURALBIOUP, DRIVE) + new alliances (DIVERSE, ARGONAUT)
- Cross-regional **Alpine bioenergy value-chain assessment** delivered (Italy regions + Slovenia, Austria, Bavaria, Auvergne-Rhône-Alpes)
- **Showcased bio-aromatics value chain** at Brussels event (24 Nov 2025)
- **12 regional S3-aligned workshops** delivered across **12 regions** (public authorities, SMEs, clusters, innovation hubs) – **Flanders**, **Slovenia**, **Lombardy**, **Emilia-Romagna**
- 3 international hackathons & roadshows (Slovenia, Auvergne-Rhône-Alpes, Macedonia) engaging **200+ participants** and **60+ SMEs/start-ups**
- Acceleration & mentorship programme for SMEs designed for launch in Q1 2026
- **Expo 2025 Osaka participation**: workshop at Padiglione Italia during Sustainability Week (5–13 Oct 2025)

Demo-cases results #1

Bio-aromatics Demo case	
Involved regions	**Flanders**, Lower Austria; Upper Austria; Wallonia; North-Rhine Westphalia; Emilia-Romagna; South Netherlands; Slovenia; Piedmont; Randstad/South Netherlands; Slovenia; Basque Country; Navarra; Varmland; Scotland; Wales; Lombardy.
Objectives	1. **Sugar to bio-aromatics**. Sugar-line based on furan and Diels-Alder chemistry: leading to functionalised furans and aromatics 2. **Lignin to bio-aromatics** (lignoValue plant). Lignin line based on depolymerisation, fractionation, conversion: leading to innovative functionalised molecules. 3. **Thermochemical conversion of biomass to bio-aromatics**: leading mostly to bio-based BTX molecules
Use cases updates	1. **LignoValue Pilot Plant**: in June 2025 delivered the second large-scale batch of depolymerized lignin for the **LEGACY project**, which aims to develop **100% bio-based epoxy resins** as a safe alternative to bisphenol-A (BPA). 2. **SAUNA Project**: introduced a **zero-waste pulping process**, capable of reducing **biogenic CO_2 emissions by up to 80%**, with promising applications in packaging, adhesives, and polyurethanes. 3. **VITO (FRPM25)**: presented **halogen-free, lignin-based flame retardants**, developed within the **B4** and **Circoplast projects**, for use in building materials and plastics. 4. **BIO-CAPPP Project (TNO)**: introduced new **furfural-derived bio-based plasticisers, already validated in coatings and textiles, as a sustainable alternative to petroleum-based plasticisers**. 5. **Innovative study**: demonstrated the production of **sustainable epoxy-acrylate thermoset materials** through dynamic crosslinks in hybrid resins made from recycled plastics and oligomeric lignin precursors, paving the way for **circular thermosets**.
Next steps	• **Scaling bioaromatics & polymers**: intensify activities to move from pilot to industry with stronger monitoring & data. • **Stakeholder engagement**: involve clusters, SMEs & research centres from VI regions in funding co-design. • **Collaborative proposals**: prepare joint EU/interregional applications (I3, Horizon Europe) with multi-regional input. • **Pilot validation**: expand demos in VI regions to test performance, scalability & sustainability in diverse contexts. • **Knowledge exchange**: hold interregional workshops to share results, foster replication & new zero-waste models.

