GEEK4FOOD

Glocal Ecosystems and Expanded Knowledge for green skills and capability in the Food Sector

D6.2

Use Cases of Policy and Training Mix/Packages to Maximize Impacts

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CONTENT

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1. Executive summary

Deliverable 6.2 presents the Action Catalogue of the GEEK4Food (G4F) Policy Pathfinder, identifying policy-training combinations ("Use Cases") that can accelerate skill development for the green transition in the agri-food sector. It operationalizes the objectives of WP6 as described in the Application Form, namely:

- identifying levers of change for transformative and forward-looking skills policies;
- ensuring innovation transferability across countries and sectors;
- improving the institutional ecosystem supporting green-transition startups and SMEs;
- supporting impact-driven policy making at EU and national level.

The Use Cases build on evidence from:

- 120+ Policy Cards (D6.1),
- the Skills Roadmap (D4.1),
- Modules & Pilots Syllabus (D4.2),
- Labour Market & Skills Gap Assessment (MS3),
- Green Skills Pedagogical Model (MS5),
- and the training pilots delivered in WP5.

The result is a catalogue of 12 Use Cases, each demonstrating how targeted training solutions, aligned with concrete policy instruments and funding opportunities, can produce measurable impact by 2030 and beyond. Each Use Case also includes KPIs, transferability considerations, risks and mitigation strategies, and potential funding routes (The Common Agricultural Policy (CAP), The European Social Fund Plus (ESF+), The Recovery and Resilience Facility (RRF), The Strategic Technologies for Europe Platform (STEP), national strategies, and private impact capital).

The Action Catalogue has been disseminated through focus groups in all partner countries and integrated into the digital G4F Policy Pathfinder library.

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2. WP6, Task description and methodology

WP6 aims at establishing levers of change through policy innovation addressing the responsibility of all actors and to consolidate impact-driven and evidence-based policy making in order to:

- Foster innovation in terms of scope, ground-breaking methods and practices, and/or
- Ensure a transfer of innovation (across countries, policy sectors or target groups), thus ensuring at European level a sustainable exploitation of innovative project results and/or transferability into different contexts and audiences.
- Improve the institutional ecosystem for start-ups focused on the circular economy that sensitizes policy-makers to design better legislation.

The activities of Task 6.1., from which the D6.2. is the second main outcome, was aimed to enact the key multiplier agents of the 3P-G4F platform (i.e. educators, business/industry/policymakers) developed in WP3 to apply different tools for Futures Thinking and Foresight across policy and investment options to transform, future-proof, validate existing policy areas and framework conditions for enabling forward-looking skills to support the green transition in the food sector by valorising the main outcomes of the GEEK4Food (G4F) project.

3. Introduction: The GEEK4Food Strategic Imperative

The European Green Deal and the Farm-to-Fork Strategy necessitate a fundamental paradigm shift in the agri-food sector, demanding a workforce equipped with advanced green and digital competencies. However, empirical data from the Labour Market Analysis (MS3) confirms a persistent structural failure: a significant skill gap where the demand for critical green roles (e.g., farm manager, waste manager) and technical skills (e.g., sustainable food science, circular economy) consistently outpaces supply.

The GEEK4Food project, guided by its strategy to bridge the green skills' gap by using AI data analytics and educational methodologies that will foster the resilient and innovative workforce (D4.1), was designed as a direct response to this gap.

The challenge for **Work Package 6** (WP6) was to ensure that the project's innovations designed for the agri-food sector do not remain theoretical, but are systematically embedded into the policy and investment frameworks that govern both education and industry.

This embedding is essential for meeting new regulatory obligations like the Corporate Sustainability Reporting Directive (CSRD) and supporting EU Taxonomy alignment.

3.1 The Function of the Action Catalogue

The Action Catalogue is the documental output of Task 6.2, "*Mainstreaming and embedding multi-level and multi-actor policy actions.*" It moves beyond mere observation by organizing the project's solutions into replicable **Use Case Models**.
The Catalogue addresses two fundamental questions:

- **Impact Design**: Which combination of GEEK4Food tools and training modules yields the maximum measurable improvement in key green competencies?
- **Policy Mix**: Which specific Policy Tool Typology (e.g., Capacity, Incentive, or Learning Tool) must be activated alongside the training to ensure the solution is adopted, funded, and sustained at an institutional level? These typologies are essential for building Adaptive Policy Capacity (APC) at the territorial level, ensuring local actors have the necessary analytical and operational resources to implement centralized policy.

By answering these questions, D6.2 provides the definitive evidence required to verify the impact of the GEEK4Food methodology and directly contributes to the finalization of the Transformative Policies Pathfinder (D6.1).

3.2 The Strategic Mandate and Project Strategy

The GEEK4Food was designed based on a clear strategy: to bridge the green skills' gap in the agri-food sector by using AI data analytics and innovative educational methodologies that will foster a resilient and innovative workforce (D4.1). D6.2 operates directly on this strategy by testing how these AI and educational mechanisms translate into measurable policy and investment impacts.
Key Strategic Inputs:

- **Policy Relevance and Compliance**: The project aligns with major EU initiatives, including the European Green Deal's "Farm-to-Fork Strategy" and the "Pact for Skills in the Agrifood sector," by focusing on enhancing the workforce's capacity for sustainability and resilience. Crucially, the solutions directly support companies in achieving EU Taxonomy alignment and complying with the Corporate Sustainability Reporting Directive (CSRD) by providing auditable skill metrics.
- **Skill Fluidity**: The overall goal was to create the necessary fluidity and resilience in the agri-food workforce by continuously aligning educational programs with current and future market needs (D4.1).
- **Interdependence**: The success of WP6 hinges entirely on the output of the digital platform (D2.1, D3.2) and the training delivery (WP5), which collectively provide the evidence base for policy recommendations.

3.3 Interdependence and Reliance on Project Outputs

The models and use cases presented herein rely on the successful delivery and piloting of the project's core technical and educational components:

- **Intelligence**: The foundation is laid by the AI-driven Green Skills Tool (D2.1) and the Labour Market Analysis (MS3), which define the "what" and "where" of the skill gaps. This establishes the Analytical Capacity for the agri-food sector at the systemic and organizational levels.
- **Solution**: The intervention is provided by the Modular, Challenge-Based Training Curricula (D4.2), specifically modules on Eco-design of food packaging, Optimised fermentation, and Food waste valorisation. This intervention strengthens Organizational and Territorial Operational Capacity.
- **Validation**: The use cases integrate performance data collected during the WP5 pilot execution, providing the Quantitative KPI Metrics (e.g., skill score improvement) essential for policy justification.

This report, therefore, synthesizes the core deliverables of the GEEK4Food project into a singular, policy-focused resource for transformative action.

3.4 Structural failures identified

Across Policy Cards and WP6 analysis, two systemic failures are consistently identified:

1. **Funding gap** for human-capital investment in the agri-food green transition.
2. **Accountability gap** in traditional skills financing (input-based rather than outcomes-based).

The Use Cases directly address these failures.

3.5 Methodology

The Use Cases were developed through:

- synthesis of 120+ EU and national policies (D6.1),
- mapping against skills gaps (MS3),
- training modules (D4.2),
- capability architecture (D4.1),
- investigation of policy instruments, including:
  - CAP: Common Agricultural Policy
  - ESF+: European Social Fund Plus
  - RRF: Recovery and Resilience Facility
  - STEP: Strategic Technologies for Europe Platform
  - JTF: Just Transition Fund
  - VET Reforms: Vocational Education and Training - National Reforms
- partner consultations and WP6 expert focus groups.

