Climate KIC International Foundation

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Climate KIC response to the EU call for evidence on: Towards a Circular, Regenerative and Competitive Bioeconomy

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Introduction

Protecting and regenerating nature is fundamental to the European economy; **without nature there is no sustainable economy, or economic competitiveness**. Investing in the bioeconomy is therefore a cornerstone of Europe's ambition to achieve climate neutrality, economic resilience, and ecological regeneration. **Connecting bioeconomy, circularity, and regeneration is essential because it enables the sustainable use and recycling of biological resources, within planetary boundaries.**

Bioeconomy reduces dependency on fossil-based inputs, by providing bio-based alternatives, reducing emissions from high-emitting activities and offering new, sustainable markets in sectors such as bioplastics, bioenergy, and sustainable wood products[1]. **Circularity** ensures that biological resources are used efficiently, prioritizing high-value applications and maximizing resource efficiency through reuse and recycling, in line with the cascading principle[2]. **Regeneration** means actively restoring and enhancing ecosystem health, soil fertility, and biodiversity, which underpin long-term productivity and resilience.

A circular and regenerative bioeconomy can deliver climate mitigation, rural development, biodiversity conservation, and industrial competitiveness by keeping bio-based materials and products in use for as long as possible, clearly reconciling economic prosperity with ecological resilience. **A systemic approach,** grounded in place-based innovation and informed by interdependencies across food, energy, water, and biodiversity systems, is essential to realise the full potential of the bioeconomy.

However, its implementation is constrained by fragmented governance, **regulatory complexity**, **market failures**, **and underdeveloped innovation ecosystems**. Additional major obstacles include a lack of cost competitiveness with fossil-based sectors, their lobbying power as well as traditional behavioural reflexes of consumers (sticking to what they 'know'), inconsistent legislation and implementation across the EU, insufficient infrastructure, and a lack of digital traceability and transparency in supply chains.

Soil health is a foundational principle and requirement for a circular and regenerative bioeconomy. Unless healthy soils are ensured, nothing will grow – this simple fact makes it central to any bioeconomy strategy (see EU Soils

[1] Ireland's Bioeconomy Action Plan 2023-2025
[2] MATERIAL-ECONOMICS-EU-BIOMASS-USE-IN-A-NET-ZERO-ECONOMY-ONLINE-VERSION.pdf

Mission, the findings of EJP Soil and Climate KIC's work on soil health)[3]. **Urban-rural linkages** are equally critical: when designed well, they create mutually reinforcing cycles of value and innovation, but if neglected, they can lead to resource inefficiencies and contradictions[4]. **Cross-border cooperation** is similarly essential for managing shared ecosystems and accelerating innovation, especially in areas such as nutrient cycling, peatland conservation, and distributed value chains.

Innovation ecosystems, particularly those connecting municipalities, SMEs, researchers, farmers, and communities, are proving vital to bioeconomy transitions. Yet they remain under-supported in current policy frameworks. A lack of **skills development pathways** and limited support for rural workforce transitions also constrains inclusive participation and value creation.

This paper draws on Climate KIC's experience, the latest EU and national policy frameworks, and practical case studies to inform the European Commission's consultation on the future of bioeconomy policy.

Crucial issues for this consultation include:

- **Design principles** for a successful set of policies include coherence, resilience and interconnectedness.

  Transforming towards a bioeconomy will require starting with a **resilience strategy,** which means including 'robustness' with buffer mechanisms, diversity, flexibility agility, rethinking cooperation and competition, instead of (as we have done in the current economic system) building mostly from an 'efficiency' principle[5].

  A bioeconomy is **not necessarily a global economy, but an economy with many connected local production units**. It thrives on place-based systems where biomass production, processing, and consumption are optimized for local ecological and socioeconomic contexts. This avoids the inefficiencies of globalized linear supply chains (e.g. long-distance biomass transport, centralized processing), leading to regional self-sufficiency, reduced vulnerabilities, value retention[6]. Furthermore, it is important to **distinguish Global Connectivity from Global Uniformity.** While local systems dominate, they are interconnected to share knowledge, technology, and market access. This avoids the pitfalls of a homogenized global bioeconomy (e.g., monocultures, biodiversity loss, loss of cultural and historical memory and diversity)[7].

- To achieve this, there is a need for **coherent public policies at all levels** (from local to national) that facilitate the creation of a market for bioeconomy products and thus increase their competitiveness. One example would be **a robust cascading mechanism for biomass use -** needed to ensure resource efficiency and avoid ecological harm.

[3] EU Mission: A Soil Deal for Europe; https://ejpsoil.eu/
[4] unhabitat.org/sites/default/files/2020/03/url-gp-1.pdf
[5] Building a common vision for sustainable food and agriculture
[6] Economic benefits circulate within communities, supporting rural livelihoods.
[7] Reconnecting forest-to-wood value chains: A framework for action | Climate KIC

- **Soil health** is crucial: a foundation for a successful bio-based bioeconomy is that there is adequate soil health to ensure productivity of natural capital and to provide necessary ecosystem services (such as food, feed, fibre, timbre, nutrient cycling, carbon sequestration, pest control or water regulation). As it stands, 61% of EU soils are currently in an unhealthy state[8]. The degradation of soil health is a major risk; its restoration is both an underlying principle and an objective, and links directly to the EU Soils Mission and the success of this strategy.

- **Urban and rural realities** must be linked in a synergetic way; otherwise, contradictions and inefficiencies can arise. Well-designed linkages support innovation, value creation, and resilience in both settings.

- Finally, this transition must be **people-centred, digitally enabled, and innovation-driven**. Circular bioeconomy strategies will only succeed if they are embedded in thriving innovation ecosystems that bring together farmers, SMEs, municipalities, researchers, and civil society. Digital traceability and data integration are essential to ensure transparency, monitor impact, and scale circular solutions across regions. Equally, workforce development and inclusion are central. The just transition must empower people with reskilling and upskilling opportunities, foster quality job creation in both rural and urban areas, and guarantee that the benefits of the bioeconomy are shared equitably, leaving no one behind. Recognising the **role of carbon removals, valorisation of secondary materials, and regenerative land management** will be essential for both credibility and competitiveness. These systemic dimensions must be embedded from the outset to make the circular bioeconomy a cornerstone of the EU's Green Deal and Just Transition objectives.