Demo-cases results #2

Lignocellulosic biorefinery Demo case	
Involved regions	**Biorefinery** Randstad; Scotland; Wales; Flanders, Slovenia; Lombardy **Biobased asphalt** via CIRCUROAD: Randstad region, South NL, East NL, North NL, link to Flanders
Objectives	**Large-scale biorefinery focuses on production and valorization of** sugars from cellulose and hemicellulose plus the lignin fraction (stemming from wood chip/pellets as feedstock). Economic valorization of lignin is often the key to biorefining. **CIRCUROAD** focuses on proving sustainable biobased binders from lignin and other biobased components in asphalt. The complete value chain from feedstock supplier to road owners is participating, supported by science (>30 participants)
Use cases updates	• **First large-scale pilot on the InnovA58**: In December 2024, three trial sections of bio-based stone mastic asphalt were constructed, using binders developed by partners Latexfalt, BMI Esha, and BituNed, marking the transition from laboratory validation to real-world deployment. • **Stepwise implementation pathway defined**: The program set clear milestones, starting with 30% bio-based content in asphalt by 2030, validated through independent testing, with the long-term target of achieving 100% fossil-free asphalt by 2050. Current pilots show up to **75% CO_2 savings**, with future work focused on raising biobased content through vegetable oils, natural fibres, and elastomeric materials. Key partners include **Asfaltnu, Roelofs, Avantium, Latexfalt, KWS, Boskalis, Dura Vermeer, BituNed, Ventraco, BMI Esha**, across regions in the **Netherlands and Flanders**, making it a leading European effort to decarbonise road infrastructure. National, provincial and municipal road owners participate.
Next steps	• **Stakeholder engagement**: companies & organisations from **Netherlands & Flanders** drive interregional collaboration in the Vanguard network. This started with the Chaplin project (lignin) and is continued with CIRCUROAD • **Stepwise implementation**: phased strategy → **30% bio-based asphalt by 2030**, **100% fossil-free by 2050**, with independent validation and testing after 6 months, 2 years, 5 years. • **Environmental impact**: pilots show up to **75% CO_2 savings**; continuous monitoring of durability, recyclability & life-cycle performance. Involvement of Copernicus Institute for maximum environmental contribution and impact. • **Innovation & scaling**: increase bio-based content with **oils, fibres, elastomers** and expand pilots to more regions.

Demo-cases results #3

Biopolymers Demo case	
Involved regions	**Lombardy,** Emilia-Romagna; Wales, Randstad, Slovenia, Maloposka, North-Rein Wetsfalia, South Netherlands
Objectives	1. **Scale-up to TRL 8–9**: industrial demo of high-performance **biobased polyurethanes & semiconducting polymers**. 2. **Integrated pilot lines**: AI-driven formulation, automated dosing & real-time monitoring for reproducibility & scalability. 3. **End-use validation**: large-scale testing in **smart textiles** (self-powered, antimicrobial, flame-retardant) & **construction panels** (insulating, structural, energy-generating). 4. **Circular value chains**: closed-loop recycling of textiles, polymers & composites → **≥80% scraps recovered** and reintroduced. 5. **Cross-sectoral impact**: applications in **fashion, construction, automotive & healthcare**, boosting market uptake & competitiveness.
Use cases updates	• **Performance testing**: thermal efficiency, energy conversion, chemical/mechanical stability & long-term durability. • **Advanced monitoring**: thermal imaging & conductivity analysis to optimise operational efficiency. • **Validation**: compliance with standards for fire resistance, impermeability, breathability, UV stability, washability & safety. • **Real-world readiness**: materials proven sustainable, safe & innovative for practical applications.
Next steps	• **Industrial scale-up**: pilot lines launched across regions to validate materials in real production. • **Interregional replication**: use Vanguard infrastructures to test zero-waste models in diverse ecosystems. • **Advanced monitoring**: integrate thermal imaging & conductivity analysis into production protocols. • **Funding preparation**: joint **I3/VInnovate 2025 proposal** to support scale-up & EU-wide commercialisation.