4. Evidence Base

4.1 Insights from the Policy Cards (D6.1)

An analysis of the 120 Policy Cards reveals several prominent and recurring themes, primarily centered around the strategic alignment of workforce capabilities with emerging economic and environmental goals. A key finding is the mandatory integration of skills development within Common Agricultural Policy (CAP) Strategic Plans. Furthermore, broader bioeconomy and circular economy strategies are increasingly emphasizing the need for new workforce skills. This shift is underpinned by a strong horizontal priority placed on skills for sustainability, heavily referencing established frameworks such as GreenComp and ESCO Green Skills.

To support these strategic objectives, educational and training systems are undergoing significant adaptation. National Vocational Education and Training (VET) reforms are currently prioritizing green, digital, and transversal competences to ensure the workforce can meet evolving industry demands1[1]. Additionally, more agile qualification methods are gaining traction, as evidenced by the development and emergence of micro-credential frameworks across all six countries of the G4F consortium.

These systemic educational changes and skill development initiatives are backed by robust financial mechanisms. A variety of funding opportunities—including the ESF+, RRF, JTF, STEP, and LIFE CET—are actively enabling and encouraging investments in training. These targeted financial investments are particularly crucial for addressing the workforce needs of identified high-growth sectors, which include, among others, bio-based materials, fermentation, packaging, digital farming, on-farm renewable energy, short supply chains, and food safety and traceability.

4.2 Evidence of the Skills Gap and Demand (MS3)

The Labour Market Analysis Report on Green Skills in the EU (MS3) provides the empirical evidence for the systemic failure the GEEK4Food project addresses: a shortage of green talent across critical roles and technical domains.

[1] Vocational Education and Training and the Green Transition 2024 edition.A Compendium of inspiring practices, Directorate-General for Employment, Social Affairs and Inclusion, EC, Bruxelles, 2024

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Identified Skill Shortages (Demand vs. Supply)

CATEGORY	KEY FINDINGS (DEMAND > SUPPLY)	POLICY IMPLICATION
Green Technical Skills	Demand significantly surpasses supply in areas like Pharmacology, Scientific Research, Waste Management, Packaging, and Energy Management (Figure 6.2, MS3).	Need for policy levers (e.g., dedicated funding) to drive specialized training investments.
Top Green Skills in Job Postings	The most in-demand green skills associated with job postings are Sustainable Food Science and Circular Economy (MS3, Table 3), indicating that these technical skills are central to the current industry transition.	Policy should target curriculum reform to embed these specific topics in VET and HE programmes.
Transversal / Soft Skills	Soft skills are prioritized across the EU job market, with Communication, Teamwork, and Adaptability being the top 3 (Figure 6.1, MS3).	Use cases must demonstrate how challenge-based training (WP4/5) successfully develops these crucial transversal skills alongside technical knowledge.

Market and Role Context:

- **Low Market Penetration**: The overall request for "green skills" remains limited across the EU, accounting for only 1.1% of total job postings, despite high demand in specific roles (MS3, Table 1). This underscores the necessity of policy intervention to normalize and embed green skills across the entire agri-food ecosystem.
- **Green Job Roles Gap**: While demand is high for Farm Hand, Farm Manager, and Agronomist titles with green skills, a significant supply-demand gap exists, particularly in these roles (Figure 6.5, MS3). This confirms the urgent need to reskill the current workforce in the primary production sector.

4.3 Skills Roadmap (D4.1)

D4.1 defines the following competence clusters:

- **Technical competences** (fermentation, eco-design, circular materials, carbon farming)
- **Digital competences** (AI, IoT, data analytics)
- **Sustainability competences** (aligned with GreenComp)
- **Transversal competences** (entrepreneurship, collaboration)

4.4 GEEK4Food Solution Pillars (D4.2 and MS5)

The Action Catalogue Use Cases are built on the principles of pedagogical innovation, ensuring the proposed training mix is agile, effective, and directly addresses the identified skill gaps.

The Core Training Mix (D4.2)
The project's training focuses on three specific, high-demand technical areas, designed as modular, one-day courses targeting junior and senior agri-business professionals:

1. **Eco-design of food packaging**: Addresses sustainability and circular economy in food contact materials.
2. **Optimised fermentation**: Focuses on sustainable and safe production practices, particularly alternative protein sources.
3. **Food waste valorisation in food product design**: Concentrates on waste-to-value concepts and biorefinery approaches for food product design applications.

Pedagogical and Assessment Approach (MS5)

- **Modular and Homogenous Design**: All modules follow the same structure (Challenge-based lecture - Content - Case Studies - Assessment), maximizing adaptability and scalability for different educational contexts (D4.2).
- **Challenge-Based Learning**: The modules are anchored in real-world problems and case studies (e.g., identifying a fossil fuel plastic to replace, Activity/Case Study 1 in D4.2, Annex 1), which facilitates active learning and the practical application of theoretical knowledge (MS5).
- **GreenComp Alignment**: Training delivery and outcomes are aligned with the principles of the European GreenComp Framework, ensuring competency development addresses all dimensions of sustainability, including Embodying Sustainability Values and Acting for Sustainability.
- **Competency-Based Assessment**: Learning outcomes (LOs) are defined using Bloom's Taxonomy action verbs (D4.2, Figure 1) to ensure the training achieves higher-order thinking skills (Applying, Analysing, Evaluating) rather than simple recall.

This combination of empirical demand data (MS3) and standardized, high-quality training solutions (D4.2/MS5) forms the foundation of every use case in the Action Catalogue. The subsequent sections will document how this foundation, when combined with specific policy

levers (D6.1), results in maximized, sustainable impact.

4.5 WP5 Pilot Evidence (D5.2)

WP5 confirms:

1. strong learner engagement;
2. transferability across HEIs;
3. the need for improved digital readiness;
4. relevance of module content to national policies.

5. Use Case Catalogue (12 Use Cases)

The Action Catalogue is the practical realization of WP6's goal to facilitate evidence-based policymaking by showcasing models where GEEK4Food's AI-driven intelligence (WP2) and modular training (WP4/5) successfully address identified market skill gaps (MS3).
These models demonstrate how to leverage a "**policy and training mix**" to maximize systemic impact and ensure the solutions are easily replicable, or mainstreamed, across Europe. The efficacy of each Use Case is measured against its ability to enhance Adaptive Policy Capacity (APC) at the territorial level, ensuring local actors have the necessary analytical and operational resources to implement centralized policy.

This section includes **twelve representative Use Case Models,** each demonstrating a different policy lever and GEEK4Food training mix required to achieve a specific green transition objective.
Each follows the agreed G4F structure. Evidence is always drawn from Policy Cards, Skills Roadmap, or WP5.

5.1 Use Case Model 1: Embedding Circular Economy Skills into Agri-Food

This model targets the most pressing policy challenge: directing public and private funds towards validated training that supports the Circular Economy, one of the top two required green skills.

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: Addressing the high demand for Circular Economy expertise, especially in Waste Management and Food Safety sectors (MS3, Table 2). Agri-food SMEs face structural skills shortages in circular processes, waste minimisation, eco-design, valorisation, and sustainability reporting. Policy Cards (S3 Agri-food; CE Strategies of PT, IT, PL; OECD SME Green Transition; GreenComp; ESCO Green Skills) show: ● low SME capacity to implement CE innovation, ● workforce lacks systems thinking, lifecycle literacy, business-model innovation, ● SMEs missing knowledge on regulatory obligations for waste reduction and CE indicators. MS3 confirms that CE-related skills appear in <3% of agri-food job postings.
	Target Group: SME owners, production managers, sustainability officers, quality managers. These staff are directly responsible for CE compliance and innovation but lack the skills to translate CE policy obligations into operational change.
	Policy Context/Gap: National CE strategies require companies to adopt circular processes, but no mandatory or incentivised CE upskilling is built into support schemes. Need for local/regional operational programs (OPs) to prioritize funding for skills acquisition related to Waste-to-Value and Sustainable Sourcing. Current OPs may fund machinery but neglect the crucial skills investment required for successful implementation.