Climate KIC's 10 Recommendations:

1. Adopt a Systemic Bioeconomy Framework within Planetary Boundaries

2. Embed Place-Based Innovation and Urban-Rural Integration

3. Implement Cascading and Regenerative Biomass Use with Soil-Centric Approaches

4. Enable Multilevel Governance and Build Institutional Capacity

5. Develop Innovation Ecosystems for Circular Bioeconomy Transitions

6. Accelerate Valorisation Pathways and Carbon Credit Integration

7. Position Soil Health as a Foundation for the Circular Bioeconomy

8. Integrate Water Quality and Nature-based Solutions into Bioeconomy Strategies

9. Build Digital Traceability and Data-Driven Circularity

10. Invest in Workforce Skills, Transition Capacity, and Social Equity

[8] According to the EUSO Soil Degradation Dashboard based on the evidence currently available

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1. Adopt a Systemic Bioeconomy Framework within Planetary Boundaries

A sustainable, circular bioeconomy depends on systemic thinking and coherent governance across interconnected sectors such as agriculture, forestry, climate policy and industrial innovation. Understanding the interdependencies and trade-offs among food, energy, water, carbon, and biodiversity is crucial to prevent fragmented decision-making and ensure the overall success of the bioeconomy. Adopting a systems perspective means recognizing the bioeconomy as a complex web of relationships, where actions in one domain (e.g. increased bioenergy demand or biomass use) can significantly affect food security, land use, and ecosystem services[9]. When policies are disjointed and definitions of biomass, waste, and carbon remain compartmentalized, both efficiency and climate objectives are at risk. Integrated approaches are especially vital in this context, as working in silos limits the potential of sectors such as forestry and wood value chains to deliver climate, biodiversity, and economic benefits[10].

Furthermore, transforming towards 'a bioeconomy' will require starting with a resilience strategy, which means including 'robustness' with buffer mechanisms, diversity, flexibility agility, rethinking cooperation and competition, instead of (as we have done in the current economic system) building mostly from an 'efficiency' principle. Efficiency aims at reduced complexity and redundance of the value chains, simplified "just in time" inventory logic, avoiding buffers. While this approach maximizes short-term profit, it can make systems brittle and vulnerable to shocks (e.g. pandemics, geopolitical disruptions, climate events). Bioeconomy, by contrast, is highly dependent on natural cycles, local resource variability, and ecosystem services, making 'resilience' essential for its stability and long-term sustainability.

The EU's transition to a climate neutral, competitive and resilient economy demands alignment between ecological boundaries, socio-economic objectives, and long-term carbon cycles.

In practice, the 3S framework: Sink, Storage, Substitution, developed through the Climate Smart Forest Economy Program[11], exemplifies this systemic lens. It aligns forest management, wood product use, and material substitution to deliver climate and material circularity benefits:

- **Sink**: Forests sequester carbon through sustainable management and harvest.
- **Storage**: Harvested carbon remains locked in long-lived wood products.
- **Substitution**: Wood-based products displace more carbon-intensive materials or fuels.

This framework was successfully applied in the Glasgow City Region Breakthrough Initiative, demonstrating how systemic planning can simultaneously increasing forest carbon stocks, support low-carbon construction, and generate local employment.

The Irish Bioeconomy Action Plan 2023-2025[12] also demonstrates systemic design. It integrates cascading use of biomass, place-based innovation, soil health, and cross-sectoral alignment across EU and national

[9] Systems Transformation Hub
[10] Reconnecting forest-to-wood value chains: A framework for action | Climate KIC
[11] Reconnecting forest-to-wood value chains: A framework for action | Climate KIC
[12] assets.gov.ie/static/documents/bioeconomy-action-plan-2023-2025.pdf

strategies. With multi-level implementation structures – including a High-Level Implementation Group, a Bioeconomy Observatory, **and cross-border collaboration mechanisms – the plan exemplifies horizontal and vertical policy integration.**

Climate KIC's engagement in Poland through the BIOEASTsUP[13]/BIOECO-UP[14] projects further underscores the importance of **national bioeconomy roadmaps.** These act as strategic tools for aligning policy across sectors and governance levels. A lack of an integrated bioeconomy strategy illustrates the need for EU support to co-develop **tailored national roadmaps**, leveraging instruments like Horizon Europe, CAP, and Cohesion Funds to ensure alignment both with the EU Green Deal, the Clean Industrial Deal, upcoming Circularity strategies, revision of CAP etc.

Regulatory innovation is also essential. The ReNURE framework (REcovered Nitrogen from ManURE) shows how circularity can be aligned with ecological thresholds. ReNURE products[15], derived from livestock waste (slurry), demonstrate **how agricultural and environmental priorities can be reconciled:** ReNURE can substitute synthetic fertilisers and lower nutrient run-off risks. The European Biogas Association advocates recognising ReNURE as a viable substitute above current Nitrates Directive limits, enabling nutrient recycling while maintaining water quality - demonstrating how **systemic policy adjustments can unlock rural value and environmental benefits**[16].

Lastly, future bioeconomy strategies must prioritise **regenerative forestry**[17]. This means supporting biodiversity, soil health, and durable wood products rather than focusing solely on short-term carbon gains. Regenerative principles (e.g. continuous cover, mixed-species stands) need to be captured in the upcoming Bioeconomy strategy (consistently with the EU Forest Strategy), with incentives for carbon storage in durable timber products.

2. Embed Place-Based Innovation and Rural-Urban Integration

A circular and regenerative bioeconomy must be **grounded in place-based innovation, i.e. solutions tailored to local ecological, socio-economic, and institutional contexts.** Leveraging regional strengths, existing knowledge systems, and biomass flows enables more effective and equitable circularity outcomes[18]. This is particularly important for decentralised manufacturing, waste reuse, and local value creation.

Climate KIC's work[19,20,21] **demonstrates how innovation rooted in a given place can then scale** through networks of experimentation and collaboration. Rather than treating rural areas solely as biomass suppliers, circular

[13] BIOEAST – BIOEAST
[14] Building a Sustainable Future: The BIOECO-UP Project Reaches a New Milestone - Interreg Central Europe
[15] European Biogas Association, RENURE Policy Brief https://www.europeanbiogas.eu/renure-derogation-without-action-the-eu-risks-missing-out-on-a-sustainable-fertilisation-solution/
[16] Transforming Ireland's land and agri-food system | Climate KIC
[17] Reconnecting forest-to-wood value chains: A framework for action | Climate KIC
[18] Hubs 4 Circularity are helping Europe shift to circular industrial-urban ecosystems
[19] Slovenia adopts Circular, Regenerative Economies Deep Demonstration
[20] Transforming Ireland's land and agri-food system | Climate KIC
[21] FoodCoP | European Project with Startup Villages

bioeconomy models can and must enable them to capture the value, create jobs, and shape transition pathways. These projects also demonstrate how urban-rural corridors, cross-border rural cooperation and multi-actor, multi-place collaboration can be built and benefits they bring.

Agrolinera, a Climate KIC-supported Climate SAFE[22] startup, exemplifies this approach by working with dairy farmers in Asturias and Ireland. It leverages IoT and blockchain to digitise and optimise dairy waste logistics, converting manure into biogas and fertiliser while generating verified carbon credits. This model enhances biogas production viability, supports the reduction of methane emissions, and reinvests benefits into rural economies - linking innovation directly to just transition goals[23].

In Malmö, an industrial-urban symbiosis project valorises food waste and sewage sludge into biogas for heating and biochar for soil fertility and insultation materials. By closing nutrient and energy loops between urban households and surrounding regions, the project supports municipal decarbonisation and energy resilience, illustrating the importance of cross-boundary circularity[24].