Demo-cases results #4

BIO-LNG Demo case	
Involved regions	**Lombardy,** North Rhine Westphalia; Piedmont; Upper Austria
Objectives	1. **Sustainable bio-LNG production**: Transform organic waste and agricultural residues into high-quality liquefied biomethane through advanced anaerobic digestion, upgrading, and liquefaction technologies. 2. **Integrated supply chain**: Build regional and interregional value chains connecting feedstock suppliers, biomethane producers, LNG distributors, and heavy-duty transport operators. 3. **Decarbonisation of freight mobility**: Support the reduction of CO_2 emissions in long-haul transport, a sector responsible for over 25% of EU road transport emissions, with bio-LNG offering up to **80% fewer emissions compared to diesel**.
Use cases updates	• **Demo validation (2020–2021)**: confirmed technical feasibility & market potential of **bio-LNG** for heavy-duty vehicles. • **Business plan**: defined investment needs, supply chain organisation & long-term opportunities. • **Replicability Plan (Slovenia)**: adapted demo model to new regional contexts with **TAF support** (scalability, financial viability, cross-border potential). • **Interregional collaborations**: connected stakeholders across Europe to build a **resilient bio-LNG network**. • **Impact**: demonstrated **economic viability & environmental benefits**, serving as a **reference model** in the Vanguard Bioeconomy Pilot for climate-neutral freight mobility.
Next steps	• **Stakeholder engagement**: activated interregional collaborations linking feedstock suppliers, producers, distributors & transport operators. • **Regional mapping**: analysed biogas/biomethane projects in **East-North Finland**, identifying synergies with **SMBio-LNG**. • **Strategic alignment**: positioned SMBio-LNG as a **best practice** within the **Vanguard Bioeconomy Pilot**, driving climate-neutral heavy mobility & cross-border cooperation.

Challenges & Learnings

- **STRENGTHENING THE PILOT REQUIRES STRONG INVOLVEMENT FROM REGIONAL CLUSTERS AND POLYMARKERS.** The development and large-scale deployment of demonstration cases depend on the active involvement of regions to mobilize companies and align with Smart Specialization priorities.
- **THE CREATION AND EXPANSION OF DEMO CASES REQUIRES COORDINATED SUPPORT AT MULTIPLE LEVELS.** The transition from pilot validation to industrial scale requires structured collaboration between regions, research centers, industries, and public bodies.

- **FRAGMENTATION AMONG INITIATIVES LIMITS IMPACT.** Several EU-funded projects operate in complementary fields; without stronger coordination, stakeholder communities remain dispersed, and synergies are underutilized.
- **CRITICAL MASS IS ESSENTIAL FOR SYSTEMIC CHANGE.** Strengthening collaboration among already funded initiatives enables shared infrastructure, joint funding proposals, aligned communications, and greater visibility at the EU level.
- **FROM PROJECT-BASED COLLABORATION TO BUILDING LONG-TERM ECOSYSTEMS.** The Pilot Project must increasingly serve as a platform connecting projects, clusters, and value chains, transforming isolated successes into scalable, interregional bioeconomy ecosystems.

Q&A on 2025 results

(Regions subscribed to pilots & involved actors and interested regions)

Objectives 2026

1. STRENGTHEN EU BIOECONOMY ALLIANCES

Reinforce the Pilot's strategic role by building stronger partnerships with key **EU bioeconomy programmes** (e.g., **CBE JU**) and actively engaging more Vanguard regions. This objective aims to broaden regional participation, integrate EU projects into regional policies, and create new collaboration spaces through dedicated **networking** and **stakeholder events** across participating VI regions..

2. ADVANCE BIO-BASED SOLUTIONS THROUGH DEMO CASE SCALE-UP

Accelerate the industrial deployment and commercialisation of flagship **bio-based innovations** (bio-aromatics, CIRCUROAD, biopolymers, Bio-LNG) by scaling up pilot plants, launching **real-life trials**, and promoting **zero-waste value chains**. The goal is to generate market-ready solutions while strengthening interregional cooperation through joint projects, industry partnerships, and targeted demonstration events involving **SMEs and regional ecosystems**.

3. BOOST SME ENGAGEMENT, CAPACITY BUILDING AND MARKET READINESS

Support **SMEs** and **regional actors** in adopting circular bio-based business models by delivering training, workshops, coaching and matchmaking events across Pilot regions. Through **AI-driven tools** such as **VCG.AI**, the Pilot will validate replicable zero-waste symbiotic models, enhance supply-chain efficiency, and ensure stronger involvement of participating regions in innovation uptake and market expansion.