	Policy change needed: Introduce skills conditionality in Operational Programmes and CE funding programmes (ESF+, RRF, regional innovation vouchers) requiring staff training prior to funding approval.
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: Food waste valorisation in food product design module (D4.2 Annex 3). Focuses on high-level concepts like Biorefinery and Industrial Sustainability (D4.2). The module teaches CE fundamentals, operational redesign, waste analytics, lifecycle thinking, and new revenue models.
	Digital Tool Integration: Use of the G4F Skills Platform (D2.1) to diagnose the skill gap in target SME leadership before training, and to generate personalized Learning Paths (D4.1) for participating managers after training. Validates the AI-driven approach for diagnosis and personalization, maximizing training ROI.
III. Impact and Policy Outcomes	**Policy Lever Proposed**: Recommendation to amend regional OP training criteria (Action Tool) to mandate that all applicants seeking waste management grants must demonstrate engagement with a validated Circular Economy training model (like GEEK4Food). This policy action builds Territorial Analytical Capacity by incentivizing the use of data-verified skills for public benefit, combating scientific ignorance. A Learning Tool and Capability Tool for regional authorities: recognise G4F CE modules as the standard for CE upskilling; integrate them as an eligibility condition in innovation grants or CE transition vouchers.
	Quantitative KPI Metrics: ● 25% average increase in the "Circular Economy" competency score among trained target group members. ● 10 regional policy instruments (OPs) addressing the proposed Policy Lever. ● 20% reduction in waste per SME after training, and in compliance risk. ● 6 CE innovations piloted by SMEs. Provide concrete evidence of skill-level change (KPI 2) for policymakers.

Impact Finance Potential: High, due to alignment with: CEAP, ESF+ Priority 4 (skills), RRF green transition chapters, private CE/impact investors.
The financial savings from successful waste valorisation provide a clear, measurable return on investment (ROI), making this model suitable for Pay-for-Success or Impact Financing. Links policy to financial sustainability (KPI 3).

5.2 Use Case Model 2: Fermentation & Biotechnology Workforce Pipeline

This model focuses on strengthening the workforce pipeline for emerging bioeconomy technologies by aligning specialised fermentation and biotechnology training with national bioeconomy strategies and EU innovation initiatives.

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: Policy Cards on the Bioeconomy (31, 89, 90, 91), STEP, AKIS, and national bioeconomy strategies (IE, IT, PL, PT) highlight: ● high growth in fermentation-based food, precision fermentation, biomass valorisation, ● insufficient training pipelines for fermentation technicians, bioprocess engineers, and lab assistants, ● skills in regulation, safety, and scalability missing. MS3 evidence: biotech and fermentation skills appear almost absent in agri-food job postings.
	Target Group: Biotech technicians, fermentation operators, R&D staff, food technologists, startup teams.
	Policy Context/Gap: Bioeconomy strategies require new workforce pipelines but lack competency frameworks to guide VET/HE curricula. **Policy change needed:** Integrate G4F fermentation/biotech pathways into STEP-supported strategic technology platforms and reforms of national bioeconomy investments funded through Recovery and Resilience Facility (RRF).
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: Optimised Fermentation module (D4.2 Annex 2). The training provides foundational bioprocess knowledge, safety compliance, scaling principles, and innovation skills.
	Digital Tool Integration: G4F Skills Platform (D2.1) provides dynamic updates on food safety/biotech skills demand and personalised learning paths.

	Validates the AI-driven approach for diagnosis and personalization, maximizing training ROI.
III. Impact and Policy Outcomes	**Policy Lever Proposed**: A Capability Tool for national bioeconomy agencies: adopt G4F module as one of the baseline competencies for participation in bioeconomy clusters or biotech-funded projects.
	Quantitative KPI Metrics: +30% certified fermentation specialists per region; 5 regions embedding G4F into innovation programmes; 20% increase in availability of skilled biotech workers; +5% biotech startups accelerated.
	Impact Finance Potential: High, linked to: STEP, RRF bioeconomy envelopes, European Circular Bioeconomy Fund (ECBF).

5.3 Use Case Model 3: Industry Standards and Intellectual Property Rights (IPR) Alignment

This model focuses on leveraging industry-specific policy (like IPR and Safe and Sustainable by Design (SSbD) and regulatory compliance) to ensure the sustainable adoption and replication of GEEK4Food's innovations, particularly in the complex area of sustainable product development.

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: High demand for Sustainable Packaging skills and expertise in Regulatory Compliance (MS3, Figure 6.2). Product development teams require integrated knowledge of material science, environmental impact, and evolving EU regulations (e.g., Safe and Sustainable by Design - SSbD).
	Target Group: Product Development Specialists and Quality Assurance (QA) Managers. These roles are critical to ensuring new product innovations comply with EU Green Deal objectives.
	Policy Context/Gap: Lack of standardized industry guidelines for managing Intellectual Property Rights (IPR) and product innovation stemming from green upskilling. Delays in IPR guidelines create a major risk for industry adoption of new green ideas.
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: Eco-design of food packaging module (D4.2 Annex 1). Integrates content on SSbD, safety, risk assessment, and intentionally / non-intentionally added substances (NIAS). The policy linkage here supports mandatory requirements under the EU Taxonomy and CSRD for product transparency and environmental safety.
	Digital Tool Integration:

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	G4F Skills Platform (D2.1) provides dynamic updates on the need for Sustainable Packaging skills and expertise in Regulatory Compliance. Validates the AI-driven approach for diagnosis and personalization, maximizing training ROI.
III. Impact and Policy Outcomes	**Policy Lever Proposed**: Introduce the G4F eco-design and food packaging training module as a recommended competency certification for participation in publicly funded packaging innovation programmes and circular economy clusters.
	Quantitative KPI Metrics: ● +10% Faster regulatory compliance ● -15% Reduced legal risk ● +15% Improved innovation trust
	Impact Finance Potential: Moderate. Provides a basis for Public-Private-People (PPP) schemes (D6.4 input) where industry invests in training QA/R&D staff in exchange for de-risked innovation guidance and access to standardized IP management tools.

5.4 Use Case Model 4: Sustainable Packaging Compliance Training

This model focuses on strengthening industry capacity to comply with emerging EU sustainable packaging regulations by integrating technical recyclability-by-design expertise with food safety and intellectual property considerations. Through targeted training for packaging engineers, product designers, and R&D managers, the model supports companies in navigating the complex regulatory landscape created by the Packaging and Packaging Waste Regulation (PPWR), Food Contact Materials Regulation, and design protection rules, enabling faster, safer, and legally compliant development of circular packaging solutions.

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: Urgent need for Recyclability-by-Design skills and compliance with Food Contact Material (FCM) safety standards (Regulation 10/2011) to avoid massive fines under PPWR. The challenge is the dual technical/legal risk: innovation must be safe (FCM) and legally protected (Design Directive) while meeting waste reduction goals (PPWR). Professionals lack integrated recyclability-by-design, FCM safety, and IP design protection skills necessary for compliance with PPWR, Regulation 10/2011, and the Design Directive.
	Target Group: Packaging Engineers, Product Designers, R&D Managers, IP Experts. These roles must execute mandatory product redesigns (PPWR compliance).
	Policy Context/Gap: PPWR mandates ambitious targets for recycled content and recyclability. Failure may result in high compliance costs. Gap: no structured, interdisciplinary training. **Policy change needed**: Mandate training on legal/technical compliance for R&D staff as a prerequisite for market entry/investment.
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: Eco-design of food packaging module.

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	Digital Tool Integration: G4F Skills Platform (D2.1) provides dynamic updates on the need for Sustainable Packaging skills and expertise in Regulatory Compliance. Validates the AI-driven approach for diagnosis and personalization, maximizing training ROI.
III. Impact and Policy Outcomes	**Policy Lever Proposed**: Recommendation to national IP and regulatory bodies to use the GEEK4Food module as the certified standard for "Design for Circularity" training (Learning Tool). This action builds Organizational Analytical Capacity by embedding dual technical/legal knowledge, transforming mandatory compliance into a strategic competency.
	Quantitative KPI Metrics: 30% reduction in time required for the legal/R&D team to clear a new recycled-content design for market entry -10% Reduced PPWR compliance/penalty risk -15% Reduced compliance costs
	Impact Finance Potential: High. Investment is justified as a risk reduction measure against potential PPWR non-compliance penalties.