The FoodCoP initiative explores new models for citizen participation in food systems, demonstrating local governance, civic entrepreneurship, and bioregional resilience. Drawing from Climate KIC's work in Startup Villages, the project shows that decentralised governance and collaborative infrastructures are needed to unlock systemic value from local bioresources.

To fully deliver on the promise of a place-based bioeconomy, EU instruments – particularly the Common Agricultural Policy, Cohesion Policy, and Horizon Europe – need to be leveraged beyond considering and funding of isolated objectives and projects towards more holistic programmes. They must actively **foster connected, local bioeconomies**, that are tailored to territorial strengths and needs, accessible to rural and urban actors, SMEs, and local authorities, and reward innovation to reinforcereinforcing the competitiveness and sustainability of the agricultural sector. Support is needed for:

- **Networks of localized innovation ecosystems** - such as rural biorefineries, regional demonstration hubs, and startup accelerators, so that bioeconomy solutions are adapted to local contexts and can be scaled across regions,
- **Cross-sectoral value chains** - incentivising collaboration between agriculture, forestry, food, waste, energy, and industry, breaking down silos and enabling new value chains that integrate circularity and cascading use of biomass
- **Digitalisation and traceability** (e.g., blockchain, IoT) to connect local production units, enable carbon credit generation, and reinforce market access for sustainable bio-based products

[22] Agrolinera (2025). *Climate SAFE Startup Profile*. Climate-KIC / Net Zero Insights Dashboard. Climate KIC Ecosystem Dashboard - Market report | Net Zero Insights
[23] Inicio - Agrolinera
[24] Malmö Industrial-Urban Symbiosis Case Study https://www.climate-kic.org/news/circular-cities-how-malmo-is-transforming-waste-into-a-resource

- **Encourage knowledge transfer and skills development** through place-based training, advisory services, and peer-learning networks, ensuring that farmers, foresters, and rural entrepreneurs can participate in and benefit from the bioeconomy transition

3. Implement Cascading and Regenerative Biomass Use with Soil-Centric Approaches

A sustainable and competitive circular bioeconomy requires a shift in how biomass is valued, prioritised, and used**.** The **cascading use of biomass principle**[25,26] first applies biomass to the highest value uses such as food, feed, then materials and chemicals (like bioplastic or insulation) and only lastly energy, and must be embedded and operationalised across EU policy frameworks. This is because the **projected EU demand for biomass is set to considerably exceed what can be sustainably supplied within planetary boundaries**[27]. This makes it essential to prioritise biomass for applications where it delivers the greatest climate and economic value, specifically: high-value material uses such as construction materials, biochemicals, and textiles - before considering low-value energy recovery.

Crucially, any increase in biomass production must be carefully managed to **avoid undermining biodiversity and EU nature restoration targets.** Simultaneously, **regenerative approaches** must underpin biomass sourcing, ensuring that soil health, biodiversity, and water cycles are not degraded but actively improved.

Climate KIC's 'The *Material Economics'* report[28] underscores that misaligned incentives still direct high-quality biomass to low-value uses like incineration, undermining both climate neutrality and resource efficiency goals. Cascading use should be enforced to maximise greenhouse gas reductions per use of biomass[29].

The Irish **Bioeconomy Action Plan 2023–2025** offers a leading example, applying a food-first approach and promoting the valorisation of agricultural residues through initiatives like Biorefinery Glas. Under the *Biorefinery Glas* initiative, fresh grass is processed into animal feed, protein concentrates, and nutrient-rich juice for fertilizer or bioenergy, maximizing value (economic and environmental) from each biomass input[30].

Cross-border thinking and instruments can yield benefits - e.g. peatland ecosystems and river basins shared across borders (e.g., Ireland-UK, Danube basin) require harmonised biomass extraction, conservation practices, and nutrient cycling strategies, while **valorisation of invasive species** (e.g. Japanese knotweed) could benefit from a cross-border approach to avoid spreading while enabling biorefinery development.

Soil health is foundational to these transitions. Bioeconomy policies must reinforce practices that maintain and build soil organic matter, including limiting harmful agricultural practices (intensive tillage, monocultures, overuse of

[25] MATERIAL-ECONOMICS-EU-BIOMASS-USE-IN-A-NET-ZERO-ECONOMY-ONLINE-VERSION.pdf
[26] bioeconomy-action-plan-2023-2025.pdf
[27] MATERIAL-ECONOMICS-EU-BIOMASS-USE-IN-A-NET-ZERO-ECONOMY-ONLINE-VERSION.pdf
[28] MATERIAL-ECONOMICS-EU-BIOMASS-USE-IN-A-NET-ZERO-ECONOMY-ONLINE-VERSION.pdf
[29] MATERIAL-ECONOMICS-EU-BIOMASS-USE-IN-A-NET-ZERO-ECONOMY-ONLINE-VERSION.pdf
[30] https://biorefineryglas.eu/

chemical inputs, overgrazing, among others), or applying innovations such as the use of biochar and digestate as soil amendments. Both can enhance soil fertility, water retention, and carbon sequestration, supporting the objectives of the EU Soil Mission. Digestate from anaerobic digestion, already used in regions like Ireland and the Netherlands, can replace synthetic fertilisers and improve nutrient cycling, reducing emissions and creating rural jobs[31].

Furthermore, **ReNURE** (REcovered Nitrogen from ManURE) technologies demonstrate how **processed livestock manure can serve as a synthetic fertiliser substitute** without increasing nitrate leaching. The European Biogas Association has advocated for derogations under the Nitrate Directive to enable the use of ReNURE above the 170 kg/ha nitrogen limit where safe, recognising its role in closing nutrient loops while improving water quality.

Biochar production through pyrolysis is another example. It creates a stable carbon sink, improves soil quality, and can be produced from a wide variety of feedstocks, including agricultural residues, animal waste, and municipal solid waste. Biochar can also be used as a filtration medium for water treatment, as a construction material, and as a means to immobilize pollutants.

Yet, **one of the key barriers to scaling these solutions is the regulatory classification of organic materials.** Many valuable secondary feedstocks – digestate, sludges, and forestry residues – are still classified as "waste" under EU law, subjecting them to restrictive rules that inhibit circular innovation. In some cases, such flows may fall under "grey areas" of policy hindering circularity and innovation. To align with cascading principles and the Waste Framework Directive's broader sustainability objectives, **clearer and more consistent EU guidance** is needed on the **reclassification of treated organic materials as secondary raw materials** rather than waste[32] [33].

Moreover, as more sectors adopt bio-based pathways, **competition for biomass will intensify**[34]. **Governance tools such as carbon-adjusted cascading priorities, value chain coordination platforms, and regional biomass flow mapping will be needed** to manage demand sustainably. For instance, within the TIMBERHAUS project[35] where Climate KIC works, it is being leveraged as an experimentation ground for analysis of value chains where the use of biomass that is turned into construction products can flourish.