Key activities in 2026

1. **STRENGTHEN EU BIOECONOMY ALLIANCES:** Collaborate with key **EU programmes** (e.g., CBE JU) and **platforms**; involve new VI regions; create alliances and integrate **EU projects** into regional policies.
2. **ADVANCING BIO-BASED SOLUTIONS**:
   - Scale up **bio-aromatics commercialization**; Boost lignin depolymerisation via **LignoValue**; expand bio-aromatics uptake in advanced materials; promote **zero-waste biorefineries** (SAUNA, –80% CO_2); submit **3+ proposals** (**Horizon Europe/I3/VInnovate**).
   - Expand **CIRCUROAD** towards fossil-free asphalt; increase real-road pilots and validation (TRL 6–9); launch **bio-based building materials and construction materials case study.**
   - Validate AI robotic formulation platform (**POLYSMART VInnovate 2025 funded project**); produce high-performance biopolymers; implement recycling of PU textile waste; apply SSbD across processes
   - Expand **Bio-LNG demo-case** for heavy transport decarbonization, Scale deployment beyond SMBio-LNG; activate interregional supply chains; integrate zero-waste models (biofertilisers, nutrient recovery); hold 1 workshop and engage 1–2 partners; secure I3/VInnovate funding
3. **Enhance capacity building & market readiness**
   - Train 20+ SMEs; deliver 5+ workshops across EU regions;
   - Implement 10+ AI supply-chain solutions; deploy **VCG.AI** to validate 10 symbiotic zero-waste business models

Expected results & outcomes in 2026

EXPANDED PILOT COMMUNITY & EU ALLIANCES

- Increasing Vanguard regions joining the Bioeconomy Pilot
- New strategic partnerships with EU bioeconomy platforms (CBE JU)
- 5+ EU-funded projects integrated into regional policy and S3 implementation

INDUSTRIAL SCALE-UP OF FLAGSHIP DEMO CASES

- Bio-aromatics commercialisation accelerated through LignoValue and new lignin/sugar-derived applications
- Deployment of zero-waste biorefinery solutions (e.g., SAUNA with up to –80% CO_2 emissions)
- 3+ new interregional proposals submitted (Horizon Europe / I3 / VInnovate)
- Expansion of CIRCUROAD real-road pilots and validation (TRL 6–9) toward fossil-free asphalt
- Launch of a new BIOBASED BUILDING & CONSTRUCTION MATERIALS CASE STUDY WITH INTERREGIONAL REPLICATION

ADVANCED BIOPOLYMERS & AI-DRIVEN MANUFACTURING

- Kick-off and validation of POLYSMART (VInnovate 2025 funded) robotic AI formulation platform
- Development of high-performance biopolymers and PU textile waste recycling solutions

Strengthened interregional Bio-LNG supply chains beyond SMBio-LNG

- 1 international workshop to connect producers, infrastructure operators and industrial users
- 20+ SMEs trained in circular bio-based value chains
- 5+ workshops and coaching actions delivered across EU regions
- Deployment of VCG.AI to validate 10 symbiotic zero-waste business models

Envisaged changes & key asks for achieving mutual benefits

ENVISAGED CHANGES

- Transition from **project-based collaboration** to a structured, long-term interregional bioeconomy ecosystem
- Stronger alignment between **EU programmes and regional Smart Specialisation (S3)** priorities
- Faster scale-up of demo cases from **pilot validation to industrial deployment (TRL 6–9+)**
- Increased integration of **AI-driven tools** to optimise value chains and accelerate market uptake
- Greater critical mass of stakeholders across regions to enable systemic impact

KEY ASKS

- Stronger and continuous **engagement of regional clusters and policymakers**
- Commitment from regions to **co-invest, co-design proposals, and support real-life pilots**
- Improved coordination among EU-funded initiatives to avoid fragmentation and maximise synergies
- Broader participation of SMEs, industry leaders and infrastructure owners in demo-case validation
- Strategic support for joint applications under **Horizon Europe, I3 and VInnovate**

Q&A

(Regions subscribed to pilots & involved actors and interested regions)

Available Resources

Want to stay updated on Pilot events and initiatives?
Sign up for our newsletter!
Write to ilaria.re@italbiotec.it

Many thanks for your attention.

Contacts

Ilaria Re
Lombardy Green Chemistry Association
Bioeconomy Pilot
Ilaria.re@italbiotec.it