5.5 Use Case Model 5: Academic Accreditation for Skill Fluidity

This model focuses on influencing the Academic and Higher Education (HE) ecosystem to facilitate curriculum innovation and foster skill fluidity for the next generation of professionals.

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: High demand for Sustainable Food Science (MS3, Table 3) and skills in Optimized Fermentation, which requires strong Scientific Research and Chemistry knowledge (MS3, Figure 6.2). HE curricula often lack the agile, industry-relevant content needed for these rapidly emerging technical fields.
	Target Group: Master's level Food Science and Technology Students. The training aims to enhance their core technical capabilities and market readiness (D4.2).
	Policy Context/Gap: Absence of flexible credit transfer or Micro-credential mechanisms within HE regulations to recognize industry-developed, modular training content. This gap limits the capacity of academia to respond quickly to market needs, hindering skill fluidity (D4.1).
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: Optimised fermentation module (D4.2 Annex 2). Uses a strong theory-to-practice approach focused on safety, risk assessment, and alternative protein sources (biomass fermentation). Training outcome is validated against multiple GreenComp Competence areas, specifically Embodying Sustainability Values and Embracing Complexity in Sustainability.

	Digital Tool Integration: Use of the G4F Skills Platform (D2.1) to diagnose the skill gap in optimised fermentation before training, and to generate personalized Learning Paths (D4.1) for participants. Validates the AI-driven approach for diagnosis and personalization, maximizing training ROI.
III. Impact and Policy Outcomes	**Policy Lever Proposed**: Recommendation to HE funding bodies and national accreditation agencies to recognize the modular GEEK4Food structure as a certifiable professional micro-credential (Capacity Tool Typology). This action builds Systemic Operational Capacity by implementing an institutional structure (micro-credentials) that allows for the rapid integration of emerging green skills, addressing the hurdle of rigid Speed and fulfilling the mandate of the Union of Skills.
	Quantitative KPI Metrics: +25% Improved technical & transversal skills +15% increase in students applying entrepreneurial and critical thinking skills during case studies (measured via D4.2 assessment) +30% Institutional adoption by Higher Education authorities Verifies the qualitative impact of the challenge-based training (KPI 1).
	Impact Finance Potential: Moderate–High. The model enables the development of blended public–private financing schemes for green skills in higher education, leveraging the introduction of micro-credentials and modular training recognised by national accreditation systems.

5.6 Use Case Model 6: VET Modernisation for Green & Digital Skills

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: Policy Cards (68, 109, 110, 111, 112, 113, 114) identify: ● outdated VET curricula not aligned with green transition needs, ● lack of teacher capacity for CE, digitalisation, and biotechnology, ● limited integration of micro-credentials. MS3 confirms growing mismatch between VET skills and labour demand.
	Target Group: VET learners, teachers, curriculum developers, adult learners.
	Policy Context/Gap: National reforms acknowledge the issue but lack concrete curriculum content for agri-food green transition. **Policy change needed:** Adopt standardised green/digital VET modules (e.g., G4F) for accreditation.
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: All G4F modules, adapted to VET accreditation standards.
	Digital Tool Integration: G4F Skills Platform supports: teacher competency diagnostics, learner skill-gap assessments, modular pathway creation.
III. Impact and Policy Outcomes	**Policy Lever Proposed**: A Learning Tool: integrate G4F modules as micro-credentials in national VET frameworks. A Capability Tool: support VET teacher training.
	Quantitative KPI Metrics: ● +30% Learners certified ● +30% Teachers upskilled ● 6 updated national VET curricula.
	Impact Finance Potential: Moderate, aligned with ESF+ VET priorities.

5.7 Use Case Model 7: Women & Youth in Green Agri-Food Careers

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: Rural areas face demographic decline; Policy Cards (21, 24, 92, 93, Rural Vision 2040) emphasise insufficient youth and women participation in green agrifood roles. Skill shortages especially affect digital farming, CE, and entrepreneurship.
	Target Group: Women entrepreneurs, young farmers, vocational learners, Not in Employment, Education, or Training (NEETs).
	Policy Context/Gap: CAP Young Farmer Scheme and gender equality strategies exist, but few contain mandatory or subsidised green skills training. Youth employment strategies highlight mismatch between training supply and green labour demand (MS3). **Policy change needed:** Integrate targeted green-skill Micro-Credentials (incl. Geek4Food modules) as eligibility criteria for Young Farmer supports, rural entrepreneurship grants, and gender-equity schemes.
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: Eco-design of food packaging, Optimised fermentation, Food waste valorisation in food product design
	Digital Tool Integration: G4F Skills Platform tool builds personalised youth/women learning journeys, integrates labour-market insights.
III. Impact and Policy Outcomes	**Policy Lever Proposed**: A Learning Tool: Require baseline skills certification for applicants to Young Farmer payments and rural women entrepreneurship schemes. **A Preference Tool**: provide higher grant co-financing rates for certified learners.

Quantitative KPI Metrics:

- +20% increase in women/youth participation in green upskilling programmes.
- +10% new micro-enterprises created by trained youth/women.

Impact Finance Potential: High, due to social-impact investor interest, CAP gender mainstreaming funds, and rural development grants.

5.8 Use Case Model 8: CAP Compliance and AKIS Modernization

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: Acute shortage of Young/New Farmers with "appropriate training" to access CAP subsidies and implement sustainable / climate-smart practices (D26 Scenar 2040). The structural challenge is the failure of the Farm Advisory System (FAS) to deliver modular, certified, high-quality knowledge directly to new entrants.
	Target Group: Young/New Farmers and Farm Advisory Services (FAS) Staff. This targets generational renewal in rural areas and compliance with the CAP Regulation.
	Policy Context/Gap: Regulation (EU) 2021/2115 (D52) mandates Member States to define "appropriate training." The gap is the lack of a standardized, certifiable GEEK4Food protocol. Policy change needed: Defining GEEK4Food module completion as the verifiable standard for "appropriate training" to unlock CAP funds.
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: Food waste valorisation in food product design Training is short, modular, and directly addresses CAP priorities (climate change adaptation, sustainable use of products). The pedagogical methods align with CAP Network recommendations: peer-to-peer, interactive, and on-farm focused
	Digital Tool Integration: G4F Skills Platform (D2.1) is used by FAS staff to diagnose regional skill deficits among new entrants, informing which GEEK4Food modules are required for compliance.

	Positions GEEK4Food as the Skills Intelligence Feed for the Agricultural Knowledge and Innovation System (AKIS).
III. Impact and Policy Outcomes	**Policy Lever Proposed**: Recommendation to Member State Managing Authorities to include a GEEK4Food modules KPI score as a scoring/eligibility criterion for EAFRD/CAP funding (Incentive Tool). This action builds Territorial Operational Capacity by blending public structural funds (CAP/EAFRD) with mandatory skills acquisition, fulfilling the mandate of the JRC Rural Toolkit.
	Quantitative KPI Metrics: ● 100% compliance rate for Young Farmers who complete the module (compared to national average). ● +25% improvement in FAS staff advisory quality. Competency achievement is certified using ESCO terminology and aligned with GreenComp principles. Verifies the effectiveness of GEEK4Food as the quality assurance mechanism for public spending.
	Impact Finance Potential: High. Success justifies using CAP funds as the leverage capital to secure private investment for New Farmers. Links compliance training to financial sustainability.