In summary, advancing a cascading, regenerative, and soil-centric bioeconomy will require:

- **Redefining waste classifications, end-of-waste criteria, permitted processing activities and use of secondary biomass flows** to enable innovation and safe circular use;
- Providing **incentives for high-value biomass uses** and discouraging premature, low-value combustion;
- Supporting regional innovation hubs and bio-refineries that **valorise side-streams;**

[31] EIT-Climate-KIC-Ireland-Deep-Demonstration-Workshop-3.pdf
[32] https://www.europeanbiogas.eu/renure-derogation-without-action-the-eu-risks-missing-out-on-a-sustainable-fertilisation-solution/
[33] bioeconomy-action-plan-2023-2025.pdf
[34] Reconnecting forest-to-wood value chains: A framework for action | Climate KIC
[35] Homepage - TIMBERHAUS

- Integrating **soil health metrics** (aligned with the Soil Health Monitoring Law) and the adherence of soil health best practices into bioeconomy policy design.

4. Multilevel Governance and Institutional Capacity

The transition to a circular and regenerative bioeconomy hinges on the effective coordination of actors and policies across all governance levels – EU, national, regional, and local. Today, fragmented responsibilities for land use, waste, innovation, water quality, agriculture, and industrial policy across different ministries, agencies, and territorial scales often result in inconsistent definitions, competing incentives, and missed opportunities for systemic alignment.

Climate KIC's experience across regional programmes shows that while many local climate action plans exist, circular bioeconomy considerations are often peripheral or entirely absent. Few municipalities have the mandate, resources, or expertise to integrate circularity and bioeconomy into planning and procurement. This gap represents both a risk of sub-optimal, uncoordinated solutions - and an opportunity for institutional innovation.

A leading example is the Irish Bioeconomy Action Plan 2023–2025, which institutionalises governance through a **High-Level Bioeconomy Implementation Group**, supported by a **National Bioeconomy Forum** and a **Bioeconomy Observatory**. This structure enables horizontal coordination across ministries and vertical dialogue between national, regional, and local stakeholders. The plan also recognises the need for **cross-border cooperation**, particularly with Northern Ireland, in managing shared landscapes and resource flows or the development of "circular corridors" connecting urban biowaste hubs with rural biorefineries.

Multilevel governance is not just about coordination but also about **capacity-building**. Through the Climate KIC Academy, creating an umbrella for multiple partners to come together within the SOILL project of the Soils Mission, Climate KIC works with the local and regional stakeholders needs regarding: technical knowledge about circular and regenerative practices; data and tools for evaluating biomass flows and soil health; legal clarity about roles and responsibilities under EU directives; resources for infrastructure, monitoring, and stakeholder engagement[36, 37].

Insights from Poland's BIOEASTsUP/BIOECO-UP projects demonstrate the need for **formal cross-ministerial coordination mechanisms**. The lack of coordination between agriculture, environment, innovation, and industry ministries is a key barrier to bioeconomy implementation. The EU should promote **model, interministerial task forces**, backed by governance toolkits and technical support to Member States. Insights from Slovenia's BIOEAST initiative also supports these findings, while at the same time recognizing the distance and lack of coordination and alignment between public governance levels and bottom-up actors hindering the implementation of circular bioeconomy systemic solutions in the BIOEAST region.

Equally important is addressing **power asymmetries** – between urban and rural regions, large corporations and smallholders, and national and local priorities. Bioeconomy governance models must be designed to enable inclusive

[36] Climate KIC Academy | Climate KIC
[37] About Us | Soill

participation and equitable value sharing. Climate KIC's *Reconnecting Forest to Wood Value Chains* report advocates for a **systems innovation governance model** that links actors across scales around shared objectives such as climate mitigation, biodiversity restoration, just transition and inclusive value creation[4].

The evolution of the **Irish grass biorefinery project** illustrates the value of structured, sequenced governance. Originally focused on livestock feed production, it has evolved to explore bioplastic production and nutrient recovery – engaging agricultural researchers, policy-makers, and local farmers. This kind of **chronological and systemic use of biomass**, grounded in research, collaboration and community engagement, exemplifies the benefits of structured governance and sequencing of use cases to maximise value and reduce trade-offs[38].

To activate multilevel governance as an enabler of the circular bioeconomy, the EU should:

- Provide clear guidance on bioeconomy governance roles and responsibilities at all levels;
- Invest in municipal and regional capacity-building and technical assistance;
- Strengthen inter-regional and cross-border cooperation through existing EU instruments such as Interreg;
- Integrate circular bioeconomy objectives into territorial strategies, Just Transition plans, and CAP programming.

In bioeconomy, a critical problem is the creation of silos between agri-natural systems where production occurs, the transformation activities where commodities are produced (without enough circular processes) and the consumption/utilisation activities. It is essential that the various actors involved keep a holistic view despite the fact that our societies have developed siloed institutions (for instance forests are managed by environment ministries while wood is managed by agricultural ministries). The development of bioeconomy requires changes in the approach in agriculture, forestry, production and consumption, as well as systemic continuous coordination of activities between these areas at the level of planning, implementation and evaluation - therefore, in the opinion of Climate KIC, it is extremely important to take care of capacity building processes containing issues of systemic approach, systemic management and multilevel governance. It is necessary to develop, test and implement such institutional processes that will allow for such multidimensional and broad actions.

5. Develop Innovation Ecosystems for Circular Bioeconomy Transitions

The transition to a circular bioeconomy is not only a technical or policy challenge, it is fundamentally **an innovation ecosystem challenge**. Most innovation policies remain focused on technological R&D and startups, without addressing the broader systemic conditions needed for circularity, biomass valorisation, and cascading use of biomass. Systemic innovation and ecosystems require enabling environments that support experimentation, learning, cross-sectoral collaboration, networks that allow new solutions to emerge, scale, and become inclusive[39].

[38] https://biorefineryglas.eu
[39] How-strong-innovation-ecosystems-can-help-create-an-inclusive-circular-economy_Key-Insight-report_Climate-KIC.pdf

Circular bioeconomy innovation spans technologies, business models, governance processes, and social practices. Successful circular innovation ecosystems foster **strong collaboration between public, private, and civil society actors, provide access to finance and skills for startups and SMEs, encourage knowledge sharing and peer learning, and enable regulatory experimentation and "safe spaces" for piloting new business models.**

Climate KIC's work in the food portfolio of the **Slovenian Deep Demonstration** included extensive mapping and engagement of stakeholders across the different stages of the value chain, identifying needs, common challenges but also opportunities. The multistakeholder nature for the work allowed for the development of concrete and context-specific innovation portfolios for the Ministry of Agriculture, Food and Forestry.

Climate KIC's work in **Hubs4Circularity**[40]**,** Deep Demonstrations, and Startup Villages demonstrates the importance of **regionally embedded, cross-sectoral ecosystems**. These ecosystems connect municipalities, industries, farmers, researchers, and citizens to co-design circular solutions and test them in real-world contexts. The Hubs4Circularity Community of Practice supports place-based innovation in cities like Roubaix (France) and Päijät-Häme (Finland), **integrating circular industries with regional planning. Industrial-urban symbiosis emerges** by linking local biogenic waste streams (e.g. food residues, forestry side products) to processing and reuse pathways such as composting, biochar production, or biomaterials.

Hubs also allow for tackling the often-forgotten symbiosis link between rural and urban contexts, bringing together relevant actors. These types of ecosystems also support tackling of critical mass issues of biomass flows in certain regions as highlighted by the Slovenian Deep Demonstration food portfolio.

Crucially, the emergence of the circular bioeconomy requires the **creation of new relationships and market linkages across the value chain.** Farmers, for example, are no longer simply food producers - they are also biomass suppliers to new markets such as biogas, bioplastics, or bio-based construction materials. This shift means that farmers must engage with new partners and intermediaries, negotiate new types of contracts, and navigate more complex supply chains[41]. This diversification opens **new revenue streams but also requires new forms of cooperation, logistics, and market intelligence.**

The value of innovation ecosystems lies not only in developing new products or processes, but in building **the relational and institutional infrastructure** needed for scaling up. Climate KIC's report on innovation ecosystems in Bengaluru and Nairobi, although outside of the EU, demonstrates that impactful circularity emerges when actors share risk, access blended finance, and participate in adaptative governance processes[42]. These insights are highly relevant for and transferable to EU regions undergoing industrial transition.

Within the Climate KIC entrepreneurial ecosystem we have over 500 start-ups linked with bioeconomy[43], the majority of which illustrate how bioeconomy innovation is enabled by systems thinking. Point2hectar, a Climate SAFE startup, exemplifies this. Point2Hectare focuses on developing biochar-based solutions to enhance soil health and support

[40] How Climate KIC is working with cities and regions to scale up circular and competitive European industries | Climate KIC
[41] For instance, when a farmer grows corn for bioplastics, the harvest may be split: one stream goes to bioplastic production, another to animal feed, and the straw to yet another market such as bioenergy or construction
[42] Report: How strong innovation ecosystems can create inclusive circular economies | Climate KIC
[43] Climate KIC Ecosystem Dashboard - Market report | Net Zero Insights

sustainable agriculture, ultimately enhancing soil fertility, increasing crop yields, improving water retention, and boosting fertilizer efficiency reducing CO2 emissions and sequestering carbon. Their technology addresses the global soil health crisis by supporting regenerative agriculture and promoting climate-resilient farming. Through biochar application, the company aims to restore degraded soils, enhance agricultural productivity, and contribute to a more sustainable, eco-friendly food system. Another example among many is SpaceCrop from Hungary, an agricultural software company that specializes in helping farms manage irrigation and monitor crop health using satellite data and artificial intelligence. Their AI-driven decision support tool offers features such as tracking water usage, providing weather forecast information, and predictive analytics on soil moisture stress and crop insights. By optimizing irrigation practices based on climate data and satellite imagery, SpaceCrop aims to reduce water utility costs and improve crop yields, making agriculture smarter and more sustainable.

Such models succeed only within **supportive ecosystems** that include digital infrastructure, regulatory flexibility, and local knowledge networks. However, current barriers to circular bioeconomy innovation persist: lack of long-term funding for place-based experimentation; regulatory silos that prevent circular models from being trialled (e.g. the already mentioned waste regulations blocking reuse); weak collaboration between universities, municipalities, and SMEs; insufficient attention to inclusion, skills, and just transition dimensions.

To help overcome these barriers, Climate KIC promotes the creation of Bioeconomy Transition Zones (BTZs). BTZs bring together public, private, civic, and research actors to co-create regenerative, circular, and just bioeconomy value systems tailored to the unique characteristics of local ecosystems and communities. Rather than applying a one-size-fits-all approach or relying on isolated pilots, BTZs are grounded in the realities of local landscapes, biomass flows, and socio-economic conditions. They serve as testbeds for experimentation, measuring and managing a broad range of outcomes - from economic and carbon impacts to soil health, biodiversity, employment, equity, and cultural value. By convening anchor institutions, SMEs, cooperatives, industry, and funders, BTZs enable the development of innovative governance, ownership, and revenue-sharing models, while also supporting the early investment in shared infrastructure that is essential for a successful and inclusive bioeconomy transition.

Poland's National Bioeconomy Hub, structured through a “five-helix” model (science, policy, business, civil society, and education), serves as a strong place-based platform facilitating **cross-sectoral collaboration**. This model underscores the need for **regional hubs** that are deeply embedded in local socio-ecological contexts and can act as catalysts for innovation, knowledge transfer, and community participation

Slovenia’s Bioeconomy Hub is a multistakeholder platform where at its core is coordinated by NGOs, the National Chamber of Commerce, the Ministry of Agriculture, Forestry and Food, and leading businesses in the sector. Similarly to the Polish hub, it has a deeply embedded decision-making process and network connecting to the levers of the local ecosystem’s context with the aim of supporting policy, knowledge transfer, innovation, and circular biobased solutions.

To build resilient innovation ecosystems for the circular bioeconomy, Climate KIC proposes four enabling mechanisms:

1. **Regional Circular Bioeconomy Innovation Hubs** to serve as transition zones, funded through Horizon Europe and Cohesion Policy, with mandates to build shared infrastructures, cross-sector alliances and cross-border platforms;
2. **Regulatory sandboxes**, allowing legal flexibility for time-bound, circular bioeconomy pilots;
3. **Learning communities and peer exchange** between regions, municipalities, and ecosystem actors (as seen in the Systems Innovation Learning Partnership – SILP);
4. **Just transition and inclusion metrics and safeguards**, ensuring that ecosystem benefits are accessible to rural SMEs, women, and youth - not just large incumbents.

6. Accelerate Valorisation Pathways and Carbon Credit Integration

To realise the full potential of the circular bioeconomy, EU policy and market mechanisms must shift from linear "waste-to-energy" models (e.g. biomass conversion), towards **valorisation pathways grounded in the cascading use of biomass** that generate multiple streams of environmental, economic and climate value. This includes **carbon sequestration, nutrient recovery, and materials reuse,** with a critical need to align bioeconomy development with **emerging carbon market frameworks** in scientifically robust and inclusive ways.

Biochar is a clear example of a material with substantial climate mitigation potential and a broad application base. Produced through pyrolysis of organic residues such as agricultural waste, food waste, or invasive plant species, biochar can sequester 2.5 to 3 tonnes of CO_2 per tonne of product (when properly stabilised). It also improves soil fertility, retains water and nutrients, and filters pollutants, making it applicable not only in agriculture but also in constructed wetlands, insulation panels, and road construction[44]. However, current EU regulations restrict its use depending on feedstock origin, limiting application for materials derived from urban or construction waste, despite their valorisation potential.