5.9 Use Case Model 9: Digital Farming & On-Farm Sustainability Compass

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: Policy Cards (CAP Network, OECD Digital Agriculture, national digitalisation strategies) show: ● farmers lack skills to interpret sustainability metrics, ● low adoption of digital tools (MS3), ● inability to use data to meet CAP eco-scheme or CSRD reporting requirements.
	Target Group: Farmers, farm managers, cooperatives, digital advisors.
	Policy Context/Gap: CAP mandates digitalisation but does not standardise farmer/advisor competencies. **Policy change needed:** Introduce minimum competency requirements for eco-scheme participation or farm advisory services.
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: Optimised fermentation, Food waste valorisation in food product design
	Digital Tool Integration: G4F Skills Platform (D2.1) is used to diagnose regional skill deficits, inform on GEEK4Food modules and design individual training pathways.
III. Impact and Policy Outcomes	**Policy Lever Proposed**: A Learning Tool requiring G4F modules for participation in digital advisory programmes under CAP.
	Quantitative KPI Metrics: ● +25% increase in precision-farming adoption ● -10% GHG reduction via data-driven management

Impact Finance Potential: Moderate–High, aligned with: CAP eco-schemes, Digital Europe Programme, private ag-tech investments.

5.10 Use Case Model 10: Carbon Farming & Ecosystem Services Skills

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: Policy Cards (CAP Strategic Plans, Soil Strategy, national climate plans) show: ● low capacity to implement carbon-farming methods, ● lack of competence in soil sampling, carbon baselining, remote sensing, ● limited understanding of ecosystem service monetisation.
	Target Group: Farmers, environmental consultants, advisory networks.
	Policy Context/Gap: Voluntary carbon markets are expanding rapidly but there is a lack of trained personnel. **Policy change needed:** Require certified training leading to popularisation of carbon-farming methods to access public or private carbon schemes.
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: Optimised fermentation, Food waste valorisation in food product design
	Digital Tool Integration: G4F Skills Platform (D2.1) is used to diagnose regional skill deficits, inform on GEEK4Food modules and design individual training pathways.
III. Impact and Policy Outcomes	**Policy Lever Proposed**: A Learning Tool embedding G4F modules in CAP carbon scheme participation rules.
	Quantitative KPI Metrics: ● +25% increase in farmers eligible for carbon schemes. ● +10% verified improvements in soil health.

Impact Finance Potential: High, directly linked to carbon markets and eco-scheme budgets.

5.11 Use Case Model 11: Micro-Credentials for Green Agri-Food Skills

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: Policy Cards (32, 68, 109–114) highlight that Member States are implementing micro-credential frameworks, yet agri-food green skills micro-credentials remain underdeveloped. HEIs/VET providers lack modular, stackable, labour-market-aligned training for CE, bioeconomy, digital farming, and sustainability. MS3 confirms persistent competency gaps in digital and green domains within agri-food occupations.
	Target Group: University students, adult upskillers, VET learners, displaced workers, and SME employees requiring flexible training.
	Policy Context/Gap: EU Micro-Credential Recommendation (2022) promotes portability and labour-market relevance, but national MC ecosystems lack sector-specific green content. CAP Strategic Plans, STEP, and national CE/Bioeconomy strategies require skills pipelines, but lack mechanisms to accredit agri-food green skills. **Policy change needed:** Mandate that national micro-credential registries include accredited green agri-food modules based on recognised standards (e.g., G4F), especially for CAP advisory systems, RRF-funded labour transitions, and JTF re-skilling.
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: All G4F modules can be packaged as micro-credentials: Optimised fermentation, Food waste valorisation in food product design, Eco-design of food packaging. Each module includes learning outcomes, assessments, ECTS allocation, and GreenComp alignment.
	Digital Tool Integration: G4F Skills Platform (D2.1) enables: • automated mapping of learner skill gaps,

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	• personalised sequencing of MC pathways.
III. Impact and Policy Outcomes	**Policy Lever Proposed**: A Learning Tool: recognition by ministries/HE authorities of G4F MCs as part of national MC ecosystems (e.g., Poland ZSU, Italy VET reforms, Denmark's lifelong learning strategy). Also a Capacity Tool: enabling HEIs/VETs to rapidly update MC content using AI monitoring.
	Quantitative KPI Metrics: • +10% Large-scale uptake • +20% Institutional embedding
	Impact Finance Potential: Moderate–High, due to alignment with ESF+ skills priorities and RRF-funded reskilling. Potential for adult upskilling.

5.12 Use Case Model 12: Agri-Food Startups & Innovation Clusters

TEMPLATE SECTION	POLICY AND TRAINING MIX
I. Problem and Context	**Green Skill Challenge**: Policy Cards (S3, 20, 31, 89, 90) emphasise emerging bioeconomy and circular economy industries where startup teams lack technical mastery of fermentation, valorisation, packaging, data, and sustainability reporting.
	Target Group: Startup founders, cluster members, incubator/accelerator participants.
	Policy Context/Gap: Smart Specialisation (S3/S4) strategies require skills-based innovation ecosystems, but current cluster programmes seldom integrate structured training. Many regions lack coordinated upskilling pipelines aligned to innovation domains (e.g. Italy's AKIS, Portugal Bioeconomy, Denmark Green Transition). **Policy change needed:** Embed mandatory green-skills training requirements within regional innovation vouchers and startup incubation programmes.
II. GEEK4Food Solution Mix	**G4F Training Module(s)**: All G4F modules: Optimised fermentation, Food waste valorisation in food product design, Eco-design of food packaging.
	Digital Tool Integration: G4F Skills Platform (D2.1) enables: • automated mapping of learner skill gaps, • personalised sequencing of MC pathways.
III. Impact and Policy Outcomes	**Policy Lever Proposed**: A Capability Tool for regional authorities to integrate G4F modules into S3 innovation cluster funding calls. A Learning Tool for accelerators, making training mandatory for receiving innovation vouchers.

Quantitative KPI Metrics:

- +20% Faster pilots for circular/bio-based products
- +10% Cross-border cooperation agreements

Impact Finance Potential: Very High — linked to STEP, ECBF, regional innovation funds, EIT Food.

These models, validated by the outcomes of the WP5 pilot training and engagement with policy stakeholders, form the complete Action Catalogue. The subsequent reports on D6.3 and D6.4 extrapolate the generalized mechanisms and financial models required to scale these successful mixes across Europe.

6. Models for Sustainability and Embedding

The final segment of the Action Catalogue (D6.2) focuses on developing generalized mechanisms for sustainability, answering the crucial question of how GEEK4Food's successful policy and training mixes can be scaled, funded, and institutionally embedded long-term. This forms the essential evidence base and conceptual framework for the final two high-level reports: D6.3 (Guidelines for Policy Makers, Academia, and Private Investors) and D6.4 (Impact Finance and PPP models).

6.1 Generalized Models for Maximizing Impact

The pilot results derived from the Use Cases (Section 2) allow for the extrapolation of recurring patterns and models that maximize the impact of green skills training in the agri-food sector. These models go beyond single project instances to inform systemic policy design.

Model A: Multi-Level Policy Mainstreaming

This model defines how GEEK4Food's AI-driven intelligence (D2.1) can be integrated across different political and institutional levels to achieve cross-program alignment.

UPSTREAM INTEGRATION (POLICY LEVEL)	HORIZONTAL ALIGNMENT (INSTITUTIONAL LEVEL)	DOWNSTREAM INTEGRATION (CURRICULUM LEVEL)
The use cases demonstrate that presenting quantitative skill gap data (MS3) directly to national and regional policy bodies is the most effective approach for securing policy change. Successful embedding requires policy makers to use GEEK4Food data to design new Operational Programmes (OPs) or amend existing regulations to recognize the Sustainable Food Science or Circular Economy competencies as national priorities. This policy	This involves disseminating the Action Catalogue via established Policy Learning Platforms (PLPs) and networks to facilitate knowledge transfer across different EU countries and sectors. The goal is to encourage peer-to-peer adoption of successful Policy Mixes, addressing the low overall market penetration rate of green skills (MS3).	Validation confirms the effectiveness of the Modular, Challenge-Based Design (D4.2) for both HE students and professionals. Policy should therefore mandate the adoption of this agile structure in traditional education systems to enable faster skill updates (Skill Fluidity, D4.1).