Projects such as **Biorefinery Glas** in Ireland demonstrate practical models of integrating biomass valorisation with soil-focused benefits. Grass biomass is fractionated to produce protein feed and nutrient-rich liquid, which can be used as a bio-fertiliser, closing the nutrient loop at the local level. This aligns well with Ireland's Bioeconomy Action Plan, which explicitly includes **soil protection, nutrient recycling, and regenerative land use** as strategic pillars.

Carbon markets, both voluntary and compliance-based, offer a major opportunity for the bioeconomy by recognising **bio-based negative emissions**. Start-ups such as Point2Hectare are already responding to this market opportunity by specialising in biochar-based products that improve soil health and nourish crops. They offer a way not only to grow the bioeconomy but to make significant inroads on the carbon removal backlog. Climate KIC also supports a network and the running of event under the CREDIBLE initiative, driving high-level conversations to shape carbon farming markets and policies.

[44] Circular cities: how Malmö is transforming waste into a resource | Climate KIC

This not only improves farm-level sustainability but opens new income streams for rural producers – provided that EU and Member State carbon accounting systems recognise such credits transparently.

Other emerging waste stream valorisation opportunities include the use of **urban wastewater** sludge, **invasive species**, and **industrial side-streams** (e.g. wood panels with adhesives). **Malmö's food waste-to-biogas system,** for example, diverts organic residues into district heating and fertiliser production. Similarly, the **Hubs4Circularity initiative** explores safe valorisation of sludges and side-streams into materials and soil amendments, shifting them away from incineration and landfill[45].

Despite these advances, several barriers to scaling these models remain: lack of harmonised EU standards for **secondary resource quality** (e.g. for digestate, biochar); insufficient cross-fertilisation between bioeconomy and **carbon credit and emissions trading systems**; regulatory ambiguity on **permissible feedstocks** and cross-sector uses; low awareness and capacity among **municipalities and SMEs** on how to implement valorisation projects.

To address these challenges, the EU should:

- **Define high-quality criteria for bio-based carbon removals**, linked to MRV (Monitoring, Reporting, Verification) standards;
- **Amend the Waste Framework Directive** to explicitly include valorisation goals and promote reuse over energy recovery;
- **Provide guidance** to municipalities on valorisation potential in urban-rural loops (e.g. linking biowaste and bio-byproducts to regional biorefineries).
- Establish an EU Bioeconomy Project Development Facility to address the critical funding gap in early project-development work. The Facility would provide milestone-based grants (€0.5-5m) and advisory support to systematically transform technically proven biochar, biorefinery and other valorisation concepts into bankable projects that can attract private capital and bridge implementation gap.

7. Position Soil Health as a Foundation for the Circular Bioeconomy

Soil is a living system central to food security, carbon sequestration, water regulation, biodiversity, and the success of the circular bioeconomy. Yet, soil health is often treated as a secondary concern – external to industrial or even bio-based strategies. A resilient, truly circular bioeconomy strategy must recognise **soil health as a foundational principle**, embedding it into all stages of policy, investment, and innovation design.

The **EU Soil Mission** has established clear soil health objectives and targets for soil restoration, carbon storage, and erosion prevention. Climate KIC's systems work, particularly through Deep Demonstrations[46] and through regenerative agriculture pilots supported in EU Initiatives such as Climate Neutral Farms offer New organisational,

[45] How Climate KIC is working with cities and regions to scale up circular and competitive European industries | Climate KIC
[46] Place-based transformations | Climate KIC

technical and financial solutions in agriculture can significantly contribute to reducing greenhouse gas emissions[47], reinforces this by **linking soil degradation to circularity failures in agriculture, waste reuse, and industrial land use**[48].

The EU Soils Mission and Climate KIC's work stress that bioeconomy strategies must explicitly address soil health, for example through the use of digestate[49,] biochar [50,] and regenerative agricultural practices that build soil organic matter, enhance nutrient cycling, and improve water retention.

Yet, EU regulation[51] and national implementation vary significantly, with digestate often misclassified, subject to inconsistent quality criteria or ending up in a grey area of legal utilisation.

Climate-KIC's engagement with EU funded soil projects such as **SoilTribes** and **SOILL** as well as through their **SILP (Systems Innovation Learning Partnership)** also identifies a clear need to build **soil literacy** into public procurement, land use planning and management, and climate action plans. Very few municipalities include soil as a core metric or monitor soil health impacts from biomass or waste reuse projects.

To embed soil health as a foundation of the EU's circular bioeconomy, the following policy levers are needed:

- **Align all bioeconomy policies** with the objectives of the Soil Mission;
- **Harmonise EU standards** for bio-based soil amendments, especially biochar and digestate;
- **Support regional soil health observatories** to track improvements linked to circular practices;
- **Prioritise soil outcomes** in CAP conditionality, LIFE projects, and Horizon Europe funding;
- **Embed soil quality metrics** in circular economy indicators and ESG reporting.
- **Implement robust land-use and biodiversity safeguards** to prioritise waste and residue streams over dedicated energy crops, preventing negative impacts of the bioeconomy on soil, water, and ecosystem health

8. Integrate Water Quality and Nature-based Solutions into Bioeconomy Strategies

Water quality is tightly interlinked with bioeconomy practices, particularly in agriculture, biomass reuse, and forestry. Improperly managed applications can lead to **nutrient leaching, eutrophication, and microbial contamination**, undermining environmental integrity and public trust. Circular bioeconomy strategies must therefore incorporate

[47] Climate Neutral Farms | ClieNFarms | Projekt | Fact Sheet | H2020 | CORDIS | European Commission
[48] Climate-KIC (2023). *Soil Health and Systemic Regeneration: Insights from Deep Demonstrations*.
[49] Digestate from anaerobic digestion of agricultural and food residues presents an immediate opportunity to improve soil health.
[50] Biochar offers proven benefits in improving soil structure, nutrient availability, and pH balance, particularly in degraded soils. When integrated with compost or digestate, biochar can act as a long-term carbon sink while supporting regenerative practices. This makes it a uniquely circular solution that spans waste management, agriculture, and climate mitigation. European Biochar Industry Consortium (2023). *Applications and Soil Benefits of Biochar*.
[51] Regulation (EU) 2019/1009 (Fertilising Products Regulation)

water protection as a central design principle. At the same time, **nature-based solutions (NbS)**, including wetlands, buffer strips, and filtration substrates like biochar, offer powerful tools for restoring hydrological cycles and closing nutrient loops, especially if their potential to build resilience is leveraged at all scales (particularly from hyperlocal to municipal, territorial and regional). Designing a bioeconomy strategy that protects and restores water cycles is essential for: ecological resilience, agricultural productivity, and human health.

Biochar also holds strong potential for water-related circularity[52]. In Ireland, Climate KIC-supported initiatives have trialled biochar-based filtration in constructed wetlands to treat agricultural runoff before it enters groundwater. These interventions are low-cost, regenerative, and can be deployed by farmers and municipalities alike.

The **Malmö industrial symbiosis mode**l further demonstrates how circular systems can contribute to water outcomes. By converting food waste into biogas and fertiliser via anaerobic digestion, the system diverts organics from landfill while preventing nutrient runoff into surrounding water bodies. This integration of urban waste into regional nutrient cycles offers a model for urban-rural collaboration.

Water quality also intersects with forestry. The Climate KIC report *Reconnecting Forest to Wood Value Chains* stresses the need for regenerative silviculture practices, such as continuous cover forestry and mixed-species planting, which reduce erosion, improve infiltration, and protect downstream aquatic systems. These forest-based approaches are nature-based by design and can complement agricultural NbS.

In the forestry sector, a clear issue is that too much of the extracted wood carbon returns to the atmosphere the year after harvest. Only 10 to 15% of it is stored in long term products. This can and needs to change. We should have a clear plan to reach 20, 25 or even more % of the carbon stored in long lived products – e.g. by expanding use of hardwoods in construction and design, Repurposing wood by-products into insulation or engineered panels, Reusing and remanufacturing wood at end-of-life etc. More details you can find in our report[53].

To mainstream water-related circularity, the EU should:

- **Explicitly link** ReNURE, digestate, and biochar use to the **Water Framework Directive and CAP eco-schemes;**
- **Update Nitrates Directive implementation** to reflect the actual risk profiles of processed organic fertilisers;
- **Fund municipality-scale and regional-scale NbS infrastructure** through LIFE and Cohesion Policy instruments;
- **Incorporate water quality indicators** into bioeconomy monitoring frameworks**.**

[52] Regulation (EU) 2019/1009 (Fertilising Products Regulation)
[53] Reconnecting forest-to-wood value chains: A framework for action | Climate KIC

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9. Build (EU Native) Digital Traceability and Data-Driven Circularity

As the circular bioeconomy increases in scale and complexity, **digital traceability** becomes essential. The ability to trace material flows, validate sustainability claims, and quantify environmental benefits is foundational to credibility in **carbon markets, compliance systems, and consumer trust.** A truly circular and regenerative bioeconomy relies not only on physical flows, but also on robust **data flows**, making processes visible, verifiable, and valuable, particularly across rural-urban and cross-border systems.

Yet, many bioeconomy value chains remain **fragmented and poorly digitised,** especially at the interface between rural producers, processors, and urban end-users. Climate KIC's work with innovation-led startups, systemic transition programmes and impact (emissions and circularity) measurement[54]reveals that this lack of data integration limits life-cycle impact assessments, hinders carbon credit issuance, and increases the risk of greenwashing.

A leading example of innovation in this space is **Agrolinera**, providing a **blockchain- and IoT-enabled platform** for dairy farms and biogas producers to track waste streams, optimise logistics, and generate verified carbon credits. By linking the physical flow of manure to digital verification systems, Agrolinera unlocks value (optimising data collection and valorisation) while ensuring transparency, regulatory compliance, and traceability across the supply chain and carbon credit generation.

Digital traceability also enables **performance-based incentives** for soil health, carbon sequestration, and nutrient recovery. Without such systems, public schemes such as the CAP eco-schemes or carbon farming payments may struggle to ensure accountability. Digital infrastructure is also crucial for **cross-sector collaboration,** for example, enabling cities to identify available organic residues that could feed nearby rural biorefineries.

Furthermore, data traceability and biomass intelligence are often hindered due to the use of different mechanisms of measuring biomass, thus limiting the **harmonisation** of bioeconomy and biomass indicators and therefore the comparability of cross-regional and cross-border data analysis and potential joint and strategic decision making.

In addition, Climate KIC's innovation ecosystem and regional work[54, 55] has shown that municipalities and SMEs often lack the capacity to design or operate digital monitoring systems. EU policy must therefore support not only the deployment of tools, but also capacity-building and governance models that ensure equitable data access and stewardship. Furthermore, in the current context and for the forseeable future, EU policy in this regard should privilege EU sovereignty in the collection, cleaning, curation and utilization of data linked to sustainable bioeconomy, given the critical importance of the bioeconomy for European economic and social stability, resilience and competitiveness.

Key barriers identified across our projects include: lack of interoperability between existing digital systems across agriculture, energy, and waste sectors; absence of EU-level **standards for data formats, privacy, and verification** in bioeconomy contexts; low digital readiness in rural areas and SMEs; limited integration of bioeconomy data into broader environmental and economic policy tools.

To overcome these barriers and fully leverage digital infrastructure for circularity, the EU should:

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[54] The Systems Innovation Learning Partnership | Climate KIC
[55] Europe 2030 missions | Climate KIC

- Mandate digital traceability and MRV systems as part of **EU Bioeconomy and Digital Strategies,** including across borders;
- Develop **open data protocols and standards** for bio-based material flows and sustainability metrics – to ensure they are accessible to all types and sizes of actors;
- Support digital readiness of municipalities and SMEs through **technical assistance and funding** (e.g. Digital Europe Programme);
- Embed traceability as a requirement for **carbon market participation, CAP payments, and eco-labels**.
- **Harmonise** biomass and bioeconomy indicators.

10. Invest in Skills, Workforce Development, and Social Equity

The shift to a circular and regenerative bioeconomy is a **societal transformation** – it is about people and places as it is about technologies, markets, and systems. For this transition to succeed at scale and depth, it must create decent jobs, equip people with new **skills and mindsets**, and ensure that **rural and post-industrial regions** become not only biomass providers, but **owners and beneficiaries** of innovation and value creation.

The **Irish Bioeconomy Action Plan 2023–2025** exemplifies this approach, with targeted actions to build capacity building among farmers, SMEs, and rural communities in areas such as anaerobic digestion, nutrient recovery, and biorefinery operations[1]. Its explicit link between workforce development and **Just Transition** reinforces the need for people-centred strategies.

Across Climate KIC's portfolio, including **SILP (Systems Innovation Learning Partnership)** and **Startup Villages**, workforce development consistently emerges as a key enabler of systemic change. Yet many municipalities and SMEs still lack the capabilities to navigate the technical, regulatory, and entrepreneurial dimensions of the circular bioeconomy, particularly in rural and post-industrial regions, where innovation infrastructure is less developed. Academy?

The **Safeguards Toolkit**[56] developed by Climate KIC provides guidance on embedding **social equity and inclusion** into innovation ecosystems. It highlights the importance of equitable benefit distribution, community engagement, and diversity in innovation ecosystems. Applying this lens to bioeconomy policy means recognising that skill needs are diverse: ranging from advanced digital capabilities (e.g., data monitoring, IoT-enabled logistics) to traditional land stewardship, and from biochemistry to social facilitation.

Bioeconomy skills strategies must also **value and integrate local knowledge. Farmers' understanding of soils, seasonal cycles, and regenerative land practices is vital and should be integrated into co-learning processes, rather than displaced by top-down technical training.** This aligns with Climate KIC's work through **SoilTribes,**

[56] Climate KIC - Visual toolbox for system innovation

SOILL and through the **Deep Demonstrations** and **transformative innovation**, which promote mutual learning between experts and communities.