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integration should explicitly leverage the EU Taxonomy regulation by mandating that publicly funded projects must hire staff with verified competencies to perform Taxonomy-aligned green activities (e.g., waste reduction).	

Model B: The Integrated PPP (Private-Public-People) Model for Investment (D6.4 Input)

To overcome reliance on public grants, the project designs financial solutions that attract private capital. The use cases provide evidence that GEEK4Food solutions generate a measurable ROI, justifying this investment.

ITEM	DESCRIPTION
Public (P1 - The Enabler)	Provides the foundational investment (seed funding, data access, regulatory environment, G4F Skills Platform). The Policy Lever Proposed in the Use Cases (e.g., tax incentives, accreditation recognition) represents P1's ongoing commitment. P1 also ensures the regulatory acceptance of the financial models.
Private (P2 - The Investor)	Industry stakeholders (SMEs, corporations) invest directly in G4F training for their staff or in using the G4F Skills Platform (D2.1) for workforce planning. Their ROI is based on tangible performance metrics (e.g., approx 25% increase in Circular Economy competency, resulting in reduced waste costs). This performance data is auditable evidence required for CSRD reporting.
People (P3 - The Asset)	Individuals (students/workers) invest their time and effort, gaining credentials (D4.2) that lead to increased career mobility and salary potential (Skill Fluidity, D4.1).
The Financial Model	Successful models will be structured in a way, where private funders finance the P3 training, and the Public Sector (P1) or the employing Private Sector (P2) repays the funders upon documented achievement of the Quantitative KPI Metrics (e.g., skill score improvement, job placement in green roles). This ensures accountability and long-term funding stability.

6.2 KPI & Impact Measurement Framework

The impact assessment of the GEEK4Food models and associated use cases is based on a multi-dimensional Key Performance Indicator (KPI) framework designed to capture outcomes across skills development, policy adoption, financial mobilisation, behavioral change, and environmental impact.

Given the systemic character of the GEEK4Food intervention, spanning policy mainstreaming, training innovation, and investment mechanisms, the monitoring approach adopts a generalized indicator structure applicable across all use cases and implementation contexts.

This framework operationalizes the intervention logic embedded in Model A (Multi-Level Policy Mainstreaming) and Model B (Integrated Public–Private–People Investment Model). It allows for the consistent measurement of results across the three levels of transformation targeted by the project:

- **Policy level** (institutional and regulatory change)
- **Organizational level** (industry and education system adaptation)
- **Individual level** (skills acquisition and behavioral change)

By maintaining a common structure while allowing contextual adaptation, the KPI framework enables comparability, policy learning, and scalability across regions and sectors.

6.2.1 Methodological Foundations

The measurement framework follows three methodological principles.

6.2.1.1 Baseline and Benchmarking

Baseline values are derived primarily from the MS3 Labour Market and Skills Gap Analysis, which provides quantitative evidence of the current demand and supply mismatch in green skills within the agri-food sector. These baseline indicators allow the project to measure progress against the initial level of market penetration of sustainable competencies, institutional adoption, and training availability.

Where direct baseline data is not available, proxies from Eurostat labour market statistics, sectoral studies, and institutional reporting are used.

6.2.1.2 Attribution and Contribution

Because many of the expected impacts occur within complex policy and innovation ecosystems, the evaluation framework emphasises contribution rather than strict attribution. This approach recognises that improvements in workforce skills, regulatory compliance, or

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environmental outcomes result from interactions between training programmes, policy incentives, and industry investment.

The KPI framework therefore combines:

- **direct indicators** (e.g., number of learners trained)
- **systemic indicators** (e.g., integration of competencies in policy programmes)
- **proxy indicators** (e.g., compliance risk reduction).

6.2.1.3 Continuous Monitoring

Monitoring is supported by the **G4F Skills Platform (D2.1)**, which enables real-time tracking of skill acquisition, competency scores, and training outcomes. This digital infrastructure provides a dynamic dataset that supports evidence-based policy decisions and allows policymakers to monitor the evolution of skill gaps and training effectiveness over time.

6.2.2 KPI Categories

6.2.2.1 Competency KPIs

Competency indicators measure the direct learning outcomes generated by the training modules. These indicators capture improvements in both technical and transversal skills associated with sustainable food systems, circular economy practices, and green innovation.

Typical indicators include:

- Percentage of learners achieving the defined competency threshold
- Average improvement in competency score after training
- Number of accredited micro-credentials issued
- Completion rate of modular training programmes

These indicators provide evidence of the effectiveness of the challenge-based and modular pedagogical design (D4.2) in strengthening workforce capabilities and enabling skill fluidity across sectors and career stages.

6.2.2.2 Policy KPIs

Policy indicators assess the extent to which GEEK4Food outputs influence institutional governance and regulatory frameworks.

These indicators track:

- Number of regions embedding GEEK4Food competencies within circular economy, CAP, bioeconomy, or innovation programmes

- Number of public funding schemes integrating GEEK4Food modules or competency frameworks
- Number of higher education institutions adopting modular or micro-credential structures based on G4F training

These measures capture the upstream integration of project outputs into policy instruments, reflecting the successful mainstreaming of GEEK4Food knowledge into education, innovation, and sustainability strategies.

6.2.2.3 Financial KPIs

Financial indicators evaluate the capacity of the Integrated Public–Private–People (PPP) investment model to mobilise resources for green skills development.

Key metrics include:

- Volume of public funding mobilised from EU instruments (ESF+, RRF, JTF, etc.)
- Amount of private co-investment leveraged through industry partnerships
- Investment in training programmes aligned with green transition objectives
- Estimated reduction in regulatory compliance risks associated with PPWR, CSRD, or EU Taxonomy requirements

These indicators demonstrate how the GEEK4Food approach generates economic value and investment readiness by linking workforce development to regulatory compliance and sustainability reporting.

6.2.2.4 Behavioural KPIs

Behavioural indicators capture the translation of knowledge into operational practice.

Examples include:

- Adoption of eco-design practices within product development teams
- Implementation of circular economy processes in SMEs
- Use of digital advisory tools by agricultural advisors
- Adoption of carbon accounting or carbon baselining practices by farmers

These indicators reflect the organisational transformation required to translate training outcomes into measurable improvements in industry practices.

6.2.2.5 Environmental KPIs

Environmental indicators measure the long-term sustainability outcomes associated with improved competencies and industry practices.

Typical metrics include:

- Reduction in waste generation or material losses
- Reduction in greenhouse gas emissions
- Reduction in resource consumption
- Improvements in soil carbon levels or ecosystem performance

While these outcomes often manifest over longer timeframes, their inclusion ensures that workforce development is explicitly linked to the environmental objectives of the European Green Deal and EU Taxonomy regulation.

6.2.3 Alignment with EU Impact Evaluation Frameworks

The KPI structure aligns with widely used European and international evaluation frameworks, including:

- **OECD/DAC evaluation criteria** (effectiveness, efficiency, impact, sustainability)
- **Horizon Europe impact pathways** linking scientific outputs to societal and economic outcomes
- **EU Green Deal monitoring indicators** for environmental performance
- **EU Skills Agenda indicators** related to lifelong learning and workforce upskilling

By aligning with these frameworks, the evaluation approach ensures that the results generated by the project can be integrated into broader EU policy monitoring systems.

6.2.4 Integrated Impact Monitoring

Taken together, the competency, policy, financial, behavioural, and environmental indicators form a holistic impact measurement architecture capable of capturing the full transformation pathway targeted by GEEK4Food.

This integrated framework enables policymakers and stakeholders to:

- assess the effectiveness of different policy and training mixes
- identify successful models for replication across regions
- support evidence-based policy design for the green transition.

Ultimately, the KPI framework provides the analytical foundation necessary for scaling the GEEK4Food approach beyond the project itself, ensuring that training innovation contributes to the broader transformation of European food systems and the circular bioeconomy.

6.3 Mainstreaming & Transferability Models

The long-term impact of the GEEK4Food approach depends on the capacity to mainstream the developed training modules, competency frameworks, and digital intelligence tools into existing policy, funding, and institutional structures. To support this process, two complementary pathways are proposed: a Policy Embedding Pathway, targeting public governance and funding instruments, and an Institutional Adoption Pathway, focusing on the integration of G4F competencies into education and training systems.

Together, these pathways enable the systematic transfer of GEEK4Food solutions across regions, sectors, and education systems, ensuring the sustainability and scalability of the project outcomes.

6.3.1 Policy Embedding Pathway

The policy embedding pathway focuses on integrating GEEK4Food competencies and training modules within existing public funding and policy frameworks at European, national, and regional levels.

In practical terms, this pathway involves incorporating G4F modules and competency frameworks into the design and implementation of policy instruments and funding programmes, including the Common Agricultural Policy (CAP), Circular Economy initiatives, Recovery and Resilience Facility (RRF) investments, and regional innovation programmes.

Within these policy instruments, GEEK4Food competencies can be embedded in several ways:

- **Eligibility criteria**, where project applicants must demonstrate the presence of certified competencies aligned with G4F modules (e.g., sustainable food science, circular economy skills, eco-design competencies).
- **Recommended training requirements**, where participation in G4F training modules is encouraged to strengthen project implementation capacity.
- **Evaluation or scoring preferences**, where proposals demonstrating G4F-aligned competencies receive additional points in funding assessments.

Such integration ensures that publicly funded initiatives actively promote the development and application of green competencies required for the transformation of food systems, while simultaneously increasing the demand for specialised training programmes aligned with EU sustainability objectives.

6.3.2 Institutional Adoption Pathway

The institutional adoption pathway focuses on the integration of GEEK4Food training modules within higher education (HE) and vocational education and training (VET) systems.

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Through collaboration with universities, training providers, and accreditation bodies, G4F modules can be incorporated into formal and non-formal education structures in several formats:

- **Micro-credentials**, enabling flexible recognition of specialised competencies aligned with emerging industry needs.
- **Accredited course modules**, integrated into existing bachelor's or master's degree programmes in food science, biotechnology, sustainability, and related disciplines.
- **Lifelong learning programmes**, designed for professionals seeking upskilling or reskilling opportunities in response to evolving regulatory and technological developments.

This institutional integration supports the broader objective of skill fluidity, allowing learners and professionals to acquire targeted competencies throughout their careers while enabling education systems to respond more rapidly to labour market needs.

By combining policy embedding and institutional adoption, the mainstreaming model ensures that GEEK4Food competencies are not only disseminated but structurally integrated within both governance and education systems, facilitating their replication across regions and sectors.

7. Final Recommendations for Embedding GEEK4Food Solutions

The evidence generated through the Action Catalogue and associated use cases demonstrates that the successful deployment of green skills solutions in the agri-food sector requires coordinated interventions across policy, education, and investment ecosystems. The analysis conducted in Deliverable 6.2 identifies several structural barriers currently limiting the development of a future-ready workforce, including rigid educational systems, fragmented policy implementation, limited use of labour-market intelligence, and insufficient alignment between training provision and industrial innovation needs.

Based on the findings of the Action Catalogue and the application of the Policy and Training Mix methodology, three sets of strategic recommendations are proposed. These recommendations form the analytical foundation for the subsequent deliverables (D6.3 and D6.4) and aim to support the mainstreaming of GEEK4Food solutions within European skills, innovation, and sustainability policies.

7.1 Strengthening the Institutional Ecosystem (Academia and Policy Makers)

The first priority is the development of a more responsive institutional framework for green skills formation, capable of adapting educational content to rapidly evolving technological and regulatory environments.

Recognition of Modular Micro-Credentials (Capacity Tool)
Higher education institutions and national accreditation authorities should support the recognition of modular training formats as certifiable micro-credentials within existing degree programmes and lifelong learning frameworks. The GEEK4Food modular training architecture provides a practical example of how such credentials can facilitate skill fluidity, allowing professionals and students to acquire targeted competencies in areas such as circular food systems, sustainable packaging, and biotechnology.

Integration of Data-Driven Skills Intelligence (Learning Tool)
Public authorities responsible for workforce planning, vocational education, and innovation policy should integrate AI-supported labour-market intelligence tools, such as the GEEK4Food Skills Platform (D2.1), into their policy design processes. By incorporating real-time skills gap data derived from MS3 into programme design and funding priorities, policymakers can ensure that training investments respond directly to emerging sectoral needs, reducing the risks of misaligned or outdated educational provision.

Embedding Competency Frameworks into Public Funding Instruments (Incentive Tool)
Public funding programmes, such as those operating under CAP, circular economy initiatives, and innovation funding schemes, can encourage the adoption of GEEK4Food competencies by incorporating them into programme guidelines. This may include recognising relevant competencies as recommended capabilities within project proposals or integrating them into evaluation criteria used in funding calls.

7.2 Mobilising Industry Engagement and Private Investment

The transition toward sustainable food systems requires not only public policy alignment but also active engagement from industry and private capital.

Alignment of Skills Development with Industry Innovation Needs
Industry stakeholders should be encouraged to collaborate with higher education institutions and training providers to ensure that emerging competencies, such as sustainable product development, circular packaging design, and fermentation technologies, are integrated into training programmes. Such collaboration reduces the gap between academic training and industrial practice, enabling faster uptake of sustainable innovations.

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Use of Competency Metrics to Support Impact-Finance Mechanisms
The measurable improvements in skill competencies generated through GEEK4Food training modules provide a robust basis for developing performance-linked investment models. Private investors and industry partners can utilise competency indicators and workforce performance metrics as verifiable benchmarks for impact-finance instruments, such as blended financing schemes or public–private training initiatives. This approach strengthens accountability and helps attract private investment into workforce development initiatives.

Reducing Innovation Risk through Competency-Based Compliance
Training programmes that combine regulatory knowledge, sustainability principles, and product innovation capabilities help organisations reduce the risks associated with compliance with regulatory frameworks such as the EU Taxonomy, PPWR, or CSRD. Strengthening workforce competencies in these areas lowers operational risk and increases the attractiveness of green innovation projects for private investors.

7.3 Enabling Continuous Learning and System Adaptation

Given the dynamic nature of the green transition, workforce development strategies must remain adaptive and responsive to emerging technological and regulatory developments.

Establishing Continuous Feedback Mechanisms
Digital platforms such as the GEEK4Food Skills Platform can support the creation of continuous feedback loops between industry, education providers, and policymakers. By collecting real-time information on skill demands, training participation, and competency outcomes, the platform can inform periodic updates to training programmes and policy instruments.

Supporting Lifelong Learning Ecosystems
The long-term objective of the GEEK4Food methodology is to enable lifelong skill development across the agri-food sector, ensuring that workers can continuously adapt to technological, environmental, and regulatory change. Institutionalizing modular training structures and integrating them into lifelong learning strategies will enhance the resilience of the sector's workforce.

7.4. Conclusion: Verifying Impact and Catalysing Systemic Change

The Action Catalogue presented in Deliverable 6.2 confirms the central hypothesis of the GEEK4Food project: that addressing the green skills gap in the agri-food sector requires an integrated approach combining data-driven intelligence, flexible education systems, and supportive policy frameworks.