Climate KIC's work in the Slovenian Deep Demonstration is working on the development of a circular bioeconomy centre in the Faculty of Biotechnology of the University of Ljubljana, aiming at breaking down silos regarding the teaching of the bioeconomy and increasing cross-cutting collaborative research.

Key areas for skill development include:

- **Literacy**: for example, the basic foundations and science that drives soil health and quality, raising awareness around soil threats and potential consequences, and ensuring sustainable long-term solutions to protect ecosystem services
- **Technical**: e.g. operation of biorefineries, pyrolysis units, digesters, and nutrient recovery systems;
- **Digital**: traceability, MRV (monitoring, reporting, verification), carbon accounting, blockchain-enabled platforms;
- **Entrepreneurial**: business model innovation, product valorisation, cooperative structures;
- **Governance**: participatory planning, policy literacy, and cross-sectoral coordination.
- **Systemic**: ability to design and implement complex, cross sectoral policies with a range of stakeholders.

To deliver these outcomes, the EU should:

- Launch a **Bioeconomy Skills Pact**, to fund regional **training centres and digital platforms** for circular bioeconomy skills;
- **Support targeted reskilling pathways** for agricultural workers, youth, and women in rural areas;
- **Promote peer-to-peer learning** across Member States;
- **Integrate skills development** into the **Soil Mission's vision** for 100+ Soil Health Living Labs and Lighthouses.

To enable a truly transformative shift in the bioeconomy, there is an urgent need to build **multilevel governance capabilities** across the European workforce. Addressing challenges like siloed decision-making, biomass scarcity, and unsustainable carbon cycles requires aligned action across local, regional, national, and EU levels. This involves equipping professionals—not just in policy, but also in research, industry, and civil society—with the skills to navigate institutional complexity, mediate across jurisdictions, and coordinate interventions that are both place-based and system-aware. *EIT Climate-KIC Academy*[57] plays a critical role in fostering these capabilities, empowering actors to work across governance scales, bridge fragmented mandates, and co-create policies and solutions that reflect the interconnected nature of environmental, social, and economic systems.

[57] Bridging the green skills gap with the Climate KIC Academy | Climate KIC

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About Climate KIC

Climate KIC, Europe's leading climate innovation agency and community, one of the first created EIT Knowledge Innovation Communities, has over 15 years of expertise in driving systemic change across 60 countries globally. Our approach goes **beyond traditional solutions, addressing climate challenges holistically with a focus on long-term transformation.**

We support climate, environmental, social and economic transitions through **systemic, place-based innovation,** enabling the transformation of 100+ cities, 150+ regions and multiple countries in Europe and beyond, and leading ground-breaking work in radical collaboration to lift the speed, scale and coordination of climate and environmental action and be able to meet the urgency and pervasiveness of the poly-crises we face. Our solutions intertwine technology, governance, finance, and social change.

Through our 'systems innovation as a service' model, exemplified by our unique **Deep Demonstrations**[58] methodology we work with national governments and regions. Our methodology supports decision makers and innovators to plan, map, analyse, engage, design, test and invest in a portfolio of solutions in cities, bioregions and value chains. Deeply rooted in the communities they serve and learn from, they demonstrate how the interrelated actions of systemic change can benefit all.

We coordinate the NetZeroCities platform[59], which supports the implementation of the EU Mission for **Climate-Neutral and Smart Cities**[60], partnering with 112 cities to demonstrate how systemic transformation can be achieved by 2030. We are actively involved in the Climate **Adaptation**[61] and Healthy Soils[62] Missions, all deeply relevant to the Circular Bioeconomy strategy.

Climate KIC's systemic approach to regional transformation focuses on resilience, adaptation, and sustainable land use. This work area spans multiple scales, from large-scale landscape initiatives, across food-systems[63], forestry to localised community engagement efforts, addressing critical climate challenges across different levels. It harnesses nature-based solutions - cost-effective solutions that simultaneously provide environmental, social, and economic benefits and help build resilience to address climate change, urbanisation, and biodiversity loss.

Transforming energy-intensive industries is crucial for achieving climate neutrality and resource efficiency. The shift from a linear to a circular economy necessitates reconfiguring supply and value chains, maintaining product value through extended lifecycles rather than obsolescence, disposal and waste. This transformation demands redesigning manufacturing, supply, and economic structures to foster sustainability. Climate KIC plays a key role in this transition, identifying systemic levers for change and enabling industry-wide collaboration.

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[58] Place-based transformations | Climate KIC
[59] Home - NetZeroCities
[60] Climate-neutral and smart cities - European Commission
[61] Adaptation to climate change - European Commission
[62] EU Mission: A Soil Deal for Europe
[63] Deep Demonstration Ireland brochure

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Since 2017, Climate KIC has been **advancing space-based Earth Observation (EO) and Climate Services** in partnership with the European Union Copernicus Program to accelerate climate action and resilience. Addressing systemic challenges across cities, regions, and value chains requires integrating Earth Observation tools that provide actionable insights into climate risks, biodiversity loss, and socio-political changes.

Through its venture support programs, impact-driven investment, and innovation ecosystems[64], Climate KIC has helped scale over 6,000 start-ups and supported the development of over 10,000 cli-mate solutions. Working alongside partners, Climate KIC currently has active venture and solu-tions development initiatives running across 81 countries. While supporting start-ups remains crucial, individual solutions alone do not drive deep structural change. Pursuing our mission to catalyze systemic change, Climate KIC works to integrate entrepreneurial ventures into larger systems, accelerating climate resilience and sustainability. This approach focuses on demand-driven innovation, ensuring climate solutions are effectively adopted across industries and communities.

Over the years, we have placed more and more focus on **mobilizing finance**, new business models, institutional change, and behavioural change. We stimulate action and build skills to accelerate learning and identify where innovation can best transform systems and bridge silos.

Climate KIC has been pioneering **new investment models that mobilize capital for systemic change**. We have strategically expanded our investment portfolio beyond traditional grant-based funding to include venture capital, blended finance, and catalytic investments, ensuring that climate-positive solutions can scale effectively.

Our approach to **learning and capacity-building**[65] evolved to recognize that true climate transformation requires more than skills: it calls for a shift in mindsets and ways of being. What began as multiple standalone education pro-grams and trainings has matured into integrated, **multilevel learning ecosystems** where a broader ef-fort towards capacity building and leadership devel-opment is integrated across our innovation efforts in governance, business, entrepreneurship and commu-nity systems.

Our diverse **community**[66] consists of a with a wide variety of stakeholders: businesses large and small, including startups and farmers, research organisations and academia, civil society, citizens.

[64] Climate entrepreneurship | Climate KIC
[65] About the Academy | Climate KIC
[66] About our community | Climate KIC

Climate KIC was initiated by the EIT –
European Institute of Innovation & Technology.