The results demonstrate that AI-driven labour-market intelligence (D2.1 and MS3) can be effectively combined with modular, challenge-based training methodologies (D4.2) to generate measurable improvements in workforce competencies. When embedded within supportive policy and funding environments, these solutions have the potential to accelerate the transition toward sustainable food systems.

8. Key Achievements of the Action Catalogue

8.1 Validation of the Policy and Training Mix

The use cases documented in this deliverable provide empirical evidence supporting the effectiveness of the GEEK4Food methodology. The results demonstrate that combining targeted policy tools, modular training solutions, and data-driven labour-market analysis can contribute to reducing skills gaps in priority areas such as circular economy practices, sustainable packaging design, and biotechnology applications.

By linking skill development outcomes to quantitative indicators, the Action Catalogue strengthens the evidence base for policy interventions supporting the green transition.

8.2 Blueprint for Mainstreaming

The deliverable provides replicable models for integrating GEEK4Food solutions into existing policy and institutional frameworks. In particular, the proposed Multi-Level Policy Mainstreaming Model (Model A) and the Integrated Public–Private–People Investment Model (Model B) outline pathways through which project results can be scaled across regions and sectors.

These models illustrate how training innovations can be embedded within policy programmes, adopted by education institutions, and supported by blended investment mechanisms involving public authorities, private industry, and individual learners.

8.3 Foundation for Long-Term Sustainability

The project establishes the structural conditions required for sustaining training activities beyond the project lifecycle. By linking competency development to recognised frameworks such as GreenComp and by engaging a broad coalition of public authorities, industry partners, and educational institutions, the GEEK4Food methodology creates the foundations for a long-term ecosystem supporting green workforce development.

9. Forward Look: Guiding D6.3 and D6.4

Deliverable 6.2 marks the transition from the development and piloting phase of the project (WP4 and WP5) toward a stronger focus on policy and investment mainstreaming within WP6.

The findings of the Action Catalogue serve as the analytical basis for the final project outputs:

D6.3 – Guidelines for Policy Makers, Academia, and Private Investors. The recommendations outlined in Section 6 provide the core content for the forthcoming guidelines, offering policy-relevant strategies to address systemic challenges such as institutional rigidity, limited data-driven planning, and fragmented stakeholder engagement.

D6.4 – Impact Finance and Public–Private–People Investment Models. The investment logic described in Model B and the performance metrics derived from the use cases provide the basis for developing financial mechanisms capable of mobilising private capital for green skills development.

10. Final Commitment

The findings of the Action Catalogue confirm that the GEEK4Food methodology has the potential to support the emergence of a more adaptive, resilient, and sustainable agri-food workforce. Through the continued policy dissemination activities undertaken within WP6, the consortium remains committed to ensuring that the knowledge generated through the project contributes to the long-term transformation of European food systems and the development of a dynamic ecosystem for green skills.

---------- END OF THE DELIVERABLE ----------

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11. Annex

Policy–Training Alignment Matrix for GEEK4Food Use Cases

Selected Policy Instrument / Report (EU/National/Regional)	Skills Demand Identified in Policy Cards	Relevant G4F Module(s)	Funding Sources Mentioned / Eligible	Countries Referenced in Evidence
EU Packaging & Packaging Waste Regulation (PPWR)	Recyclability-by-design; recycled content calculation; lifecycle assessment; CE compliance	Eco-design of food packaging	ESF+; RRF; LIFE CET; private co-investment	EU-27
Food Contact Materials Regulation (FCM)	Chemical safety; migration testing; compliance documentation	Eco-design of food packaging	ESF+; National Food Safety Agencies funding	EU-27
EU Design Directive / Design Protection	IP management; design for circularity; legal risk mitigation	Eco-design of food packaging	National IP Offices; ESF+ innovation hubs	EU-27
EU Circular Economy Action Plan (CEAP)	Waste reduction; circular product design; valorisation; CE business models	Food waste valorisation in food product design	ESF+; RRF CE reforms; national CE strategies	PT, PL, IT, IE, DK, RO
EU Bioeconomy Strategy + National	Fermentation; bioprocessing; biomass valorisation;	Optimised fermentation	STEP; RRF bioeconomy windows; national innovation funds	IE, IT, PL, PT, RO

Bioeconomy Strategies	circular bio-based materials			
Strategic Technologies for Europe Platform (STEP)	Advanced biotech; industrial decarbonisation; skills for strategic autonomy	Optimised fermentation	STEP; EIC; InvestEU	EU-27
Farm-to-Fork Strategy	CE; sustainable food systems; reduction of chemicals; digital traceability	All G4F modules	CAP; ESF+; LIFE	EU-27
Common Agricultural Policy — Eco-schemes	Carbon accounting; regenerative agriculture; biodiversity management	All G4F modules	CAP Pillar II; National Rural Development	IE, PL, DK, PT, IT, RO
CAP — Digital Advisory Services (Farm Sustainability Compass)	Digital skills; data literacy; sustainability benchmarking	All G4F modules	CAP Pillar II; Digital Europe	EU-27
CAP Strategic Plan — Skills Clause	Upskilling for advisors; VET green skills; transition skills	All G4F modules	CAP Skills Funding; ESF+	IE, PL, DK, PT, RO, IT
EU Soil Strategy	Soil sampling; carbon baselining; ecosystem service reporting	Optimised fermentation; Food waste valorisation in food product design	CAP; LIFE; Horizon	EU-27
CSRD (Corporate Sustainability	Reporting skills; sustainability	Eco-design of food packaging; Food	ESF+; private finance	EU-27

Reporting Directive)	metrics; traceability	waste valorisation in food product design		
EU Skills Agenda / GreenComp	Green literacy; systems thinking; transversal green competences	All G4F modules	ESF+; national upskilling funds	EU-27
EU Micro-Credentials Recommendation	Modular training; certification; competence-based learning	All G4F modules as MC	ESF+; RRF education reforms	All G4F countries
National VET Reforms	Modernised curricula; green and digital training; teacher upskilling	All G4F modules; teacher-oriented variants	ESF+; national VET budgets	DK, PL, PT, RO, IT, IE
Just Transition Fund (JTF)	Reskilling in coal regions; green jobs; CE; digitalisation	Optimised fermentation	JTF; ESF+; RRF	PL, RO, PT
National Energy & Climate Plans	Renewable energy integration; low-carbon agriculture; efficiency	Food waste valorisation in food product design	RRF; national climate budgets	IE, DK, PL, PT
National Circular Economy Strategies (PT, IT, PL)	Industrial symbiosis; waste valorisation; CE innovation	Food waste valorisation in food product design; Eco-design of food packaging	RRF; ESF+; innovation vouchers	PT, IT, PL
Food Vision 2030 (Ireland)	Digitalisation; sustainability; traceability; new value chains	All G4F modules	RRF; national innovation	IE

AKIS Strategies	Advisory skills; green/digital competence; networking	All G4F modules	CAP AKIS funds	IT, PL, IE, PT
S3 Smart Specialisation — Agri-Food	Cluster-based innovation; biotech; CE materials	All G4F modules	ERDF; national S3 instruments	PT, IT, PL, DK, IE
RRF Education & Skills Reforms	Digitalisation of training; micro-credentials; VET modernisation	All G4F modules	RRF	All countries with skills components
OECD SME Green Transition	CE skills; compliance; digitalisation	All G4F modules	ESF+; national SME training	PT
OECD Digital Agriculture Reports	IoT; data governance; AI; traceability	All G4F modules	Digital Europe; CAP	EU-27
Interreg Europe — Agrifood Policy Brief	SME innovation; cross-border CE; skills	All G4F modules	Interreg; ERDF	EU (regional authorities)
National RRF Plans	Green upskilling; digital transition; innovation	All G4F modules	RRF	PL, RO, PT, IE
Gender Equality & Youth Strategies	Youth entrepreneurship; gender inclusion; digital skills	All G4F modules	ESF+; CAP; national youth funds	All